

JAPANESE INDUSTRIAL STANDARD

JIS B 9960-11 : 2004

Safety of machinery — Electrical equipment of machines — Part 11: Requirements
for HV equipment for voltages above 1 000 V a.c. or 1 500 V d.c. and not exceeding
36 kV

February, 2005

ERRATA

Page 1

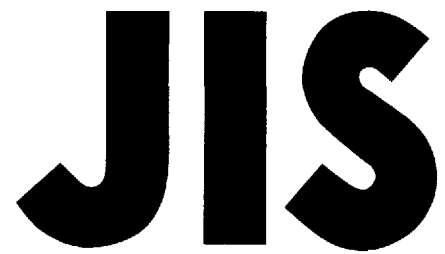
The title

Error : not exceeding 360 kV

Correct : not exceeding 36 kV

Remarks: This erratum is for correcting the first edition of this Standard.

Japanese Standards Association



JAPANESE
INDUSTRIAL
STANDARD

Translated and Published by
Japanese Standards Association

JIS B 9960-11 : 2004 (JMF)

**Safety of machinery—
Electrical equipment of machines—
Part 11 : Requirements for HV
equipment for voltages above
1 000 V a.c. or 1 500 V d.c. and
not exceeding 36 kV**

ICS 13.110; 29.020

Reference number : JIS B 9960-11 : 2004 (E)

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Foreword

This translation has been made based on the original Japanese Industrial Standard established by the Minister of Health, Labour and Welfare, and the Minister of Economy, Trade and Industry through deliberations at the Japanese Industrial Standards Committee according to the proposal of establishing a Japanese Industrial Standard from the Japan Machinery Federation (JMF), with a draft of Industrial Standard based on the provision of Article 12 Clause 1 of the Industrial Standardization Law.

This Standard has been made based on **IEC 60204-11 : 2000** *Safety of machinery—Electrical equipment of machines—Part 11 : Requirements for HV equipment for voltages above 1 000 V a.c. or 1 500 V d.c. and not exceeding 36 kV* for the purposes of making it easier to compare this Standard with International Standard; to prepare Japanese Industrial Standard conforming with International Standard; and to propose a draft of an International Standard which is based on Japanese Industrial Standard.

Attention is drawn to the possibility that some parts of this Standard may conflict with a patent right, application for a patent after opening to the public, utility model right or application for registration of utility model after opening to the public which have technical properties. The relevant Minister and the Japanese Industrial Standards Committee are not responsible for identifying the patent right, application for a patent after opening to the public, utility model right or application for registration of utility model after opening to the public which have the said technical properties.

JIS B 9960 consists of the following 4 parts under the general title *Safety of machinery—Electrical equipment of machines*.

Part 1 : General requirements

Part 11 : Requirements for HV equipment for voltages above 1 000 V a.c. or 1 500 V d.c. and not exceeding 36 kV

Part 31 : Particular safety and EMC requirements for sewing machines, units and systems

Part 32 : Requirements for hoisting machines.

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the original JIS is to be the final authority.

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**Safety of machinery—
Electrical equipment of machines—
Part 11 : Requirements for HV equipment
for voltages above 1 000 V a.c. or
1 500 V d.c. and not exceeding 360 kV**

Introduction This Japanese Industrial Standard has been prepared based on the first edition of **IEC 60204-11** *Safety of machinery—Electrical equipment of machines—Part 11 : Requirements for HV equipment for voltages above 1 000 V a.c. or 1 500 V d.c. and not exceeding 36 kV* published in 2000 with some modifications of the technical contents.

Portions given sidelines or dotted underlines are the matters modified from the original International Standard. A list of modifications with the explanations is given in annex 1 (informative).

This Standard 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.

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 Standard. Numbers in parentheses refer to clauses and subclauses in this Standard. 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 (informative) of **JIS B 9960-1**.

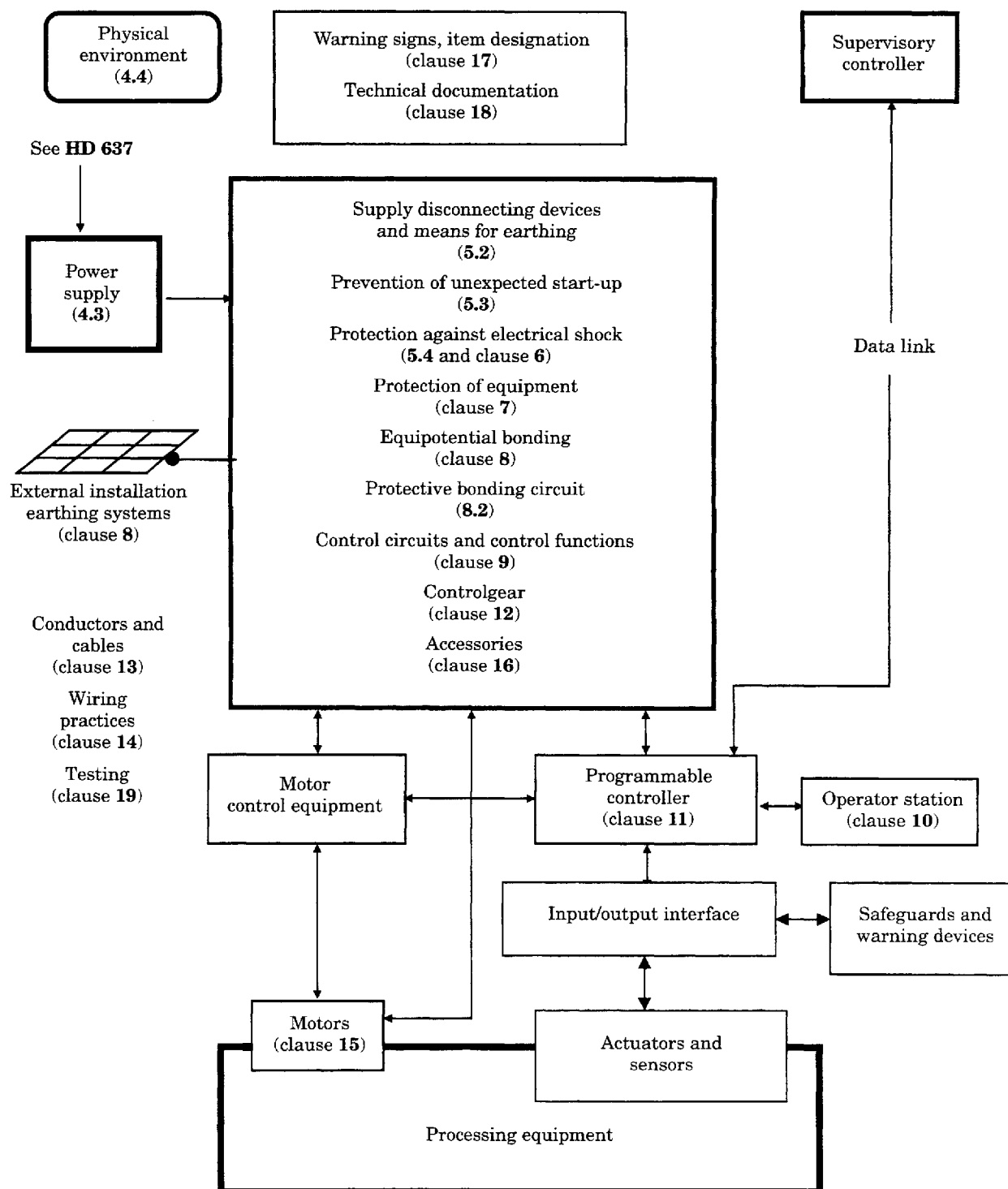


Figure 1 Block diagram of a machine containing HV equipment

1 Scope JIS B 9960 applies to the electrical and electronic equipment and systems of machines, including a group of machines working together in a coordinated manner, but excluding higher level system aspects (i.e. communications between systems).

This part of **JIS B 9960** 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 Standard, the term HV equipment also covers the LV equipment forming an integral part of the equipment operating at high voltage. The requirements in this Standard primarily cover the parts operating at high voltage except where explicitly stated otherwise. Reference is made to **JIS B 9960-1** for those requirements which also apply to HV equipment.

- NOTES
- 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 **JIS B 9960-1**.
 - 2 In this Standard, the term “electrical” includes both electrical and electronic matters i.e. electrical equipment means both the electrical and the electronic equipment.

The electrical equipment covered by this part of **JIS B 9960** commences at the point of connection of the supply to the electrical equipment of the machine (see **5.1**).

Information : For power supply installations, CENELEC documents define the requirements (**HD 637** Power supply installations exceeding 1 000 V a.c.). **HD** refers to the Harmonized Document of CENELEC.

This part of **JIS B 9960** 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) 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 3 In the context of this Standard, 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 **JIS B 9960** specifically includes, but is not limited to, machines as defined in **3.26**, 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 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 Standard.

NOTE 4 The International Standard corresponding to this Standard is as follows.

In addition, symbols which denote the degree of correspondence in the contents between the relevant International Standard and JIS are IDT (identical), MOD (modified), and NEQ (not equivalent) according to **ISO/IEC Guide 21**.

IEC 60204-11 : 2000 *Safety of machinery—Electrical equipment of machines—Part 11 : Requirements for HV equipment for voltages above 1 000 V a.c. or 1 500 V d.c. and not exceeding 36 kV (MOD)*

2 Normative references The following standards contain provisions which, through reference in this Standard, constitute provisions of this Standard. If the indication of the year of coming into effect or the year of publication is given to these referred standards, only the edition of the indicated year constitutes the provision of this Standard but the revision and amendment made thereafter do not apply.

JIS B 9706-1 : 2001 *Safety of machinery—Indication, marking and actuation—Part 1 : Requirements for visual, auditory and tactile signals*

NOTE : **IEC 61310-1** : 1995 *Safety of machinery—Indication, marking and actuation—Part 1 : Requirements for visual, auditory and tactile signals* is identical with the said standard.

JIS B 9706-3 : 2001 *Safety of machinery—Indication, marking and actuation—Part 3 : Requirements for the location and operation of actuators*

NOTE : **IEC 61310-3** : 1999 *Safety of machinery—Indication, marking and actuation—Part 3 : Requirements for the location and operation of actuators* is identical with the said standard.

JIS B 9960-1 : 1999 *Safety of machinery—Electrical equipment of machines—Part 1 : General requirements*

NOTE : **IEC 60204-1** : 1997 *Safety of machinery—Electrical equipment of machines—Part 1 : General requirements* is equivalent to the said standard.

JIS C 0364-4-41 : 1997 *Electrical installations of buildings Part 4 : Protection for safety Chapter 41 : Protection against electric shock*

NOTE : **IEC 60364-4-41** : 1992 *Electrical installations of buildings—Part 4 : Protection for safety—Chapter 41 : Protection against electric shock* is identical with the said standard.

JIS C 0364-4-42 : 1999 *Electrical installations of buildings Part 4 : Protection for safety Chapter 42 : Protection against thermal effects*

NOTE : **IEC 60364-4-42** : 1980 *Electrical installations of buildings—Part 4 : Protection for safety—Chapter 42 : Protection against thermal effects* is identical with the said standard.

JIS C 0364-5-54 : 1997 *Electrical installations of buildings Part 5 : Selection and erection of electrical equipment Chapter 54 : Earthing arrangements and protective conductors*

NOTE : **IEC 60364-5-54** : 1980 *Electrical installations of buildings—Part 5 : Selection and erection of electrical equipment—Chapter 54 : Earthing arrangements and protective conductors* is identical with the said standard.

JIS C 0445 : 1999 *Identification of equipment terminals and of terminations of certain designated conductors, including general rules for an alphanumeric system*

NOTE : **IEC 60445** : 1999 *Basic and safety principles for man-machine interface, marking and identification—Identification of equipment terminals and of terminations of certain designated conductors, including general rules for an alphanumeric system* is identical with the said standard.

JIS C 0920 : 1993 *Tests to prove protection against ingress of water and degrees of protection against ingress of solid objects for electrical equipment*

NOTE : **IEC 60529** : 1989 *Degrees of protection provided by enclosures (IP Code)* is equivalent to the said standard.

JIS C 4606 : 1993 *6.6 kV disconnectors for indoor use*

NOTE : **IEC 60129** : 1984 *Alternating current disconnectors and earthing switches* is equivalent to the said standard.

JIS Z 9101 : 1995 *Safety colours and safety signs*

NOTE : **ISO 3864** : 1984 *Safety colours and safety signs* is equivalent to the said standard.

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

IEC 60417 (all parts) : 1973 *Graphical symbols for use on equipment*

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

- 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 control-gear 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.*
- ISO 12100-1 : 2003 *Safety of machinery—Basic concepts, general principles for design—Part 1 : Basic terminology, methodology*

3 Definitions For the purpose of this Standard, the following principal definitions apply.

3.1 ambient temperature temperature of the air or other medium where the equipment is to be used [see **IEC 60050-(826), 01-04**]

3.2 barrier part providing protection against direct contact from any usual direction of access [see **IEC 60050-(826), 03-13**]

3.3 cable tray cable support consisting of a continuous base and raised edges and no covering [see **IEC 60050-(826), 06-07**]

NOTE : A cable tray may be perforated or non-perforated.

3.4 control circuit (of a machine) circuit used for the operational control of the machine and for protection of the power circuits

3.5 control device device connected into the control circuit and used for controlling the operation of the machine (e.g. position sensor, manual control switch, relay, magnetically operated valve)

3.6 controlgear general term covering switching devices and their combination with associated control, measuring, protective, and regulating equipment, also assemblies of such devices and equipment with associated interconnections, accessories, enclosures, and supporting structures [see **IEC 60050-(441)**]

3.7 direct contact electric contact of persons or animals with live parts [see **IEC 60050-(195), 06-03**]

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

NOTE : Conduits, cable trunking systems and underfloor channels are types of duct.

3.9 earthing system locally limited system of conductively connected earth electrodes or metal parts of equal effectiveness (for example tower footings, armourings, metal cable sheaths), of earthing conductors and of bonding conductors (see figure 2)

Information : **HD 637, 2.7.6** also defines identically.

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

NOTE : **(electrically) instructed person**: A person adequately advised or supervised by an electrically skilled person to enable him or her to perceive risks and to avoid hazards which electricity can create [**IEC 60050-(826), 09-02**, modified]

(electrically) skilled person: A person with relevant education and experience to enable him or her to perceive risks and to avoid hazards which electricity can create [**IEC 60050-(826), 09-02**, modified], (see also **JIS B 9960-1, 3.28** and **3.52**)

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

3.12 enclosed electrical operating area room or location for electrical equipment to which access is intended to be restricted to skilled or instructed persons by the opening of a door or the removal of a barrier by the use of a key or tool and which is clearly marked by appropriate warning signs

NOTE : See also NOTE to definition **3.10**.

3.13 enclosure part providing protection of equipment against certain external influences and, in any direction, protection against direct contact (**IEV 826-03-12**)

NOTE : The definition taken from the existing **IEV** needs the following explanations under the scope of this Standard (see **JIS C 0920, 3.1**):

- a) enclosures provide protection of persons or livestock against access to hazardous parts;
- b) barriers, shaped openings, or any other means suitable to prevent or limit the penetration of the specified test probes, whether attached to the enclosure or formed by the enclosed equipment, are considered as part of the enclosure, except where they can be removed without the use of a key or tool.

An enclosure may be

- a cabinet or box, either mounted on the machine or separate from the machine;
- a compartment consisting of an enclosed space within the machine structure.

3.14 equipment general term including material, fittings, devices, appliances, fixtures, apparatus, and the like used as part of, or in connection with, an electrical installation.

3.15 equipotential bonding provision of electric connections between conductive parts, intended to achieve equipotentiality [see **IEC 60050-(195), 01-10**]

3.16 equipotential bonding conductor/protective bonding conductor protective conductor provided for protective-equipotential-bonding [see **IEC 60050-(195), 02-10**]

3.17 exposed-conductive-part conductive part of equipment which can be touched and which is not normally live, but which can become live when basic insulation fails [see **IEC 60050-(195), 06-10**]

3.18 extraneous-conductive-part conductive part not forming part of the electrical installation and liable to introduce an electric potential, generally the electric potential of a local earth [see **IEC 60050-(195), 06-11**]

3.19 failure termination of the ability of an item to perform a required function

NOTES 1 After failure the item has a fault.

2 “Failure” is an event, as distinguished from “fault”, which is a state.

3 This concept as defined does not apply to items consisting of software only [see **IEC 60050-(191), 04-01**].

4 In practice the terms fault and failure are often used synonymously.

3.20 fault state of an item characterized by inability to perform a required function, excluding the inability during preventive maintenance or other planned actions, or due to lack of external resources

NOTE : A fault is often the result of a failure of the item itself, but may exist without prior failure.

3.21 hazard source of possible injury or damage to health (see **ISO 12100-1, 3.5**)

3.22 indirect contact electric contact of persons or animals with exposed-conductive-parts which have become live under fault conditions [see **IEC 60050-(195), 06-04**]

3.23 interlock (for safeguarding) arrangement that interconnects guard(s) or device(s) with the control system and/or all or part of the electrical energy distributed to the machine

3.24 live part conductor or conductive part intended to be energized in normal operation, including a neutral conductor, but by convention not a PEN conductor or PEM conductor (protective earthing mid-point conductor) or PEL conductor (protective earthing line conductor) [see **IEC 60050-(195), 06-04**]

NOTE : This concept does not necessarily imply a risk of electric shock.

3.25 machine bonding conductor conductor connecting the machine equipotential bonding to the earthing system [see **IEC 60050-(826), 04-07**]

Information : This is an earthing conductor as defined and used in **HD 637**.

3.26 machinery (machine) An assembly of linked parts or components, at least one of which moves, with the appropriate machine actuators, control and power circuits, etc., joined together for a specific application, in particular for the processing, treatment, moving or packaging of a material.

The term “machinery” also covers an assembly of machines which, in order to achieve one and the same end, are arranged and controlled so that they function as an integral whole.

“Machinery” also means interchangeable equipment modifying the function of a machine, which is placed on the market (supplied) for the purpose of being assembled with a machine or a series of different machines, or with a tractor by the operator himself insofar as this equipment is not a spare part or tool.

3.27 marking signs or inscriptions for the identification of the type of a component or device attached by the manufacturer of the component or device

3.28 neutral conductor conductor electrically connected to the neutral point and capable of contributing to the distribution of electric energy [see **IEC 60050-(195), 02-06**]

3.29 obstacle part preventing unintentional direct contact, but not preventing direct contact by deliberate action [see **IEC 60050-(826), 03-14**]

3.30 overcurrent current exceeding the rated value. For conductors, the rated value is the current-carrying capacity [see **IEC 60050-(826), 05-06**]

3.31 overload (of a circuit) time/current relationship in a circuit which is in excess of the rated full load of the circuit when the circuit is not under a fault condition

NOTE : “Overload” should not be used as a synonym for overcurrent.

3.32 plug/socket combination plug and socket-outlet, cable coupler, or appliance coupler

3.33 power circuit circuit used for supplying power from the supply network to units of electrical equipment used for productive operation and to transformers supplying control circuits

3.34 protective bonding circuit the whole of the protective conductors and conductive parts used for protection against electric shock in the event of an insulation failure

3.35 protective conductor conductor required by some measures for protection against electric shock for electrically connecting any of the following parts (**IEV 826-04-05**, modified):

- exposed-conductive-parts;
- extraneous-conductive-parts;
- main earthing terminal.

3.36 reference designation distinctive code which serves to identify an item in a diagram, list or chart, and on the equipment

3.37 risk combination of the probability and the degree of possible injury or damage to health in a hazardous situation (**ISO 12100-1**)

3.38 safe working procedure method of working that reduces risk

3.39 safeguard guard or protective device used as a means to protect persons from a present or impending hazard

3.40 safeguarding safety measures consisting of the use of specific means called safeguards (guard, safety device) to protect persons from hazards that cannot reasonably be removed or are not sufficiently limited by design

3.41 servicing level level on which persons normally stand when operating or maintaining the electrical equipment

3.42 short-circuit current overcurrent resulting from a short circuit due to a fault or an incorrect connection in an electric circuit [see **IEC 60050-(441)**, **11-07**]

3.43 supplier entity (e.g. manufacturer, contractor, installer, integrator) who provides equipment or services associated with the machine

NOTE : The user may also act in the capacity of a supplier to himself.

3.44 switching device device designed to make or break the current in one or more electric circuits [see **IEC 60050-(441)**, **14-01**]

NOTE : A switching device may perform one or both of these actions.

3.45 terminal conductive part of a device provided for electrical connection to external circuits

3.46 user entity who utilizes the machine and its associated electrical equipment

4 General requirements

4.1 General considerations This part of **JIS B 9960** is intended to apply to electrical equipment used with a wide variety of machines and with a group of machines working together in a coordinated manner.

The risks associated with the hazards relevant to the HV equipment shall be assessed as part of the overall requirements for risk assessment of the machine. This will determine the acceptable level of risk, and the necessary protective measures for persons who can be exposed to those hazards, while still maintaining an acceptable level of performance of the machine and its equipment.

Hazards can result from, but are not limited to, the following causes:

- failures or faults in the electrical equipment resulting in the possibility of electric shock or electrical fire;
- failures or faults in control circuits (or components and devices associated with those circuits) resulting in the malfunctioning of the machine;
- disturbances or disruptions in power sources as well as failures or faults in the power circuits resulting in the malfunctioning of the machine;
- loss of continuity of circuits that depend upon sliding or rolling contacts, resulting in a failure of a safety function;
- electrical disturbances (e.g. electromagnetic, electrostatic or radio interference) either from outside the electrical equipment or internally generated;
- stored energy (either electrical or mechanical);
- audible noise at levels that cause health problems to persons.

Safety measures are a combination of the measures incorporated at the design stage and those measures required to be implemented by the user.

Design and development shall be the first consideration in the reduction of risks. Where this is not sufficient, safeguarding and safe working procedures shall be considered. Safeguarding includes the use of safeguards and awareness means.

The use of the inquiry form as shown in annex B of this Standard is recommended in order to facilitate an appropriate agreement between the user and the supplier(s) on basic conditions and additional user requirements related to the HV equipment. Those additional requirements are to

- provide additional features that are dependent on the type of machine (or group of machines) and the application;
- facilitate maintenance and repair, and
- advance the reliability and ease of operation.

4.2 Selection of electrical equipment Electrical components and devices shall be suitable for their intended use and shall conform to relevant **JIS** or **IEC** standards where such exist. For example, where factory-built, type-tested HV switchgear is used, it shall be selected from those manufactured and tested in accordance with standards such as **IEC 60298**, **IEC 60466** and **IEC 60694**.

Information : **JEM 1425** specifies as equivalent to **IEC 60298**.

4.3 Electrical supply

4.3.1 General The electrical equipment shall be designed to operate correctly with any of the following supply

- a.c. supply source specified in **4.3.2**;
- a.c. or d.c. source otherwise specified by the user (see annex B), or
- a special source, such as an on-board generator, specified by the supplier.

4.3.2 Supplies

Voltage	Steady-state voltage: 0.9 ... 1.1 of nominal voltage
Frequency	0.99 ... 1.01 of nominal frequency (continuously) or 0.98 ... 1.02 (short time). NOTE : The short-time value may be specified by the user (see annex B).
Harmonics	Harmonic distortion not to exceed 10 % of the total r.m.s. voltage between live conductors for the sum of the 2nd through 5th harmonic. An additional 2 % of the total r.m.s. voltage between live conductors for the sum of the 6th through 30th harmonic is permissible.
Voltage unbalance	Neither the voltage of the negative sequence component nor the voltage of the zero sequence component in three-phase supplies shall exceed 2 % of the positive sequence component.
Voltage interruption	Supply interrupted or at zero voltage for not more than 3 ms at any random time in the supply cycle. There shall be more than 1 s between successive interruptions.
Voltage dips	Voltage dips shall not exceed 20 % of the peak voltage of the supply for more than 1 cycle. There shall be more than 1 s between successive dips.

4.3.3 On-board power supply For special supply systems such as on-board generators, the limits given in 4.3.2 may be exceeded provided that the electrical equipment is designed to operate correctly with those conditions.

4.4 Physical environment and operating conditions The HV equipment shall be suitable for use in the physical environment and operating conditions specified in 4.4.2 to 4.4.8 of **JIS B 9960-1**. When the physical environment or the operating conditions are outside those specified, an agreement may be needed between the supplier and the user (see annex B).

4.5 Transportation and storage Electrical equipment shall be designed to withstand, or suitable precautions shall be taken to protect against, the effects of transportation and storage temperatures within a range of $-25\text{ }^{\circ}\text{C}$ to $+55\text{ }^{\circ}\text{C}$ and for short periods not exceeding 24 h at up to $+70\text{ }^{\circ}\text{C}$. Suitable means shall be provided to prevent damage from humidity, vibration, and shock.

NOTE : Electrical equipment susceptible to damage at low temperatures includes PVC insulated cables.

4.6 Provisions for handling Heavy and bulky electrical equipment that has to be removed from the machine for transport, or that is independent of the machine, shall be provided with suitable means for handling by cranes or similar equipment (see also 14.5).

4.7 Installation Electrical equipment shall be installed in accordance with the supplier's instructions, and ergonomic principles should be taken into account.