

INTERNATIONAL STANDARD

IEC
60335-2-87

First edition
1998-11

**Safety of household and similar
electrical appliances –**

Part 2-87:
**Particular requirements for electric
animal-stunning equipment**

Sécurité des appareils électrodomestiques et analogues –

Partie 2-87:
*Règles particulières pour les appareils électriques
d'insensibilisation des animaux*



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* See web site address on title page.

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

SAFETY OF HOUSEHOLD AND SIMILAR ELECTRICAL APPLIANCES –**Part 2: Particular requirements for electric animal-stunning equipment**

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.
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- 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 60335-2-87 has been prepared by subcommittee 61H: Safety of electrically-operated farm appliances, of IEC technical committee 61: Safety of household and similar electrical appliances.

The text of this standard is based on the following documents:

FDIS	Report on voting
61H/124/FDIS	61H/129/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 part 2 is to be used in conjunction with the latest edition of IEC 60335-1 and its amendments. It was established on the basis of the third edition (1991) of that standard and its amendment 1 (1994).

This part 2 supplements or modifies the corresponding clauses in IEC 60335-1, so as to convert that publication into the IEC standard: Safety requirements for electric animal-stunning equipment.

Where a particular subclause of part 1 is not mentioned in this part 2, that subclause applies as far as is reasonable. Where this standard states "addition", "modification" or "replacement", the relevant text in part 1 is to be adapted accordingly.

NOTE 1 – The following print types are used:

- requirements proper: in roman type;
- *test specifications: in italic type*;
- notes: in smaller roman type.

Words in **bold** in the text are defined in clause 2. When a definition of part 1 concerns an adjective, the adjective and the associated noun are also in **bold**.

NOTE 2 – Subclauses, tables and figures which are additional to those in part 1 are numbered starting from 101.

The following additional differences exist in some countries:

- 25.7: Ordinary polyvinyl chloride cords are allowed (Australia, New Zealand).

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SAFETY OF HOUSEHOLD AND SIMILAR ELECTRICAL APPLIANCES –

Part 2: Particular requirements for electric animal-stunning equipment

1 Scope

This clause of part 1 is replaced by:

This standard deals with the safety of **electric animal-stunning equipment** the **rated voltage** of which is not more than 250 V for single-phase appliances and 480 V for other appliances.

This standard is applicable to **electric animal-stunning equipment** for industrial or commercial use, for use on farms or for use in areas where they may be a source of danger to the public.

So far as is practical, this standard deals with the common hazards presented by these types of appliances.

NOTE 1 – Examples of **electric animal-stunning equipment** within the scope of this standard are those used to stun:

- bovines such as cattle, calves, cows, heifers and bulls;
- ovines such as sheep and lambs;
- caprines such as goats;
- cervids such as deer;
- solipeds such as horses, donkeys and mules;
- birds such as chickens, turkeys and guinea fowl;
- porcines such as pigs;
- fur animals such as foxes, chinchilla, rabbits and possums;
- mustelids such as mink and polecats;
- other ruminants such as camels.

NOTE 2 – The following types of **electric animal-stunning equipment** are covered by this standard:

- manual, semi-automatic and automatic.

NOTE 3 – Attention is drawn to the fact that:

- for **electric animal-stunning equipment** intended to be used on board ships, additional requirements may be necessary;
- for **electric animal-stunning equipment** intended to be used in tropical countries, special requirements may be necessary;
- in many countries, additional requirements are specified by the national health authorities, the national authorities responsible for the protection of labour, the national water supply authorities and similar authorities;
- in many countries, additional requirements are specified concerning the humane slaughter of animals.

NOTE 4 – This standard does not apply to:

- appliances intended to be used in locations where special conditions prevail, such as the presence of a corrosive or explosive atmosphere (dust, vapour or gas);
- electric fishing machines (see IEC 60335-2-86);
- electric fence energizers (see IEC 60335-2-76);
- meat tenderizers, carcass immobilizers, carcass stiffeners, spinal discharge equipment or similar equipment.

2 Definitions

This clause of part 1 is applicable except as follows:

2.2.9 Replacement:

normal operation

The **electric animal-stunning equipment** is operated as in normal use when connected to the supply with **electrodes** connected to the output terminals of the **stunning equipment**. An adjustable non-inductive resistor is connected between the **electrodes**. The resistor is adjusted so that **output current** can flow.

2.9.3 Addition:

NOTE – It also includes terminals for the connection of the batteries and other metal parts in a battery compartment which become accessible when replacing batteries even with the aid of a **tool**.

2.9.4 Replacement:

live part

A conductive part which may cause an electric shock.

NOTE – Parts, accessible or not, complying with 8.1.4 are not considered to be **live parts**.

2.101

electric animal-stunning equipment

Appliance which is designed or used to cause electronarcosis in an animal by means of an electric current. It may also cause irreversible cardiac arrest.

NOTE – In this standard, for convenience, this term is abbreviated to **stunning equipment**.

2.102

mains-operated stunning equipment

Stunning equipment designed for direct connection to a supply, other than a battery supply or a **safety extra-low voltage** supply.

2.103

battery-operated stunning equipment

Stunning equipment deriving its energy solely from chargeable or non-rechargeable batteries.

2.104

electrode

Parts of **stunning equipment** which transfer the electric current to the animal.

NOTE – The **stun electrode** is the **electrode** used to apply the stun voltage, the **return electrode** is the other **electrode**.

2.105

stunning circuit

Conductive parts or components within **stunning equipment**, which are connected or intended to be connected galvanically to the **electrode** terminals.

2.106

output voltage

Voltage required to sustain the **output current** under **normal operation**.

2.107

output current

Current in the **stunning circuit** that the **stunning equipment** is designed to supply.

2.108**biased-off switch**

Switch which automatically returns to the **off position** when its actuating member is released.

3 General requirement

This clause of part 1 is applicable.

4 General conditions for the tests

This clause of part 1 is applicable except as follows:

4.8.1 Addition:

For **battery-operated stunning equipment** where the supply terminals for the connection of the batteries have no indication for polarity, the application of the more unfavourable polarity is used.

4.101 If there is no indication as to which of the output terminals is to be connected to the **stun electrode**, the terminal which gives the most unfavourable result is connected to the return **electrode**.

4.102 Unless otherwise specified, **stunning equipment** is tested as a **motor-operated appliance**.

5 Void**6 Classification**

This clause of part 1 is applicable except as follows:

6.1 Replacement:

Stunning equipment which is suitable for connection to the supply mains shall be of **class I**, **class II** or **class III** with respect to protection against electric shock.

Stunning equipment which is suitable for connection to the supply mains and which is directly connected to the water supply mains shall be of **class I** with respect to protection against electric shock.

Portable and **hand-held stunning equipment** shall be **class II** or **class III** with respect to protection against electric shock.

Compliance is checked by inspection and by the relevant tests.

6.2 Addition:

Parts of **stunning equipment** which contain electrical components and which may be cleaned with a water jet according to the instructions, shall be at least of IPX5 construction.

Hand-held stunning equipment shall be at least of IPX5 construction.

7 Marking and instructions

This clause of part 1 is applicable except as follows:

7.1 Addition:

Stunning equipment shall be marked with:

- duty cycle, if applicable;
- **output current**;
- no-load **output voltage**;
- warning – "Read full instructions before use";
- a symbol indicating the presence of a dangerous voltage in accordance with symbol number 5036 of IEC 60417-2.

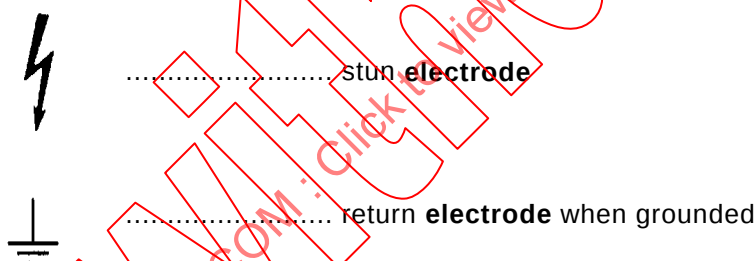
NOTE – This symbol forms a warning sign for which the rules in ISO 3864 are applicable.

- the stun **electrode** and return **electrode** terminals shall be identified by appropriate symbols where applicable, except if the return **electrode** is not grounded.

Battery-operated stunning equipment shall also be marked with:

- the **rated input current** in amperes;
- WARNING – Do not connect to mains-operated equipment.
- the type of battery, unless the type is irrelevant for the operation of the stunning equipment, distinguishing between chargeable and non-rechargeable batteries if necessary.

7.6 Addition:



The symbols for stun **electrode** and return **electrode** when grounded shall be in accordance with symbol numbers 5036 and 5017 of IEC 60417-2 respectively.

7.8 Addition:

For **battery-operated stunning equipment** the supply terminals for connection of the battery shall be clearly indicated by the symbol "+" or the colour red if of positive polarity, and by the symbol "-" or the colour black if of negative polarity, unless the polarity is irrelevant.

7.12 Addition:

The instructions shall contain the substance of the following:

- for **stunning equipment** parts of which are hand-held, the power supply switch shall be visible from any point that the piece held in the hand may be used;
- for **stunning equipment** parts of which are hand-held, the hand-held sub-assembly when not in use shall be kept in a holder placed alongside the supply unit, or be otherwise suspended at a minimum height of 1,6 m;
- isolate the **stunning equipment** from the power supply when it is not in use.

The instructions for **battery-operated stunning equipment** shall in particular emphasize the warning marked on the **stunning equipment** which states:

WARNING – Do not connect to mains-operated equipment.

The instructions for **class III portable stunners**, shall state that the stunner shall only be used with the isolating transformer with which it is supplied.

7.12.1 Addition:

The instructions shall include the substance of the following:

- a wiring diagram;
- recommendations concerning functional tests to be carried out to ensure the continuing correct operation of safety controls and interlocks;
- the stunner shall be disconnected from the power supply during cleaning;
- for **fixed stunning equipment**, the installation shall be integrated into an effective equipotential bonding system;
- parts which are not marked IPX5 shall be installed in a location where they are not likely to be cleaned with the aid of a water jet;
- the stunner shall be installed in a well drained position;
- the **supply cord** shall be placed such that it is not accessible to animals;
- the **stunning equipment** is to be installed according to the relevant sections of the wiring rules and health and safety rules.

NOTE – Attention is drawn to IEC 60364-7-705.

7.101 Hand-pieces of **stunning equipment**, which are detachable from the rest of the **stunning equipment**, shall be marked with:

- name, trade mark or identification mark of the manufacturer or responsible vendor;
- model or type reference of the hand-piece;
- **rated voltage, rated current** and duty cycle if applicable;
- IP rating.

Compliance is checked by inspection.

7.14 Addition:

The perpendicular height of the triangle containing the symbol indicating the presence of a dangerous voltage shall be not less than 120 mm, however for the warning sign on the hand-piece of **hand-held stunning equipment** the height shall not be less than 20 mm.

8 Protection against access to live parts

This clause of part 1 is applicable except as follows:

8.1.4 Addition:

The **electrodes** are not considered to be a **live part**.

9 Starting of motor-operated appliances

This clause of part 1 is not applicable.

10 Power input and current

This clause of part 1 is applicable.

11 Heating

This clause of part 1 is applicable except as follows:

11.5 Replacement:

Stunning equipment is operated under **normal operation** supplied as follows:

- for **mains-operated stunning equipment**, supplied with the most unfavourable supply voltage between 0,94 and 1,06 times **rated voltage**;
- for **battery-operated stunning equipment** when it is supplied with the most unfavourable supply voltage between:
 - 0,55 and 1,1 times **rated voltage**, if the **stunning equipment** can be used with non-rechargeable batteries;
 - 0,75 and 1,1 times **rated voltage**, if the **stunning equipment** is designed for use with rechargeable batteries only.

The values specified in table 101 for the internal resistance/cell of the battery shall be taken into account.

Table 101 – Battery source impedance

Supply to the terminals for the connection of the battery	Internal resistance/cell Ω	
	Non-rechargeable batteries	Rechargeable batteries
1,1 times rated voltage	0,08	0,0012
1,0 times rated voltage	0,10	0,0015
0,75 times rated voltage	0,75	0,0060
0,55 times rated voltage	2,00	–
NOTE – For determining the internal resistance of a battery, two or more cells connected in parallel are considered to be one cell.		

11.7 Replacement:

Stunning equipment which, according to the instructions, requires a rest period between stuns is operated at the duty cycle marked on the equipment until steady conditions are established. Other **stunning equipment** is operated continuously until steady conditions are established.

12 Void

13 Leakage current and electric strength at operating temperature

This clause of part 1 is applicable except as follows:

13.1 Modification:

The requirement and tests are only applicable to **mains-operated stunning equipment**.

14 Void

15 Moisture resistance

This clause of part 1 is applicable.

16 Leakage current and electric strength

This clause of part 1 is applicable except as follows:

16.1 Modification:

Compliance is checked by the tests of:

- 16.2 and 16.3 for **stunning equipment** suitable for connection to the supply mains;
- 16.101 for **battery-operated stunning equipment**.

16.3 Modification:

For **working voltages** exceeding 250 V the following test voltages apply:

1 250 V becomes $2U + 750$ V;

2 500 V becomes $2U + 2\,000$ V;

3 750 V becomes $2U + 3\,250$ V;

where U is the **working voltage** of the insulation.

16.101 For **battery-operated stunning equipment** the supply terminals are connected for 10 min to a voltage between 1,1 and 1,5 times **rated voltage**, which is so chosen that the **output voltage**, without a load connected, has the maximum value, protective spark gaps, if any, being disconnected.

The insulation between the poles of the supply circuit is then subjected for 1 min to a d.c. voltage of approximately 500 V. Before this test is made, capacitors, resistors, inductors, transformer windings and **electronic components** which are connected between the poles of the supply circuit are disconnected. When a capacitor forms part of an integrated circuit and cannot be disconnected separately, the circuit as a whole is disconnected.

No breakdown shall occur during the test.

17 Overload protection of transformers and associated circuits

This clause of part 1 is applicable.

18 Endurance

This clause of part 1 is not applicable.

19 Abnormal operation

This clause of part 1 is applicable except as follows.

19.1 Addition:

Compliance is also checked by the test of 19.101.

19.13 Addition:

The **stunning equipment** shall automatically be disconnected within 50 ms after a fault which causes a no-load voltage exceeding 24 V to appear between the **electrodes**.

19.101 The **stunning equipment** is operated under **normal operation** and supplied at **rated voltage**. The following defects are applied in turn:

- the stunning **electrodes** are short-circuited;
- level switches and other devices used to control the water level in a water bath are short-circuited or rendered inoperative;
- fuses accessible to the user without the aid of a **tool** are short-circuited;
- **stunning equipment** with a duty cycle of less than 100 % is operated continuously.

20 Stability and mechanical hazards

This clause of part 1 is applicable.

21 Mechanical strength

This clause of part 1 is applicable except as follows:

Addition:

*Except for **hand-held equipment**, external surfaces of enclosures, the failure of which would give access to hazardous parts, are tested as follows.*

A sample consisting of the complete enclosure or portion thereof representing the weakest area is supported in normal position. A solid steel sphere, approximately 50 mm in diameter and with a mass of $500\text{ g} \pm 25\text{ g}$, is permitted to fall freely from rest through a vertical distance (H) of 1 300 mm onto the horizontal surfaces of the sample.

In addition the steel sphere is suspended by a cord and swung like a pendulum, dropping through a vertical distance (H) of 1 300 mm as shown in figure 101 in order to apply a horizontal impact to vertical and vertically sloping surfaces.

If the pendulum is inconvenient, it is permitted to simulate horizontal impacts on vertical sloping surfaces by mounting the sample at up to 90° to its normal position and applying the vertical impact test instead of the pendulum test.

NOTE – The test is not applied to glass surfaces.

Hand-held equipment and other parts of **stunning equipment** that are carried in use are subject to the free fall test described in IEC 60068-2-32, test Ed, the equipment being dropped from a height of 1 m a total of three times.

After the tests, the appliance shall show no damage within the meaning of this standard; in particular, compliance with 8.1, 15.1, 16.3 and 29.1 shall not be impaired.

22 Construction

This clause of part 1 is applicable except as follows:

22.101 Where the **stunning equipment** is carried by the user during operation, a tilt switch shall be fitted that disconnects the **stunning circuit** when the **stunning equipment** is tipped past 45° from the vertical. A manual operation shall be required to reconnect the **stunning circuit**.

Compliance is checked by inspection and manual test.

22.102 **Battery-operated stunning equipment** shall be so designed that connection to the supply mains, either directly or indirectly through a battery charger, is not possible.

Compliance is checked by inspection.

NOTE – External clips and crocodile clips are not considered to be supply-mains connectors.

22.103 For **stunning equipment** suitable for connection to the supply mains, internal connections shall be so fixed or protected and **stunning equipment** shall be so designed that, even in the event of loosening or breaking of wires, a conductive connection cannot be formed between the mains supply and the **stunning circuit**, nor can any other hazardous condition arise.

For **stunning equipment** suitable for connection to the supply mains, the **stunning circuit** shall be isolated from the supply circuit by means of an isolating transformer.

Compliance is checked by inspection, by the tests of the other clauses of this standard and by the tests of IEC 61558-1, if applicable.

22.104 Only one pair of electrodes shall be supplied from each isolating transformer associated with the **stunning equipment**.

Compliance is checked by inspection.

22.105 The actuator of any switch or control that is operated in normal use shall be accessible without opening or removing any part of the enclosure which provides protection against harmful ingress of water or unintended electric shock.

Compliance is checked by inspection.

22.106 In stunning equipment where the electrodes are connected in normal use after the stunning equipment has been installed and connected to the supply mains, the terminals for connection of the **electrodes** shall be accessible without opening or removing any part of the enclosure which provides protection against harmful ingress of water or unintended electric shock.

Compliance is checked by inspection.

22.107 Where conductors of the **stunning circuit** pass through the enclosure, bushings of insulating material suitable for the relevant **working voltage** shall be provided, unless the enclosure is made of insulating material suitable for the relevant **working voltage**.

Compliance is checked by inspection.

NOTE – For **stunning equipment** suitable for connection to the supply-mains material complying with the test of 30.3 is considered to be suitable for the relevant **working voltage**.

22.108 The presence of a voltage exceeding 24 V peak between the **electrodes** is to be indicated by a visual means able to be seen from any direction of approach to the **stunning equipment**.

Compliance is checked by inspection and test.

22.109 A visual indication shall be provided to show when the power supply is connected to the **stunning equipment**.

Compliance is checked by inspection.

NOTE – For **stunning equipment** used for pest control purposes in areas accessible to the public, this may be achieved by the use of warning signs attached to barriers erected to restrict access to the appliance.

22.110 All hand-pieces of **hand-held stunning equipment** shall either:

- be fitted with two **biased-off switches**, not able to be switched on by using one hand, both of which shall be closed to provide current in the **stun circuit**; or shall
- comply with the requirement of 22.111.

Compliance is checked by inspection and the appropriate tests.

22.111 **Stunning equipment** not complying with 22.110 and other **stunning equipment** where animals are individually stunned, shall incorporate a control unit which prevents application of a voltage between the **electrodes** exceeding 24 V peak if the **electrode** load impedance exceeds a limiting value.

The magnitude of the **electrode load** impedance shall be checked at least every 20 ms and the **electrode** voltage shall be reduced to the no-load value within 30 ms of the load impedance exceeding the limiting value.

*Compliance is checked by measurement and the following test which is carried out with the **stunning equipment** supplied at **rated voltage**.*

*The no-load value of the voltage appearing between the **electrodes** is measured. A variable resistor is then connected between the **electrodes** and is adjusted so that the voltage appearing between the **electrodes** exceeds the no-load voltage.*

*The minimum value of the resistor at which the voltage appearing between the **electrodes** exceeds the no-load voltage shall not exceed the limiting value given by the curve of figure 102.*

*The resistance is then increased and the voltage appearing between the **electrodes** shall be reduced to the no-load value within 30 ms of the resistance between the **electrodes** exceeding the limiting resistance given by the curve in figure 102.*

22.112 The control circuit operated by the two switches used to comply with 22.110, shall be such that:

- the second switch shall be closed within 5 s of closure of the first switch to allow current to flow in the **stun circuit**;
- in semi-automatic **stunning equipment**, release of one switch after initiation of the stun, will cause voltage to be removed from the **electrodes** after a time sufficient to complete the stun;
- both switches shall be released to reset the **stunning equipment** for further use.

Compliance is checked by inspection and test.

22.113 **Stunning equipment**, other than that connected to the supply by a **supply cord** and plug, shall be provided with a switch which isolates the equipment from all power sources and which is capable of being locked in the **off position**. The switch shall have a contact separation of least 3 mm in all poles.

Compliance is checked by inspection and test.

22.114 **Stunning equipment** shall be so designed that an interruption and restoration of the power supply cannot result in voltage being applied to the **electrodes** without a further manual action being taken.

Compliance is checked by inspection and test.

22.115 For water bath **stunning equipment** it shall not be possible to energize the **stunning equipment** when draining water from the bath.

For water bath **stunning equipment** it shall not be possible to energize the **stunning equipment** when filling the bath unless this is carried out by using water supplied automatically from a separate tank.

Compliance is checked by inspection and test.

22.116 Appliances connected to the water mains shall withstand the water pressure expected in normal use.

*Compliance is checked by connecting the **stunning equipment** to a water supply having a static pressure equal to twice the maximum permissible inlet water pressure or 1,5 MPa whichever is the higher, for a period of 5 min.*

There shall be no leakage from any part, including the inlet water hose.

22.117 For **stunning equipment** directly connected to the water supply mains, the point of connection between the **stunning equipment** and the water supply shall be metallic and shall be connected to the **stunning equipment** protective earth.

Compliance is checked by inspection and the test of 27.5.

22.118 It shall not be possible to make unintentional contact with **electrodes**.

For other than **hand-held stunning equipment**, if unintentional contact is prevented by the use of distance or barriers, there shall be a minimum distance of 1,25 m between the enclosure of the **stunning equipment** or barrier and the **electrodes**.

Hand pieces of **hand-held stunning equipment** shall incorporate barriers that reduce the risk of the hand of the user making contact with the **electrodes**.

Compliance is checked by inspection, measurement and test.

22.119 If access to the area containing the **electrodes** is necessary then an interlock shall be fitted to the door giving access to the area to ensure that the **electrodes** are not energized while the door is open. It shall only be possible to reset the **stunning equipment** from outside the enclosure. The position from which the stunning equipment is reset shall be in sight of the **electrodes**.

Compliance is checked by inspection.

23 Internal wiring

This clause of part 1 is applicable.

24 Components

This clause of part 1 is applicable.

25 Supply connection and external flexible cords

This clause of part 1 is applicable except as follows:

25.1 Replacement:

Mains-operated stunning equipment, other than those intended to be permanently connected to fixed wiring, shall be provided with a **supply cord** fitted with a plug.

Compliance is checked by inspection.

25.3 Modification:

Delete the third dash item referring to supply leads.

25.5 Addition:

The flexible leads or cord used to connect the battery in **battery-operated stunning equipment** shall be assembled with the **stunning equipment** by a **type X attachment**.

25.7 Replacement:

Supply cords, other than the flexible leads or cord connecting an external battery or battery box with **stunning equipment**, shall not be lighter than heavy polychloroprene sheathed cord (code designation 60245 IEC 66).

Compliance is checked by inspection.

25.13.2 Addition:

The requirement is not applicable to the flexible leads or cord connecting an external battery or battery box with **stunning equipment**.

25.23 Addition:

For **battery-operated stunning equipment**, if the battery is placed in a separate box, the flexible leads or cord connecting the box with the **stunning equipment** are considered to be an **interconnection cord**.

25.101 **Battery-operated stunning equipment** shall have suitable means for connection of the battery.

If the type of battery is marked on the **stunning equipment**, the means for connection shall be suitable for this type of battery.

Compliance is checked by inspection.

26 Terminals for external conductors

This clause of part 1 is applicable except as follows:

26.11 *Addition:*

Terminals in **stunning equipment** for the connection of the flexible leads or cord with **type X attachment** connecting an external battery or battery box shall be so located or shielded that there is no risk of accidental connection between terminals.

27 Provision for earthing

This clause of part 1 is applicable.

28 Screws and connections

This clause of part 1 is applicable.

29 Creepage distances, clearances and distances through insulation

This clause of part 1 is applicable.

30 Resistance to heat, fire and tracking

This clause of part 1 is applicable except as follows:

30.2 *Modification:*

Compliance is checked by the tests of 30.2.1, 30.2.2 and if necessary, 30.2.4.

30.3 *Addition:*

NOTE 1 – **Battery-operated stunning equipment** is subject to normal duty conditions.

NOTE 2 – In **stunning equipment** suitable for connection to the supply mains, switching devices with moving contacts other than manually-operated are regarded as being subjected to extra-severe duty conditions. In addition, other parts of insulating material are also regarded as being subjected to extra-severe duty conditions, unless these parts are so enclosed or located that pollution by moisture or dirt is unlikely to occur; in such a case, the requirements for severe duty conditions apply.

31 Resistance to rusting

31.1 Metallic enclosures **class II stunning equipment** shall be adequately protected against corrosion.

*Compliance is checked by the salt mist test described in IEC 60068-2-52, test Kb, with conditioning severity (2), which is made on the **stunning equipment** or a representative part of it mounted in its normal position of use.*

Before starting the conditioning, temporary protective coatings shall be removed and on completion of the conditioning the enclosure shall be washed.

Before and after the test, enclosures provided with a coating are scratched by means of a hardened steel pin, the end of which has the form of a cone with a top angle of 40°, its tip being rounded with a radius of $0,25\text{ mm} \pm 0,02\text{ mm}$. The scratches are made by drawing the pin along the surface of the coating at a speed of about 20 mm/s, in the manner shown in figure 103. The pin is so loaded that the force exerted along its axis is $10\text{ N} \pm 0,5\text{ N}$. Each time, five scratches are made at least 5 mm apart and at least 5 mm from the edges of the coating.

*After the test, a visual inspection of the enclosure of the **stunning equipment** shall reveal no sign of corrosion which could affect compliance with this standard and its coating, if any, shall not have loosened from the metal surface and shall not have been pierced.*

32 Radiation, toxicity and similar hazards

This clause of part 1 is applicable.

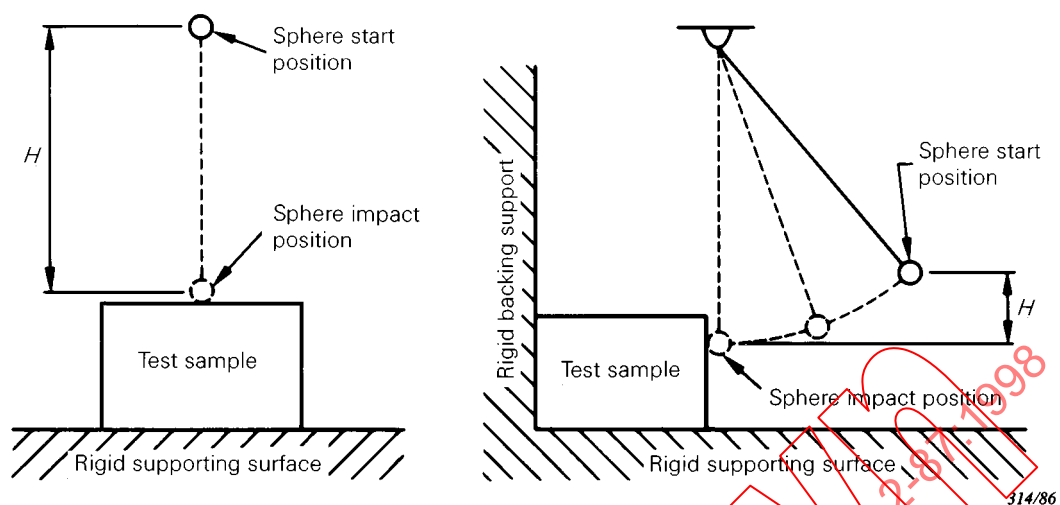


Figure 101 – Impact test using sphere

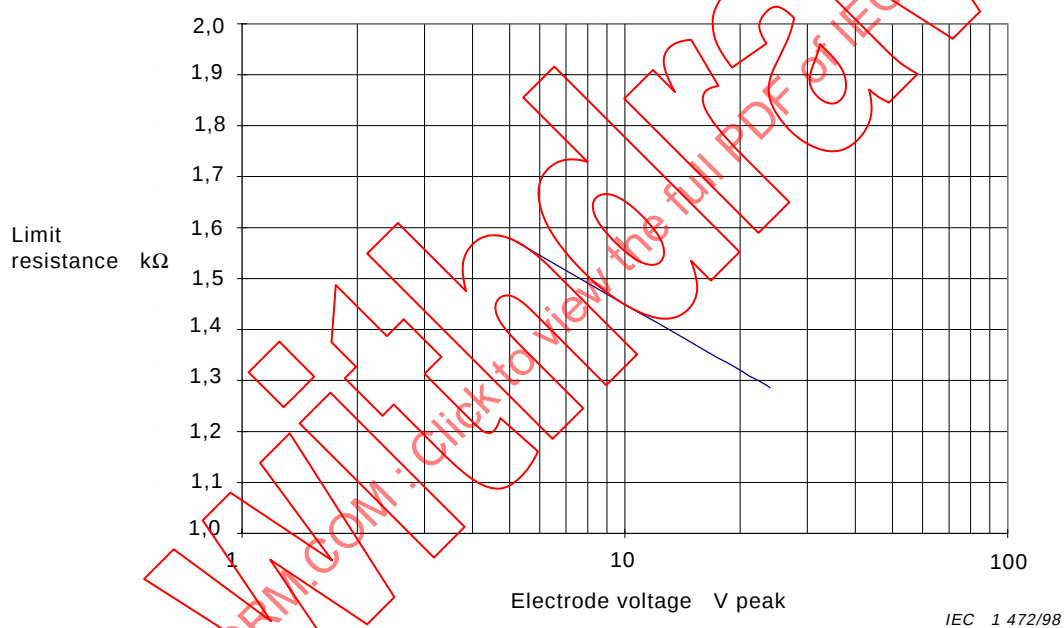


Figure 102 – Limiting resistance curve for stunning equipment