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Specification for

Electric stunners for poultry

ICS 65.040.20

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- AFRC Institute of Engineering Research
- Agricultural Training Board
- Association of Manufacturers Allied to the Electrical and Electronic Industry (BEAMA Ltd)
- British Agricultural and Garden Machinery Association Ltd
- British Medical Association
- Health and Safety Executive
- Institution of Electrical Engineers
- Milk Marketing Board
- Milking Machine Manufacturers' Association
- Ministry of Agriculture, Fisheries and Food
- National Farmers' Union
- Universities Federation for Animal Welfare

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Foreword

This British Standard has been prepared by Technical Committee CPL/61/8 (formerly LEL/105).

It specifies requirements and tests for the safety and performance of electric stunners for poultry.

The style used in this standard follows that used in IEC 1011 which in turn was based on IEC 335-1.

Attention is drawn to the provisions of legislation which require that poultry be slaughtered without causing or permitting avoidable excitement, pain or suffering. One permitted method under the regulations requires that poultry be stunned prior to slaughter. This standard therefore includes both safety requirements for the protection of the operators of stunners and also minimum performance requirements for stunners to ensure that stunning is satisfactorily carried out without avoidable pain or suffering.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Summary of pages

This document comprises a front cover, an inside front cover, pages i to iv, pages 1 to 52, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

1 Scope

This British Standard specifies safety and performance requirements for type tests and routine tests for electric stunners for poultry. It does not cover stunning and tenderizing equipment used for other animals.

NOTE The titles of the publications referred to in this standard are listed on the inside back cover.

2 Definitions

For the purposes of this British Standard the following definitions apply.

NOTE Where the terms “voltage” and “current” are used, they imply the r.m.s. values, unless otherwise specified.

2.1

rated voltage

the input voltage assigned to the stunner by the manufacturer

2.2

rated voltage range

the input voltage range assigned to the stunner by the manufacturer, expressed by its lower and upper limits

2.3

working voltage

the maximum voltage to which the part under consideration can be subjected when the stunner is operating at its rated voltage and under normal operating conditions

NOTE When deducing the working voltage, the effect of possible transient voltages on the supply mains is ignored.

2.4

output voltage

the voltage required to sustain the stunning current under normal load conditions

2.5

rated power input

the input power under normal operating conditions and assigned to the stunner by the manufacturer

2.6

rated input current

the current assigned to the stunner by the manufacturer

NOTE If no current is assigned to the appliance, the rated input current for the purpose of this standard is determined by calculation from the rated power input and the rated voltage and/or by measuring the current when the stunner is operating under normal operating conditions [see 4.3 a)] but supplied at rated voltage.

2.7

rated frequency

the supply mains frequency assigned to the stunner by the manufacturer

2.8

rated frequency range

the supply mains frequency range assigned to the stunner by the manufacturer, expressed by its lower and upper limits

2.9

normal load

a non-inductive resistor which represents the impedance of the poultry for test purposes. For an enclosed poultry stunner it is 322 Ω and for an open poultry stunner 1 250 Ω .

2.10

power supply cord

a flexible cable or cord, for supply purposes, fixed to, or assembled with, the stunner

2.11

basic insulation

the insulation applied to live parts to provide basic protection against electric shock

NOTE Basic insulation does not necessarily include insulation used exclusively for functional purposes.

2.12

supplementary insulation

an independent insulation applied in addition to the basic insulation, in order to ensure protection against electric shock in the event of a failure of the basic insulation

2.13

double insulation

insulation comprising both basic insulation and supplementary insulation

2.14

reinforced insulation

a single insulation system applied to live parts which provides a degree of protection against electric shock equivalent to double insulation under the conditions specified in this standard

NOTE The term “insulation system” does not imply that the insulation should be one homogeneous piece. It may comprise several layers that cannot be tested singly as supplementary or basic insulation.

2.15

poultry

domestic fowl including chickens, turkeys, guinea fowl, ducks, geese and quail

2.16

poultry stunner

an apparatus which is intended to deliver an electric current for the purpose of rendering poultry immediately unconscious prior to slaughter

NOTE Open poultry stunners (see 2.17), which use reduced voltages, are intended to stun. Enclosed poultry stunners (see 2.18), which normally use higher voltages, may be designed to be capable of causing cardiac arrest.

2.17 open poultry stunner

a poultry stunner in which at least part of the stunner circuit can be touched by means of the standard test finger in Figure 1

NOTE An open poultry stunner may be hand held or free standing.

2.18 enclosed poultry stunner

a poultry stunner having a durable and substantially continuous enclosure inside which poultry is exposed to live electrodes

NOTE The most common type of enclosed poultry stunner is a water bath stunner.

2.19 water bath stunner

an enclosed poultry stunner in which the heads and necks of shackled poultry are brought into contact with a water filled trough, a suitable output voltage being applied between the water and the shackles

2.20 hand-held poultry stunner

an open poultry stunner part of which is intended to be held in the hand during normal use

2.21 free standing poultry stunner

an open poultry stunner that is not intended to be moved during normal use

2.22 supply mains

denotes a power source with a nominal voltage exceeding 42 V and that is used to supply other equipment as well as a stunner

2.23 stunner circuit

all conductive parts or components of a stunner that are connected or intended to be connected electrically to the output electrodes

2.24 live part

denotes a conductive part that when touched may cause an electric shock

2.25 class I stunner

a stunner in which protection against electric shock does not rely on basic insulation only, but which includes an additional safety precaution in such a way that means are provided for the connection of accessible conductive parts to the protective (earthing) conductor in the fixed wiring of the installation so that accessible conductive parts cannot become live in the event of a failure of the basic insulation

NOTE 1 Class I stunners may have parts with double insulation or reinforced insulation.

NOTE 2 For stunners intended for use with a flexible cable or cord, this provision includes a protective (earthing) conductor as part of the flexible cable or cord.

2.26 class II stunner

a stunner in which protection against electric shock does not rely on basic insulation only, but in which additional safety precautions, such as double insulation or reinforced insulation, are provided, there being no provision for protective earthing or reliance upon installation conditions.

Such a stunner may be one of the following types:

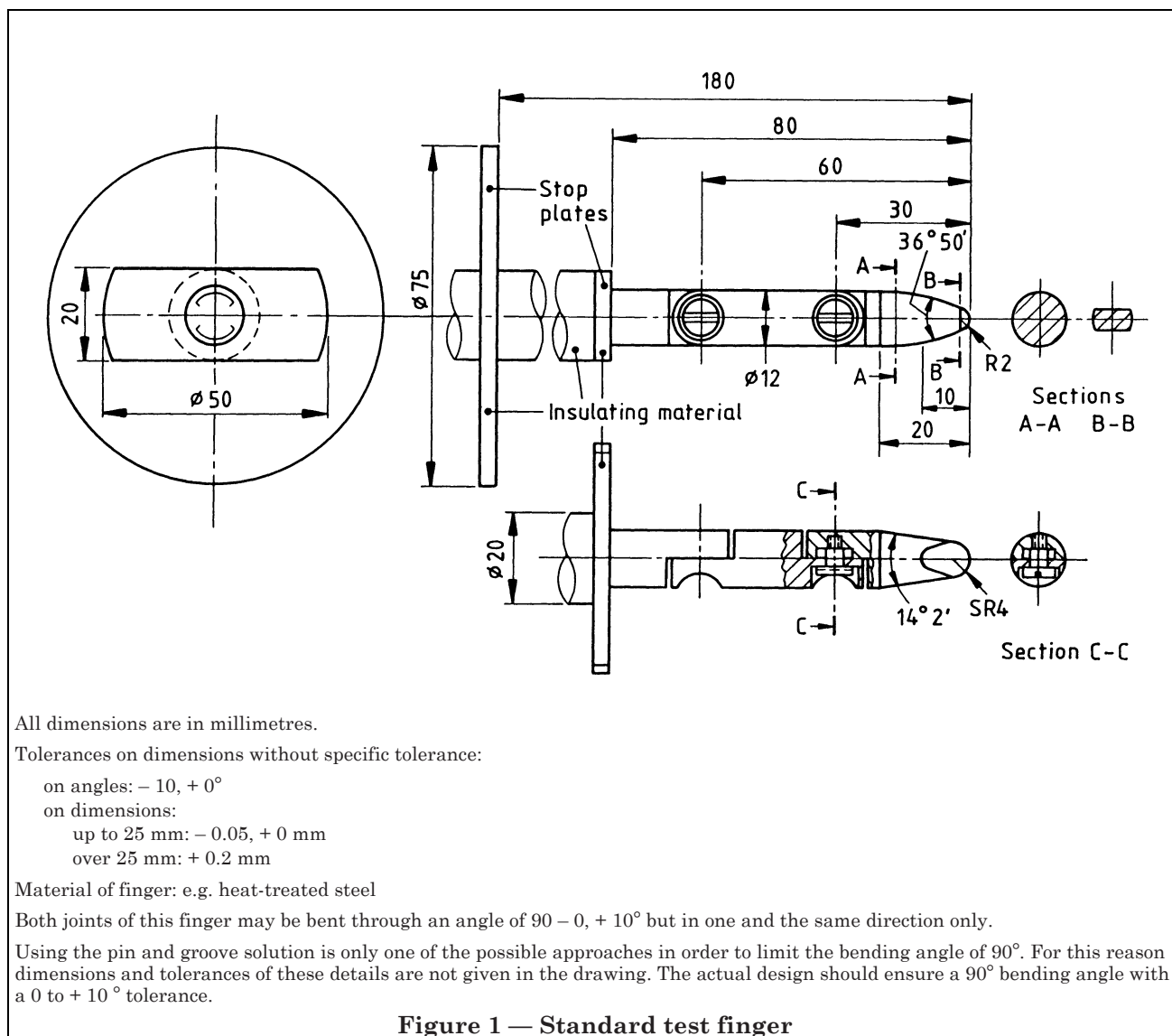
- a) an “insulation-encased class II stunner” is one having a durable and substantially continuous enclosure of insulating material which envelops all metal parts, with the exception of small parts, such as nameplates, screws and rivets, which are isolated from live parts by insulation at least equivalent to reinforced insulation;
- b) a “metal-encased class II stunner” is one having a substantially continuous metal enclosure, in which double insulation is used throughout, except for those parts where reinforced insulation is used, because the application of double insulation is manifestly impracticable;
- c) a stunner which is a combination of the types a) and b).

NOTE 1 The enclosure of an insulation-encased class II stunner may form a part of the whole of the supplementary insulation or of the reinforced insulation.

NOTE 2 If a stunner with double insulation and/or reinforced insulation throughout has an earthing terminal or earthing contact, it is considered to be of class I construction. Class II stunners may be provided with means for connecting the stunner circuit to earth, provided that such means are within the stunner and are insulated from accessible conductive parts by double insulation or reinforced insulation.

2.27 continuous operation

operation under normal operating conditions for an unlimited period



2.28 non-detachable part

a part that cannot be removed without the aid of a tool (see 2.33)

2.29 detachable part

a part that can be removed without the aid of a tool (see 2.33)

2.30 temperature limiter

a temperature-sensing device, the operating temperature of which may be fixed or adjustable and which, during normal operation, operates by either opening or closing a circuit when the temperature of a stunner, or of parts of it, reaches a predetermined value

NOTE The temperature limiter does not reset during the normal duty cycle of a stunner. It may or may not require manual resetting.

2.31 thermal cut-out

a device which, during abnormal operation, limits the temperature of a stunner, or of parts of it, by automatically opening the circuit or by reducing the current, and which is so constructed that its setting cannot be altered by the user

2.32 non-self-resetting thermal cut-out

a thermal cut-out that requires resetting by hand, or replacement of a part, in order to restore the current

2.33 tool

a screwdriver, or any other purpose-made object that may be used to operate a screw or similar fixing means

2.34 creepage distance

the shortest path between two conductive parts, or between a conductive part and the bounding surface of the stunner, measured along the surface of the insulating material

2.35 clearance

the shortest distance between two conductive parts, or between a conductive part and the bounding surface of the stunner, measured through air

NOTE The bounding surface of the stunner is the outer surface of the enclosure, considered as though metal foil were pressed into contact with accessible surfaces of insulating material.

2.36 all-pole disconnection

for single-phase a.c. stunners and for d.c. stunners, disconnection of both supply conductors by a single switching action or, for stunners to be connected to more than two supply conductors, disconnection of all supply conductors by a single switching action

NOTE The protective earthing conductor is not considered to be a supply conductor.

2.37 safety extra-low voltage

a nominal voltage not exceeding 42 V between conductors and between conductors and earth or, for three-phase supply, not exceeding 24 V between conductors and neutral, the no-load voltage not exceeding 50 V and 29 V respectively

NOTE 1 When safety extra-low voltage is obtained from the supply mains, it must be through a safety isolating transformer or a converter with separate windings.

NOTE 2 The voltage limits specified are based on the assumption that the safety isolating transformer is operated at its rated supply voltage.

2.38 accessible part or accessible surface

a part or surface that can be touched by means of the standard test finger shown in Figure 1

2.39 body

all accessible metal parts, shafts of handles, knobs, grips and the like and metal foil in contact with all accessible surfaces of insulating material but excluding inaccessible metal parts

3 General requirement

Stunners shall be so designed and constructed that, in normal use, they function safely so as to cause no danger to persons, even in event of such careless use as may occur in normal service.

TEST. In general, compliance shall be checked by carrying out all the relevant tests specified.

4 General conditions for the tests

4.1 Tests carried out in accordance with clauses 8 to 28 are type tests. Stunners made to a design that has passed the type tests and that have themselves been subjected to and have passed the routine production tests as set out in clause 29, are deemed to comply with this standard.

4.2 The type tests shall be carried out on two stunners, assembled as specified in the manufacturer's instruction sheet, one being subjected to all the tests with the exception of that of clause 16, and the other to the tests of clause 9 and clause 16.

Both stunners shall withstand the relevant tests.

Stunners are considered not to comply with this specification if there is a failure in either sample in any of the relevant tests.

If any electronic component is damaged during the tests of clause 14, the tests of clause 17 shall be carried out twice, once before and once after the damaged components have been replaced by new components.

4.3 Type tests shall be carried out under normal operating conditions as well as under fault conditions as follows.

a) Normal operating conditions shall be those recommended in the manufacturer's instructions.

1) Stunners are tested with alternating current, at rated frequency, if marked or if not marked with rated frequency, or marked with a frequency range of 50 Hz to 60 Hz, are tested with either 50 Hz or 60 Hz, whichever is the more arduous. Stunners marked with a rated frequency range other than 50 Hz to 60 Hz are tested at the most arduous frequency within the range.

2) Stunners designed for more than one rated voltage are tested at the most arduous voltage. Unless otherwise specified, stunners designed for one or more rated voltage ranges are tested at the most unfavourable voltage within the relevant range.

3) Stunners provided with a regulating device or a similar control shall be tested with these controls adjusted to their most adverse setting, if the setting is not sealed to prevent alteration by the user.

NOTE If the adjusting means of control is accessible without the aid of a tool, item 3) of 4.3 a) applies whether the setting can be altered by hand or with the aid of a tool. If the adjusting means is not accessible without the aid of a tool item 3) of 4.3 a) applies only if the setting can be altered by hand.

b) Fault conditions shall denote that, in addition to the normal operating conditions, each of the following conditions is produced in turn, associated with such other fault conditions that are an actual consequence of the condition chosen:

- 1) the stunner is placed in its most unfavourable position even if it is not likely that the stunner will be installed in this position under normal operating conditions;
- 2) parts intended for adjusting the stunner are adjusted to their most unfavourable position, even if these parts are not intended to be adjusted by the user, unless they are effectively sealed against further adjustment;
- 3) the output electrodes are short-circuited;
- 4) fuses that are accessible without the aid of tools are short-circuited;
- 5) by investigation of the circuit diagram of the stunner, the circuit is so configured that a worst case output voltage is produced by open-circuiting or short-circuiting any one component in turn;
- 6) the water bath is filled to overflowing.

4.4 Unless otherwise specified in this standard, stunners intended to be supplied by means of a flexible cable or cord shall be tested with the appropriate flexible cable or cord connected to the stunner.

4.5 For the purpose of 8.3, 14.3 and 22.8, parts separated from live parts by double insulation or reinforced insulation shall be regarded as not likely to become live in the event of an insulation fault; connection of accessible metal parts to an earthing terminal or earthing contact does not remove the necessity for carrying out the relevant tests.

4.6 For testing stunners incorporating electronic circuits, see Appendix A.

4.7 If for a stunner incorporating d.c. rectification, the stunning voltage contains greater than 10 % ripple, the stunner is tested as an a.c. stunner.

4.8 Where an apparatus consists of a combination of open and enclosed poultry stunners, the requirements for each type of stunner shall apply as far as is practicable.

4.9 The routine production tests (as given in clause 29) shall be carried out on all stunners for which compliance with this standard is claimed. Stunners shall withstand the relevant tests.

5 Rating

5.1 The maximum rated supply voltage shall be 250 V.

TEST. Compliance shall be checked by inspection of the marking.

5.2 Stunners intended for direct connection to the UK mains supply shall have a rated voltage that covers use at 240 V and a rated frequency that covers use at 50 Hz.

TEST. Compliance shall be checked by inspection of the marking.

6 Classification

Stunners shall be classified as follows:

- a) according to protection against electric shock:
 - class I stunners;
 - class II stunners;
- b) according to the construction:
 - open poultry stunners;
 - enclosed poultry stunners.

7 Marking, labelling and instructions

7.1 Stunners shall be marked with the following:

- a) rated voltage(s) or rated voltage range(s), in volts;
- b) symbol for nature of supply;
- c) rated frequency or rated frequency range, in hertz;
- d) rated power input in watts or kilowatts, or rated input current in amperes;
- e) output voltage(s) in volts;
- f) manufacturer's name and responsible vendor's name, trademark or identification mark;
- g) manufacturer's model or type reference;
- h) symbol for class II construction, for class II stunners only;
- i) symbol for direct current, if appropriate;
- j) symbol for degree of protection against moisture, i.e. IP 45;

k) the number and date of this British Standard, i.e. BS 7314:1990¹⁾;

l) the words “Read instructions before use”;

m) for enclosed poultry stunners:

1) the safety sign shown in Figure 2 that conforms with sign number **A.2.8** as specified in BS 5378-1:1980, the dimension “*l*” being not less than 120 mm;

2) a supplementary sign bearing the words “DANGER LIVE VOLTAGE” in black characters not less than 20 mm high on a yellow background, the overall size of the sign being not less than 100 mm by 180 mm;

n) for enclosed poultry stunners, a warning against attempting to lean into the enclosure whilst the stunner is energized;

o) for open poultry stunners, a warning that the stunner should only be used in conjunction with its associated transformer unit;

p) for open poultry stunners, a sign bearing the words “DANGER LIVE VOLTAGE” in black characters not less than 10 mm high on a yellow background.

NOTE Additional markings are allowed, provided they do not give rise to misunderstanding.

7.2 Where the stunner can be adjusted to suit different rated voltages, the voltage to which it is adjusted shall be easily and clearly discernible.

NOTE For stunners where frequent changes in voltage setting are not required, the requirement is considered to be complied with if the rated voltage to which the stunner is adjusted, can be determined from a wiring diagram fixed to the stunner. This wiring diagram may be on the inside of a cover which has to be removed to connect the supply conductors. This diagram may be on a card which is riveted to the cover, or on a paper or similar label secured to the cover by an adhesive, but a label loosely attached to the stunner is not permitted.

7.3 For stunners marked with more than one rated voltage or rated voltage range, the rated input for each of these voltages or ranges shall be marked.

7.4 When symbols are used, they shall be as follows:

V	volts
A	amperes
Hz	hertz
W	watts
kW	kilowatts
μF	microfarads
h	hours
min	minutes
s	seconds
~	alternating current
	class II construction

— direct current

The symbol for nature of supply shall be placed next to the marking for rated voltage.

The dimensions of the symbol for class II construction shall be such that the length of the sides of the outer square is about twice the length of the sides of the inner square. The length of the sides of the outer square shall be not less than 5 mm, unless the largest dimension of the stunner does not exceed 150 mm, in which case the dimensions of the symbol may be reduced, but the length of the sides of the outer square shall be not less than 3 mm.

The symbol for class II construction shall be so placed that it will be obvious that it is a part of the technical information and is unlikely to be confused with any other marking.

7.5 The line terminal of all stunners shall be indicated by the letter L, with the exception of class II stunners fitted with double-pole switches where this marking is optional.

Terminals intended exclusively for the neutral conductor shall be indicated by the letter N.

Earthing terminals shall be indicated by the symbol $\perp$ or $\oplus$.

These indications shall not be placed on screws, removable washers or other parts that might be removed when conductors are being connected.

7.6 The different positions of switches shall be indicated by figures, letters or other visual means.

If figures are used for indicating the different positions, the “off” position shall be indicated by the figure 0, “on” shall be indicated by the Figure 1 and the position for greater output shall be indicated by a higher figure.

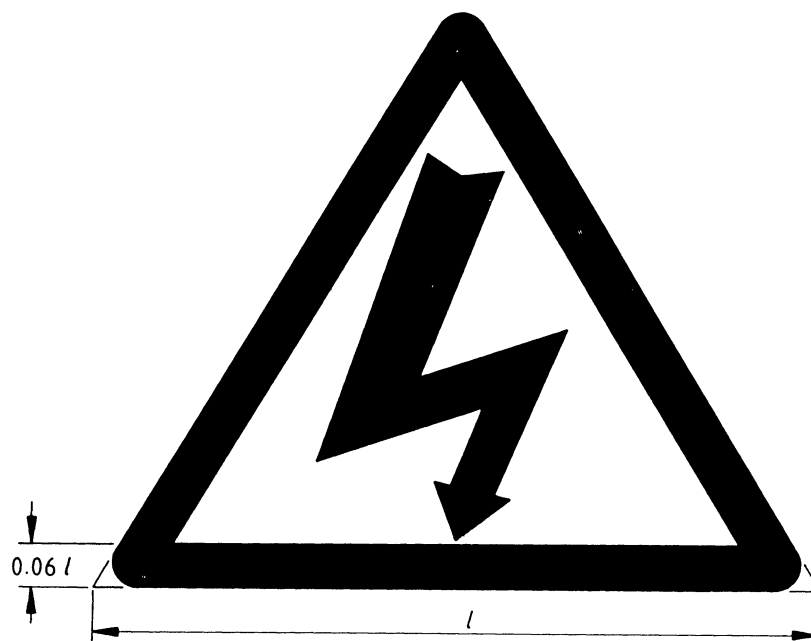
The figure 0 shall not be used for any other indication, unless it is so positioned and associated with other numbers that it does not give rise to confusion with the indication of the “off” position.

If a switch is provided which allows two levels of output voltage, the various positions of the switch shall be suitably marked with the words “STUNNER FULL VOLTAGE” and “STUNNER REDUCED VOLTAGE”.

7.7 Regulating devices and the like, intended to be adjusted during installation or in normal use, shall be provided with an indication for the direction of adjustment to increase or to decrease the value of the characteristics being adjusted.

NOTE An indication of the symbol + and the symbol – is considered to be sufficient.

¹⁾ Marking BS 7314:1990 on or in relation to a product represents a manufacturer’s declaration of conformity, i.e. a claim by or on behalf of the manufacturer that the product meets the requirements of the standard. The accuracy of the claim is therefore solely the responsibility of the person making the claim. Such a declaration is not to be confused with third party certification of conformity, which may also be desirable.



Background colour: yellow, covering at least 50 % of the area of the safety sign

Triangular band and arrow symbol: black

Figure 2 — Safety sign “Warning: Caution, risk of electric shock” complying with A.2.8 of BS 5378-1:1980

7.8 Details of special precautions to be taken when installing, using or maintaining the stunner shall be given in an instruction sheet that accompanies the stunner.

The instruction sheet shall contain at least the following details:

- a) manufacturer's name and responsible vendor's name, trade mark or identification mark;
- b) mark of origin with manufacturer's model or type reference;
- c) the symbol for degree of protection against moisture and relevant explanations;
- d) a statement of the ambient temperature operating range for the stunner;
- e) a statement of the acceptable humidity range in which the stunner can be operated;
- f) an instruction stating that the stunner should only be installed in a well drained position;
- g) an instruction stating that if the stunner is not provided with a non-detachable flexible cable or cord or with a switch having a contact separation of at least 3 mm in all poles, that such means for disconnection of all poles shall be incorporated in the fixed wiring and be positioned within a maximum distance of 2 m from the stunner;
- h) an instruction stating that supply cables or cords should be placed so as not to be accessible to animals;
- i) a warning that the supply cables or cords, the means of disconnection specified in g) and any other associated apparatus shall be suitable for the environment;
- j) an instruction stating the recommended input and output fuse values and type, e.g. slow blow, where applicable;
- k) an instruction stating that a damaged stunner should not be used;
- l) a detailed instruction for cleaning the stunner stating that the stunner shall be disconnected from the power supply during cleaning;

m) an instruction stating that inspections and repairs should be carried out only by a qualified person, and that the frequency of inspection depends on the conditions of use but should be at least:

1) for stunning apparatus and associated cables:

- i) hand held stunners: daily;
- ii) other open poultry stunners: weekly;
- iii) enclosed poultry stunners: weekly;

2) for electrical checks of earthing and insulation resistance;

- i) open poultry stunners: monthly;
- ii) enclosed poultry stunners: quarterly.

n) for class I stunners, a warning notice: "WARNING — THIS APPLIANCE MUST BE EARTHED";

o) for open poultry stunners an instruction stating that the stunner should only be used with the isolating transformer with which it was supplied;

p) for open poultry stunners, an instruction stating that the stunner should only be used when within sight and hearing distance of another person who can render assistance in the event of an accident;

q) for enclosed poultry stunners, an instruction that an interlock arrangement should be provided to ensure that it is not possible to energize the stunner unless the shackle-line is moving;

r) for enclosed poultry stunners, where applicable, a warning that the stunner is designed to accommodate a horizontal shackle-line and that other shackle-line designs may require additional guarding against access to live parts;

s) for enclosed, water-bath poultry stunners, an instruction that where metal is used in any part of a pipe supplying water to the stunner, the metallic point nearest to the stunner should be in effective electrical connection with earth by a means independent of the circuit protective conductor.

TEST for 7.1 to 7.8. Compliance with 7.1 to 7.8 shall be checked by inspection.

7.9 Marking required by this standard shall be easily legible and durable.

The marking and labelling specified in 7.1 to 7.3 and 7.11 shall be on a main part of the stunner, and shall be clearly discernible after the stunner has been fixed as in normal use.

Marking on, and indications for, switches, thermostats, thermal cut-outs and other control devices shall be placed in the vicinity of these components; they shall not be placed on removable parts if these parts can be replaced in such a way that the marking is misleading.

TEST. Compliance shall be checked by inspection and by rubbing the marking by hand for 15 s with a piece of cloth soaked with water and again for 15 s with a piece of cloth soaked with petroleum spirit. After all the tests specified in this standard, the marking shall be easily legible. It shall not be possible to remove marking plates easily and they shall show no curling. Petroleum spirit used for this test shall consist of a solvent hexane having a maximum aromatics content of 0.1 % (V/V), a kauri-butanol value of 29, an initial boiling point of approximately 65 °C, a dry point of approximately 69 °C and a relative density at 15/15 °C of approximately 0.68.

NOTE Relative density may be determined by the method described in BS 4714.

7.10 A label shall be attached to the flexible cord of all class I stunners fitted with a flexible cable or cord having cores coloured green/yellow, blue and brown. This label shall state the following.

"IMPORTANT

The wires in this mains lead are coloured in accordance with the following code:

Green/yellow: Earth

Blue: Neutral

Brown: Live".

In addition the user instructions and label shall include the substance of the following:

"As the colours of the wires in the mains lead of this appliance may not correspond with the coloured markings identifying the terminals in your plug proceed as follows.

The wire which is coloured green/yellow must be connected to the terminal in the plug which is marked with the letter E or by earth symbol $\perp$ or coloured green or green/yellow.

The wire which is coloured blue must be connected to the terminal which is marked with the letter N or coloured black.

The wire which is coloured brown must be connected to the terminal which is marked with the letter L or coloured red."

For class II stunners fitted with a two-core flexible cord, instructions shall be given by the manufacturer for the correct connection of the plug. These instructions shall make it clear that neither core is to be connected to the earth terminal of a three-pin plug.

TEST. Compliance shall be checked by inspection.

7.11 For portable class I stunners the following warning notice shall be given on a label attached to the end of the flexible cord:

“WARNING — THIS APPLIANCE MUST BE EARTHED”.

For all class I stunners the warning shall be included in the user instructions.

TEST. Compliance shall be checked by inspection.

NOTE The label specified in 7.10 may be used for this purpose; a separate label is not required.

8 Protection against electric shock

8.1 With the exceptions in a) and b) below, poultry stunners shall be so constructed and enclosed that there is adequate protection against accidental contact with live parts, and for class II stunners, with metal parts separated from live parts by basic insulation only:

a) the output electrodes of open poultry stunners;

NOTE 1 Protection is afforded through:

- 1) warning signs [see 7.1 o)]; and
- 2) limiting output voltages (see 9.3); and
- 3) warning lights (see 19.25); and
- 4) switching requirements (see 19.27); and
- 5) guarding requirements for hand held stunners (see 19.29).

b) the output electrodes of enclosed poultry stunners;

NOTE 2 Protection is afforded through:

- 1) warning signs [see 7.1 l) and m)]; and
- 2) installation advice (see 7.8 p) and q)]; and
- 3) warning lights (see 19.25); and
- 4) dimensional requirements (see 19.35); and
- 5) interlocked access doors.

This requirement applies for all positions of the stunner when it is wired and operated as in normal use, even after opening of lids and doors and removal of detachable parts. There shall be in addition, adequate protection against risk of contact with basic insulation. Such insulation may, however, be accessible after removing a cover that requires the use of tools for removal and has to be removed for user maintenance or after removing a cover that can be removed without tools if marked “Remove plug before removing this cover” or “Disconnect from the mains before removing the cover”.

For enclosed poultry stunners with adjustable enclosures, the stunner shall be adjusted to the most unfavourable position to meet the requirement.

The insulating properties of lacquer, enamel, ordinary paper, cotton, oxide film and metal parts, beads and sealing compound shall not be relied upon to give the required protection against accidental contact with live parts.

The enclosure of the stunner shall have no openings giving access to live parts and, for class II stunners, to parts separated from live parts by basic insulation only, other than the exceptions in a) and b) above. Live parts include parts which may become live as a result of water leakage, etc. from a water bath.

NOTE 3 If a manufacturer instructs the user to remove a part during normal operation or user maintenance, that part is regarded as a detachable part even if a tool has to be used for its removal.

NOTE 4 This requirement excludes the use of screw type fuses and screw type miniature circuit-breakers if they are accessible without the aid of tool.

NOTE 5 Self-hardening resins are not regarded as sealing compound.

TEST. Compliance shall be checked by inspection and, apart from the output electrodes exempted in a) and b) above, by the tests related to the degree of protection IP3X as specified in BS 5490.

8.2 For class II stunners, conducting liquids shall not be in direct contact with basic insulation or with metal parts insulated from live parts by basic insulation only.

TEST. Compliance shall be checked by inspection.

8.3 Shafts of operating knobs, handles, levers and the like shall not be live.

TEST. Compliance shall be checked by inspection.

8.4 Handles, levers and knobs which are held or actuated in normal use shall not become live in the event of a single insulation fault. If these handles, levers and knobs are of metal and if their shafts or fixings are likely to become live in the event of an insulation fault, they shall either be adequately covered by insulating material or their accessible parts shall be separated from their shafts or fixings by supplementary insulation.

TEST. Compliance shall be checked by inspection and if necessary by the tests specified for supplementary insulation (see clause 14).

8.5 Capacitors shall not be connected to accessible metal parts of the class II stunners and their casings, if of metal, shall be separated from accessible metal parts by supplementary insulation.

TEST. Compliance shall be checked by inspection and by the tests specified for supplementary insulation (see clause 14).

8.6 Stunners intended to be connected to the supply by means of a plug shall be so designed that in normal use there is no risk of electric shock from charged capacitors when touching the pins of the plug.

TEST. Compliance shall be checked by the following test, which is made 10 times.

- a) The stunner is operated at rated voltage or at the upper limit of the rated voltage range.

- b) The supply switch, if any, is then moved to the “off” position and the stunner is disconnected from the supply by means of the plug.
- c) The voltage between the pins of the plug is measured 1 s after disconnection with an instrument that does not appreciably affect the value to be measured.
- d) The peak value of this voltage shall not exceed 34 V.

NOTE Capacitors having a rated capacitance not exceeding 0.1 μ F are not considered to entail a risk of electric shock.

9 Input and output characteristics

9.1 The power input of the stunner at rated voltage and at normal operating temperature shall not deviate from the rated input by more than the deviation given in Table 1.

NOTE For stunners marked with a rated voltage range having limits differing by more than 10 % of the mean value of the range, the permissible deviations apply for both limits of the range.

TEST. Compliance shall be checked by measuring the input of the stunner, under normal operating conditions [see 4.3 a)] but operated at rated voltage, when the input has stabilized.

Table 1 — Permissible variations in rated input

Rated input	Deviation
W	
≤ 33.3	+ 10 W
> 33.3 ≤ 15	+ 30 %
> 150 ≤ 300	+ 45 W
> 300	+ 15 %

9.2 If a stunner is marked with rated input current, the input current taken by the stunner shall not exceed the rated input current by more than 10 %.

TEST. Compliance shall be checked by measuring the input current taken by the stunner operating under normal load, rated voltage and rated frequency.

NOTE For stunners marked with one or more rated voltage ranges, the tests specified in 9.1 and 9.2 are carried out at both the upper and lower limits of the ranges, unless the marking of the rated input is related to the mean value of the relevant voltage range, in which case the tests are carried out at a voltage equal to the mean value of that range.

9.3 For open poultry stunners supplied at rated input voltage operating at normal temperature under no load conditions, the output voltage of the stunner circuit shall not exceed:

- a) for a.c.
 - 1) 120 V between electrodes;
 - 2) 60 V between either electrode and earth;

- b) for d.c.
 - 240 V between electrodes (see 4.7).

During stunning the current and voltage shall be measured and be clearly displayed to the operator. TEST. Compliance shall be checked by measurement.

9.4 For open poultry stunners supplied at rated input voltage, operating at normal temperature with the output electrodes loaded with a non-inductive resistor of 1 250 Ω , the output voltage of the stunner circuit shall be not less than:

- a) for a.c.
 - 1) 95 V between electrodes;
 - 2) 47.5 V between electrode and earth;
- b) for d.c.
 - 190 V between electrodes (see 4.7).

During stunning the current and voltage shall be measured and be clearly displayed to the operator. TEST. Compliance shall be checked by measurement.

9.5 For enclosed poultry stunners supplied at rated input voltage, operating at normal temperature under no-load conditions, the output voltage of the stunner circuit shall be at least 450 V. During stunning the current and voltage shall be measured and be clearly displayed to the operator.

TEST. Compliance shall be checked by measurement.

NOTE It is recommended that in order to ensure that broilers are correctly stunned, the output voltage for an enclosed poultry stunner used for this purpose should be such that a sinusoidal current of at least 105 mA, 50 Hz passes through each bird in contact with the electrodes.

10 Heating

10.1 Stunners and their surroundings shall not attain excessive temperatures in normal use.

TEST. Compliance shall be checked by determining the temperatures of the various parts under the conditions specified in 4.3 a), 10.2 and 10.3. During the test, thermal cut-outs shall not operate. The temperature rises shall be monitored continuously and shall not exceed the values shown in column 2 of Table 2 and sealing compound, if any, shall not flow out. The measurements specified in 11.1 shall be made at the end of this test. If materials other than those listed in Table 2 are used, these shall not be exposed to temperatures in excess of those which have been proved permissible for these materials.

10.2 TEST. Temperature rises shall be determined by means of fine-wire thermocouples so chosen and positioned that they have the minimum effect on the temperature of the part under test.

Table 2 — Permissible temperature rise

1	2	3
Parts	Temperature rise for different operating conditions ^a	
	K	K
External metal parts	40	60
Other external parts:		
to be actuated in normal use	50	60
not to be actuated in normal use	60	70
Inside of enclosures of insulating material	80	100
Windings, if the winding insulation is:		
of class A material ^b	75	120
of class E material ^b	90	145
of class B material ^b	95	155
of class F material ^b	115	175
of class H material ^b	140	200
Rubber or polyvinyl chloride insulation of internal and external wiring ^c	50	100
Rubber used for gaskets or other parts, the deterioration of which could affect safety:		
when used as supplementary insulation or as reinforced insulation	40	90
in other cases	50	100
Materials used as insulation other than for wires and windings:		
impregnated or varnished textile, paper or press board	70	90
laminates bonded with:		
melamine-formaldehyde, phenol-formaldehyde or phenol-furfural resins	85	110
urea-formaldehyde resin	65	90
mouldings of:		
phenol-formaldehyde with cellulose fillers	85	110
phenol-formaldehyde with mineral fillers	100	130
melamine-formaldehyde	75	100
urea-formaldehyde	65	90
polyester with glass-fibre reinforcement	110	140
polytetrafluoro ethylene	265	—
thermoplastics material ^d	—	—
Silicone rubber insulation	145	—
Wood in general including wooden supports	65	90

Table 2 — Permissible temperature rise

^a Column 2 represents normal operating conditions (see 10.1) and column 3 represents abnormal operating conditions (see 17.2).
^b The classification is in accordance with BS 2757
Examples of class A material are: impregnated cotton, silk, artificial silk and paper; enamels based on oleamide or polyamide resins.
Examples of class B material are: asbestos; glass fibre; melamine-formaldehyde resins; phenol-formaldehyde resins.
Examples of class E material are: mouldings with cellulose fillers, cotton fabric laminates and paper laminates, bonded with melamine-formaldehyde, phenol-formaldehyde or phenol-furfural resins; cross-linked polyester resins, cellulose triacetate films, polyethylene terephthalate films; varnished polyethylene terephthalate textile bonded with oil-modified alkyd resin varnish; enamels based on polyvinylformal, polyurethane or epoxy resins.
^c This limit applies to cables, cords and wires complying with the relevant British Standards; for others it may be different.
^d There is no specific limit for thermoplastic material, which has to withstand the tests of 27.1 and 27.2, for which purpose the temperature rise should be determined.

In determining the temperature rises of handles, knobs, grips and the like, consideration shall be given to all parts which are gripped in normal use and, if of insulating material, to parts in contact with hot metal.

The temperature rise of electrical insulation, other than that of windings, shall be determined on the surface of the insulation, at places where failure could cause a short circuit, contact between live parts and accessible metal parts, bridging of insulation or reduction of creepage distances or clearances below the values specified in 26.1.

Temperature rises of windings shall be determined by the resistance method unless the windings are non-uniform or it involves severe complications to make the necessary connections, in which case the temperature rise shall be determined by means of thermocouples.

NOTE If it is necessary to dismantle the stunner to position thermocouples, the input power and output voltage should be measured again to check that the stunner has been correctly reassembled.

10.3 TEST. The stunner is operated until steady conditions are established.

NOTE The values in Table 2 are based on an ambient temperature not normally exceeding 25 °C, but occasionally reaching 35 °C.

The value of the temperature rise, Δt (in K), of a copper winding should be calculated from the following equation:

$$\Delta t = \frac{R_2 - R_1}{R_1} (234.5 + t_1) - (t_2 - t_1)$$

where:

- R₁ is the resistance at the beginning of the test (in ohms),
- R₂ is the resistance at the end of the test (in ohms),
- t₁ is the room temperature at the beginning of the test (in °C),
- t₂ is the room temperature at the end of the test (in °C).

At the beginning of the test, the windings should be at room temperature.
It is recommended that the resistance of windings at the end of the test be determined by taking resistance measurements as soon as possible after switching off, and then at short intervals so that a curve of resistance against time can be plotted for ascertaining the resistance at the instant of switching off.

11 Electrical insulation and leakage current at operating temperature

11.1 The electrical insulation of the stunner at operating temperature shall be adequate and the leakage current in normal use shall not exceed the values specified in 11.2.

TEST. Compliance shall be checked by the test specified in 11.2 and 11.3. The tests shall be carried out immediately after the heating test of clause 10.

11.2 TEST. The leakage current shall be measured between any pole of the supply and the following:

- a) accessible metal parts and metal foil with an area not exceeding 200 mm × 100 mm in contact with accessible surfaces of insulating material, connected together;
- b) metal parts of class II stunners separated from live parts by basic insulation only.

The appropriate measuring circuit is shown in Figure 3.

The resistance of the measuring circuit shall be 750 ± 100 Ω and shall be shunted by a capacitor such that the time constant of the circuit is 96 ± 6 μs.

The measuring arrangement shall have an accuracy within 5 % for all frequencies in the range of 20 Hz to 5 000 Hz.