

INTERNATIONAL STANDARD

IEC
60335-2-86

Second edition
2002-03

Household and similar electrical appliances – Safety –

Part 2-86: Particular requirements for electric fishing machines

*Appareils électrodomestiques et analogues –
Sécurité –*

*Partie 2-86:
Règles particulières pour les équipements électriques
de pêche*



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International Electrotechnical Commission, 3, rue de Varembé, PO Box 131, CH-1211 Geneva 20, Switzerland
Telephone: +41 22 919 02 11 Telefax: +41 22 919 03 00 E-mail: inmail@iec.ch Web: www.iec.ch



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CONTENTS

FOREWORD.....	3
INTRODUCTION.....	5
1 Scope.....	6
2 Normative references	6
3 Definitions	6
4 General requirement.....	8
5 General conditions for the tests	8
6 Classification.....	8
7 Marking and instructions.....	8
8 Protection against access to live parts.....	10
9 Starting of motor-operated appliances	10
10 Power input and current.....	10
11 Heating.....	10
12 Void	11
13 Leakage current and electric strength at operating temperature	11
Transient overvoltages.....	12
15 Moisture resistance	12
16 Leakage current and electric strength.....	12
17 Overload protection of transformers and associated circuits	12
18 Endurance.....	12
19 Abnormal operation	12
20 Stability and mechanical hazards.....	13
21 Mechanical strength	13
22 Construction.....	13
23 Internal wiring.....	15
24 Components	15
25 Supply connection and external flexible cords	15
26 Terminals for external conductors.....	16
27 Provision for earthing	17
28 Screws and connections.....	18
29 Clearances, creepage distances and solid insulation	18
30 Resistance to heat, and fire.....	18
31 Resistance to rusting.....	18
32 Radiation, toxicity and similar hazards.....	18
Annexes	19
Bibliography.....	19

INTERNATIONAL ELECTROTECHNICAL COMMISSION

**HOUSEHOLD AND SIMILAR ELECTRICAL APPLIANCES –
SAFETY –****Part 2-86: Particular requirements for electric fishing machines**

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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- 4) In order to promote international unification, IEC National Committees undertake to apply IEC International Standards transparently to the maximum extent possible in their national and regional standards. Any divergence between the IEC Standard and the corresponding national or regional standard shall be clearly indicated in the latter.
- 5) The IEC provides no marking procedure to indicate its approval and cannot be rendered responsible for any equipment declared to be in conformity with one of its standards.
- 6) Attention is drawn to the possibility that some of the elements of this International Standard may be the subject of patent rights. The IEC shall not be held responsible for identifying any or all such patent rights.

This part of International Standard IEC 60335 has been prepared by sub-committee 61H: Safety of electrically-operated farm appliances, of IEC technical committee 61: Safety of household and similar electrical appliances.

This second edition cancels and replaces the first edition published in 1998. It constitutes a technical revision.

The text of this part of IEC 60335 is based on the following documents:

FDIS	Report on voting
61H/165/FDIS	61H/170/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 fourth edition (2001) of that standard.

Note 1 When "Part 1" is mentioned in this standard, it refers to IEC 60335-1.

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 fishing machines.

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

NOTE 2 The following numbering system is used:

- subclauses, tables and figures that are numbered starting from 101 are additional to those in Part 1;
- unless notes are in a new subclause or involve notes in Part 1, they are numbered starting from 101, including those in a replaced clause or subclause;
- additional annexes are lettered AA, BB, etc.

NOTE 3 The following print types are used:

- requirements: in roman type
- *test specifications: in italic type*
- notes: in small roman type.

Words in **bold** in the text are defined in Clause 3. When a definition concerns an adjective, the adjective and associated noun are also in bold.

The committee has decided that the contents of this publication will remain unchanged until 2004. At this date the publication will be

- reconfirmed;
- withdrawn;
- replaced by a revised edition, or
- amended.

The following differences exist in the countries indicated below:

- 1: The use of electric fishing machines is limited to research purposes only (Denmark, Finland, Sweden).

INTRODUCTION

It has been assumed in the drafting of this International Standard that the execution of its provisions is entrusted to appropriately qualified and experienced persons.

This standard recognizes the internationally accepted level of protection against hazards such as electrical, mechanical, thermal, fire and radiation of appliances when operated as in normal use taking into account the manufacturer's instructions. It also covers abnormal situations that can be expected in practice.

This standard takes into account the requirements of IEC 60364 as far as possible so that there is compatibility with the wiring rules when the appliance is connected to the supply mains. However, national wiring rules may differ.

If an appliance within the scope of this standard also incorporates functions that are covered by another part 2 of IEC 60335, the relevant part 2 is applied to each function separately, as far as is reasonable. If applicable, the influence of one function on the other is taken into account.

This standard is a product family standard dealing with the safety of appliances and takes precedence over horizontal and generic standards covering the same subject.

An appliance that complies with the text of this standard will not necessarily be considered to comply with the safety principles of the standard if, when examined and tested, it is found to have other features which impair the level of safety covered by these requirements.

An appliance employing materials or having forms of construction differing from those detailed in the requirements of this standard may be examined and tested according to the intent of the requirements and, if found to be substantially equivalent, may be considered to comply with the standard.

HOUSEHOLD AND SIMILAR ELECTRICAL APPLIANCES – SAFETY –

Part 2-86: Particular requirements for electric fishing machines

1 Scope

This clause of Part 1 is replaced by the following.

This standard deals with the safety of **electric fishing machines** by means of which water may be electrified for the purpose of catching fish or for providing barriers to all animals living in water.

The **rated voltage** of **portable electric fishing machines** is not more than 250 V and the **rated voltage** of **fixed electric fishing machines** for permanent connection to fixed wiring is not more than 1 000 V.

NOTE 101 Examples of **electric fishing machines** coming within the scope of this standard are:

- **mains-operated electric fishing machines** which include those supplied from portable or stationary generator sets;
- **battery-operated electric fishing machines.**

NOTE 102 Attention is drawn to the fact that

- for appliances intended to be used on board ships or boats, additional 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.

NOTE 103 This standard does not apply to

- electric fence energizers (IEC 60335-2-76);
- electric animal stunning equipment (IEC 60335-2-87).

2 Normative references

This clause of Part 1 is applicable except as follows.

Addition:

IEC 60068-2-52:1996, *Environmental testing – Part 2: Tests – Test Kb: Salt mist, cyclic (sodium chloride solution)*

IEC 61558-2-4:1997, *Safety of power transformers, power supply units and similar – Part 2: Particular requirements for isolating transformers for general use*

3 Definitions

This clause of Part 1 is applicable except as follows.

3.1.9 Replacement:

normal operation

operation of the appliance under the following conditions.

The **electric fishing machine** is operated as in normal use when connected to the supply with an adjustable non-inductive resistor connected between its output terminals. The resistor is adjusted so as to give an **output current** just sufficient not to cause any **protective device** to operate

3.6.3 Addition:

NOTE 101 It also includes terminals for the connection of the battery and other metal parts in a battery compartment that become accessible when batteries are replaced, even with the aid of a **tool**.

3.6.4 Replacement:

live part

conductive part that may cause an electric shock

3.101

electric fishing machine

appliance, comprising **electrodes** and an energizer, that is designed or used for the control, taking, killing of any species of fish or invertebrate living in water or for the production of electronarcosis, by means of electric current

NOTE 1 An **electric fishing machine** may be used to provide a barrier effective for all animals living in water.

NOTE 2 A given **electric fishing machine** may only perform some of the functions specified.

3.102

mains-operated electric fishing machine

electric fishing machine designed for direct connection to a supply other than a battery supply at a voltage greater than **safety extra-low voltage**. It may also be supplied from a generator set

3.103

electrode

that part of an **electric fishing machine** that transfers the electric power into the water. The catching **electrode** is the **electrode** used by the fisherman, the return **electrode** is the **electrode** trailed in the water

NOTE The catching **electrode** is usually the anode and the return **electrode** is usually the cathode.

3.104

output circuit

all conductive parts or components within an **electric fishing machine** that are connected or intended to be connected galvanically to the **electrode** terminals

3.105

output voltage

voltage between the **electrodes**

3.106

output current

current in the **output circuit** that the **electric fishing machine** is designed to supply

3.107

impulse

that part of the **pulsed voltage** output that exceeds 12 V

3.108

pulsed voltage

voltage **impulse** of any form and any duration

3.109

battery-operated electric fishing machine

electric fishing machine deriving its energy solely from non-rechargeable batteries, rechargeable batteries or other sources of energy, with a voltage meeting the requirements for **safety extra-low voltage**

4 General requirement

This clause of Part 1 is applicable.

5 General conditions for the tests

This clause of Part 1 is applicable except as follows.

5.8.1 Addition:

For **battery-operated electric fishing machines** where the supply terminals for the connection of the battery have no indication for polarity, the more unfavourable polarity is applied.

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

5.102 **Electric fishing machines** are tested as **motor-operated appliances**.

6 Classification

This clause of Part 1 is applicable except as follows.

6.1 Replacement:

Electric fishing machines that are intended to be permanently connected to fixed wiring shall be **class I** or **class II** with respect to protection against electric shock. Other **electric fishing machines** shall be **class II** or **class III**.

Accessories intended to be supplied with **portable electric fishing machines** shall be **class III**.

Compliance is checked by inspection and by the relevant tests.

6.2 Addition:

Electric fishing machines intended for permanent connection to fixed wiring shall be at least IPX4. Other **electric fishing machines** shall be at least IPX5.

7 Marking and instructions

This clause of Part 1 is applicable except as follows.

7.1 Addition:

Electric fishing machines shall be marked with

- the words "Pulsed voltage machine", "Direct current machine", "Alternating current machine" as appropriate;
- the **output current**;
- the **output voltage**;
- "Read the instructions" or with symbol 1641 of ISO 7000;
- the catching **electrode** and return **electrode** terminals shall be identified by symbols 5036 and 5017 of IEC 60417 respectively. If the return **electrode** is not grounded it need not be marked.

Battery-operated electric fishing machines shall be marked with the substance of the following:

WARNING: Do not connect to mains-operated equipment.

7.6 Addition:

[symbol 5036 of IEC 60417] Dangerous voltage



[symbol 5017 of IEC 60417] Earth (ground)

7.8 Addition:

For **battery-operated electric fishing machines**, 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 for **battery-operated electric fishing machines** shall, in particular, emphasise the warning marked on the appliance that states the substance of the following:

WARNING: Do not connect to mains-operated equipment.

The instructions shall give details of the construction of the net that can be used with the appliance, in particular they shall indicate that net handles shall

- be constructed of non-conductive material,
- be of sufficient length to avoid hand contact with the water,
- not be wrapped or covered metallic handles,
- not have a metallic weighting chain extending beyond the bottom edge of the net proper.

If symbol 5017 of IEC 60417, symbol 5036 of IEC 60417 or symbol 1641 of ISO 7000 are marked on the appliance its meaning shall be explained

7.12.1 Addition:

For **electric fishing machines** supplied by an isolating transformer, the instructions shall include details concerning the fixing and location of the transformer to prevent it from falling into the water and from being otherwise impaired by water.

7.15 Addition:

Markings required by the addition to 7.1 shall have a height not less than:

- 5 mm for headlines;
- 3 mm for other lettering.

Symbol 5017 of IEC 60417, symbol 5036 of IEC 60417 and symbol 1641 of ISO 7000 shall have a height of at least 25 mm.

8 Protection against access to live parts

This clause of Part 1 is applicable except as follows.

8.1.4 Addition:

The means for the connection of the **electrodes** is not a **live part**.

8.101 For **battery-operated electric fishing machines**, the parts in a battery compartment that become accessible when batteries are being replaced, even with the aid of a **tool**, shall not be live.

*Compliance is checked by inspection and by the test specified for determining if a part is 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 except as follows.

10.101 The measured **output voltage** shall not deviate from the **output voltage** marked on the machine by more than 10 %.

*Compliance is checked by measurement, the **electric fishing machine** being operated under conditions of **normal operation** and supplied at **rated voltage**.*

11 Heating

This clause of Part 1 is applicable except as follows.

11.5 Replacement:

Electric fishing machines are operated under **normal operation**, supplied as follows:

- **mains-operated electric fishing machines**, are supplied with the most unfavourable supply voltage between 0,85 and 1,1 times **rated voltage**;
- **battery-operated electric fishing machines**, are supplied with the most unfavourable supply voltage between
 - 0,55 and 1,1 times **rated voltage**, if the **electric fishing machine** can be used with non-rechargeable batteries;
 - 0,75 and 1,1 times **rated voltage**, if the **electric fishing machine** is designed for use with rechargeable batteries only.

The values specified in Table 101 for the internal resistance per 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:

The **electric fishing machine** is operated 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:

Instead of all **electric fishing machines** being subjected to the tests of 13.2 and 13.3, the following applies.

Compliance is checked by the tests of 13.2 and 13.3 for **mains-operated electric fishing machines**.

13.2 Modification:

The following leakage current value is applicable:

– for **class II electric fishing machines**

0,1 mA per 100 V of **output voltage** with a maximum of 0,7 mA.

14 Transient overvoltages

This clause of Part 1 is applicable.

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, 16.3 and 16.102 for **mains-operated electric fishing machines**,
- 16.101 and 16.102 for **battery-operated electric fishing machines**.

16.101 For **battery-operated electric fishing machines** the supply terminals are connected for 10 min to a voltage between 1,1 and 1,5 times **rated voltage** that is so chosen that the **output voltage**, without a load connected, has the maximum value.

*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, the capacitors, resistors, inductors, transformer windings and **electronic components** that 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.

16.102 Immediately after the tests of 16.3 and 16.101, the output characteristics are measured as specified in 22.101.

The values measured shall not deviate in an unfavourable way by more than 10 % from the values measured as specified in 22.101.

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.

20 Stability and mechanical hazards

This clause of Part 1 is applicable.

21 Mechanical strength

This clause of Part 1 is applicable.

22 Construction

This clause of Part 1 is applicable except as follows.

22.101 Under the conditions for **normal operation**, with the **electric fishing machine** supplied at **rated voltage**, the output characteristics shall not exceed the values given in Table 102.

Table 102 – Output characteristics

Characteristics	Pulsed voltage machine (peak value) V	Direct current machine V	Alternating current machine V
Value of output voltage			
stationary machine	3 000	1 500	400
portable machine	1 000	750	400

Compliance is checked by measurement.

22.102 Where the energizer is carried by the user during normal use,

- a tilt switch shall be fitted that disables the **electric fishing machine** when it is tipped past 45° from the vertical;
- the tilt switch must be of the type that needs to be manually reset by the user after it has operated;
- a two-position, manually operated on/off switch shall be fitted that disconnects both poles of the **output circuit**.

NOTE This requirement does not preclude the disconnection being on the input side of a transformer supplying the **output circuit**.

Compliance is checked by inspection and test.

22.103 Battery-operated electric fishing machines shall be so designed that they are incapable of operation when the battery is charged through a battery charger connected to the supply mains.

Compliance is checked by inspection and test.

22.104 In **mains-operated electric fishing machines**, other than those supplied from a portable generator set, the **output circuit** shall be isolated from the mains supply by an incorporated isolating transformer or an isolating transformer for specific use complying with IEC 61558-2-4.

Isolating transformers for specific use shall have a protection index of IPX7.

Compliance is checked by inspection and, if necessary, by the relevant tests.

22.105 For **mains-operated electric fishing machines**, transformers in the **output circuit** shall be placed in a separate compartment. This compartment shall not contain any part that is or can come in contact with the supply mains, with the exception of the input winding of the transformer. The compartment shall be filled with sealing compound, unless **clearances** and **creepage distances** within the compartment cannot be reduced below the values specified in Clause 29.

Compliance is checked by inspection and by the tests of the other clauses of this standard.

22.106 In **class II electric fishing machines**, with a metal-encased energizer, the output terminals shall be placed so that external conductors connected to these terminals are not likely to come into contact with the enclosure.

Compliance is checked by inspection.

22.107 The enclosure of **portable electric fishing machines** intended for catching fish shall be non-metallic.

Compliance is checked by inspection.

22.108 Those parts of the **electrodes** that are held by the user in normal use, shall be of electrical insulating material.

Compliance is checked by inspection.

22.109 **Electric fishing machines** shall be so designed that

- the conductors for the connection of the electrodes can be easily connected;
- it is possible to actuate switches and other controls if this is necessary in normal use, after the appliance has been mounted and connected to the supply, without opening or removing any enclosure that provides protection against harmful ingress of water or unintended electric shock.

Compliance is checked by inspection.

22.110 The presence of voltage between the **electrodes** is to be indicated by an audible or visual alarm on the control unit.

Compliance is checked by inspection and test.

22.111 No net of any kind shall be attached to any **electrode**.

Compliance is checked by inspection.

22.112 All catching **electrodes** manipulated by hand shall be fitted with a biased-off switch that must be held in the on position and that when in the **off position**, removes all voltage exceeding 12 V from the **electrode**.

The switch operating lever shall be arranged in such a way that it cannot be held in an on position by the hand or any part of the hand being wrapped around the switch lever and the **electrode** handle together.

Accessible parts of the biased-off switch shall be of electrical insulating material.

Compliance is checked by inspection and test.

NOTE The above requirement does not preclude a switch with a push-button actuator mounted on top of the **electrode** handle that is intended to be held in the on position by the thumb.

22.113 Apart from electrical connections, axles and small fastening devices, the cable reels connected to the **output circuit** shall be made from non-hygroscopic insulating material.

Compliance is checked by inspection and test.

22.114 Electric fishing machines with **electrodes** enclosed in a container and that are intended for killing fish shall incorporate an interlock that de-energizes the **electrodes** when the container lid is opened.

The interlock shall be constructed so that unexpected operation of the appliance is unlikely, unless the lid is in the closed position.

NOTE Interlocks that can be released by means of the test probe B of IEC 61032 do not meet this requirement.

The killing container and its outlet pipes shall be of electrical insulating material.

Compliance is checked by inspection and by manual test.

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 electric fishing machines 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.

25.5 Addition:

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

25.7 Replacement:

Supply cords other than the flexible leads or cord connecting an external battery or battery box to an **electric fishing machine** shall not be lighter than

- ordinary polyvinyl chloride sheathed cord (code designation 60227 IEC 53),
- ordinary polychloroprene sheathed cord (code designation 60245 IEC 57).

The ordinary polychloroprene sheathed cord shall be used where, for climatic reasons, the ordinary polyvinyl chloride sheathed cord is not suitable.

Compliance is checked by inspection.

25.8 Addition:

The conductors in flexible leads or flexible cord used to connect the battery in a **battery-operated electric fishing machine** shall have a nominal cross-sectional area of not less than 0,75 mm².

25.20 Addition:

The requirement is not applicable to the flexible leads or cord connecting an external battery or battery box to an **electric fishing machine**.

25.23 Addition:

For **battery-operated electric fishing machines**, if the battery is placed in a separate box, the flexible leads or cord connecting the box to the appliance are considered to be an **interconnection cord**.

25.101 Battery-operated electric fishing machines shall have suitable means for connection of the batteries.

Electric fishing machines that incorporate internal batteries shall be provided with terminals, flexible leads, contact strips or the like, suitable for connection to the type of battery, if any, marked on the appliance.

Battery-operated electric fishing machines that are intended to be supplied from separate batteries shall be provided with terminals or flexible leads or a flexible cord that may, for connection to the battery terminals, be fitted with alligator clips, clamps or other devices suitable for use with the type of battery, if any, marked on the appliance.

Compliance is checked by inspection.

26 Terminals for external conductors

This clause of Part 1 is applicable except as follows.

26.5 Addition:

Terminal devices in an **electric fishing machine** for the connection with **type X attachment** of the flexible leads or cord to an external battery or battery box shall be so located or shielded that there is no risk of accidental connection between supply terminals.

26.101 Electric fishing machines shall have suitable means for the connection of the **electrodes**. If terminals are provided for the connection of the **electrodes**, they shall comply with the requirements of 26.102 to 26.106.

Compliance is checked by inspection and by the relevant tests.

26.102 Output terminals shall be so designed or located that it is not possible to connect conductors for the **output circuit** by means of a plug that is designed for connection to a socket-outlet for mains supply.

Compliance is checked by inspection and by manual test.

26.103 Output terminals shall, unless the enclosure is of insulating material, be mounted on suitable insulators and shall be fixed so that they will not work loose when external conductors are connected or disconnected.

Compliance is checked by inspection and by manual test.

26.104 Output terminals shall be suitable for the connection of conductors up to 3 mm diameter without the use of cable lugs.

Compliance is checked by inspection and by manual test.

26.105 Devices for clamping the conductors for the **output circuit** shall not serve to fix any other component.

Compliance is checked by inspection.

26.106 Output terminals shall be so designed that they clamp the conductor between metal surfaces with adequate contact pressure and without damage to the conductor.

Compliance is checked by inspection and by measurement, after fastening and loosening 10 times a conductor of 3 mm² cross-sectional area, the torque being equal to two-thirds of the torque specified in 28.1.

NOTE Conductors are considered to be damaged if they show deep or sharp indentations.

The conductor is then re-inserted and the terminal screw tightened with a torque equal to two-thirds of the torque specified in 28.1.

The conductor is then subjected to a pull of $40\text{ N} \pm 1\text{ N}$, the pull being applied without jerks, for 1 min, in the direction of the axis of the conductor.

During the test, the conductor shall not move noticeably in the terminal.

27 Provision for earthing

This clause of Part 1 is applicable.

28 Screws and connections

This clause of Part 1 is applicable.

29 Clearances, creepage distances and solid insulation

This clause of Part 1 is applicable.

30 Resistance to heat, and fire

This clause of Part 1 is applicable except as follows.

30.2.2 Not applicable.

31 Resistance to rusting

This clause of Part 1 is applicable except as follows.

Replacement:

The enclosures of metal-encased **class II electric fishing machines** shall be adequately protected against corrosion.

Compliance is checked by the salt mist test of IEC 60068-2-52; severity (4) is applicable.

Before the test, coatings 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 mm $\pm$ 0,02 mm. The pin is so loaded that the force exerted along its axis is 10 N $\pm$ 0,5 N. The scratches are made by drawing the pin along the surface of the coating at a speed of about 20 mm/s. Five scratches are made at least 5 mm apart and at least 5 mm from the edge.

After the test, the enclosure shall not have deteriorated to such an extent that compliance with this standard is impaired. The coating shall not have broken and shall not have loosened from the metal surface.

32 Radiation, toxicity and similar hazards

This clause of Part 1 is not applicable.