

INTERNATIONAL STANDARD



**Household and similar electrical appliances – Safety –
Part 2-86: Particular requirements for electric fishing machines**

IECNORM.COM : Click to view the full PDF of IEC 60335-2-86:2018



THIS PUBLICATION IS COPYRIGHT PROTECTED
Copyright © 2018 IEC, Geneva, Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either IEC or IEC's member National Committee in the country of the requester. If you have any questions about IEC copyright or have an enquiry about obtaining additional rights to this publication, please contact the address below or your local IEC member National Committee for further information.

IEC Central Office
3, rue de Varembe
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
info@iec.ch
www.iec.ch

About the IEC

The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

About IEC publications

The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigenda or an amendment might have been published.

IEC Catalogue - webstore.iec.ch/catalogue

The stand-alone application for consulting the entire bibliographical information on IEC International Standards, Technical Specifications, Technical Reports and other documents. Available for PC, Mac OS, Android Tablets and iPad.

IEC publications search - webstore.iec.ch/advsearchform

The advanced search enables to find IEC publications by a variety of criteria (reference number, text, technical committee,...). It also gives information on projects, replaced and withdrawn publications.

IEC Just Published - webstore.iec.ch/justpublished

Stay up to date on all new IEC publications. Just Published details all new publications released. Available online and also once a month by email.

Electropedia - www.electropedia.org

The world's leading online dictionary of electronic and electrical terms containing 21 000 terms and definitions in English and French, with equivalent terms in 16 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

IEC Glossary - std.iec.ch/glossary

67 000 electrotechnical terminology entries in English and French extracted from the Terms and Definitions clause of IEC publications issued since 2002. Some entries have been collected from earlier publications of IEC TC 37, 77, 86 and CISPR.

IEC Customer Service Centre - webstore.iec.ch/csc

If you wish to give us your feedback on this publication or need further assistance, please contact the Customer Service Centre: sales@iec.ch.

IECNORM.COM : Click to view the IEC Standard IEC 60355-2-26:2018

INTERNATIONAL STANDARD



**Household and similar electrical appliances – Safety –
Part 2-86: Particular requirements for electric fishing machines**

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

ICS 65.150

ISBN 978-2-8322-5569-8

Warning! Make sure that you obtained this publication from an authorized distributor.

CONTENTS

FOREWORD.....	3
INTRODUCTION.....	6
1 Scope.....	7
2 Normative references	7
3 Terms and definitions	8
4 General requirement.....	9
5 General conditions for the tests	9
6 Classification.....	10
7 Marking and instructions.....	10
8 Protection against access to live parts.....	11
9 Starting of motor-operated appliances	12
10 Power input and current.....	12
11 Heating.....	12
12 Void.....	12
13 Leakage current and electric strength at operating temperature.....	12
14 Transient overvoltages	12
15 Moisture resistance	13
16 Leakage current and electric strength.....	13
17 Overload protection of transformers and associated circuits	13
18 Endurance.....	13
19 Abnormal operation	13
20 Stability and mechanical hazards.....	13
21 Mechanical strength	13
22 Construction	13
23 Internal wiring.....	16
24 Components.....	16
25 Supply connection and external flexible cords	16
26 Terminals for external conductors.....	16
27 Provision for earthing	17
28 Screws and connections.....	17
29 Clearances, creepage distances and solid insulation	17
30 Resistance to heat and fire.....	17
31 Resistance to rusting.....	17
32 Radiation, toxicity and similar hazards.....	18
Annexes	19
Annex A (informative) Routine tests	19
Annex S (normative) Battery-operated appliances powered by batteries that are non-rechargeable or not recharged in the appliance	20
Annex AA (normative) Boat mounted electric fishing machines	23
Bibliography.....	25

INTERNATIONAL ELECTROTECHNICAL COMMISSION

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

FOREWORD

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of 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, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as “IEC Publication(s)”). 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. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. 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 subcommittee 61H: Safety of electrically-operated farm appliances, of IEC technical committee 61: Safety of household and similar electrical appliances.

This third edition cancels and replaces the second edition published in 2002, its Amendment 1 (2005) and its Amendment 2 (2012). This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

- aligns the text with IEC 60335-1, Ed 5, and its Amendments 1 and 2;
- some notes have been converted to normative text (22.102, 22.113, 26.106);
- requirements for battery-operated electric fishing machines have been moved to Annex S.

The text of this International Standard is based on the following documents:

FDIS	Report on voting
61H/363/FDIS	61H/365/RVD

Full information on the voting for the approval of this International Standard can be found in the report on voting indicated in the above table.

This document has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all parts of the IEC 60335 series, under the general title: *Household and similar electrical appliances – Safety*, can be found on the IEC website.

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 fifth edition (2010) 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.

NOTE 4 The attention of National Committees is drawn to the fact that equipment manufacturers and testing organizations may need a transitional period following publication of a new, amended or revised IEC publication in which to make products in accordance with the new requirements and to equip themselves for conducting new or revised tests.

It is the recommendation of the committee that the content of this publication be adopted for implementation nationally not earlier than 12 months or later than 36 months from the date of publication.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under "<http://webstore.iec.ch>" in the data related to the specific document. At this date, the document will be

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

A bilingual version of this publication may be issued at a later date.

IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

IECNORM.COM : Click to view the full PDF of IEC 60335-2-86:2018

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 and takes into account the way in which electromagnetic phenomena can affect the safe operation of appliances.

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.

NOTE 1 Throughout this publication, when "Part 1" is mentioned, it refers to IEC 60335-1.

When a part 2 standard does not include additional requirements to cover hazards dealt with in Part 1, Part 1 applies.

NOTE 2 This means that the technical committees responsible for the part 2 standards have determined that it is not necessary to specify particular requirements for the appliance in question over and above the general requirements.

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.

NOTE 3 Horizontal and generic standards covering a hazard are not applicable since they have been taken into consideration when developing the general and particular requirements for the IEC 60335 series of standards. For example, in the case of temperature requirements for surfaces on many appliances, generic standards, such as ISO 13732-1 for hot surfaces, are not applicable in addition to Part 1 or part 2 standards.

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 part of IEC 60335 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 **electric fishing machines** is not more than 250 V for single phase machines and 480 V for other machines, except that the **rated voltage** of **electric fishing machines** for permanent connection to fixed wiring is not more than 1 000 V.

Electric fishing machines are appliances for scientific and commercial use.

Additional requirements for boat mounted **electric fishing machines** are given in Annex AA.

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 can 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);
- shark deterrent devices that are carried by the user.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

This clause of Part 1 is applicable except as follows.

Addition:

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

IEC 61558-2-4, *Safety of transformers, reactors, power supply units and similar products for supply voltages up to 1 100 V – Part 2-4: Particular requirements and tests for isolating transformers and power supply units incorporating isolating transformers*

3 Terms and definitions

This clause of Part 1 is applicable except as follows.

3.1 Definitions relating to physical characteristics

3.1.1 Addition:

Note 101 to entry: The **rated voltage** is the rated input voltage.

3.1.6 Addition:

Note 102 to entry: The **rated current** is the rated input current.

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

3.1.101

output voltage

voltage between the **electrodes**

3.1.102

output current

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

3.1.103

pulsed voltage

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

3.1.104

impulse

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

3.5 Definitions relating to types of appliances

3.5.101

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

Note 2 to entry: A given **electric fishing machine** may only perform some of the functions specified.

3.5.102

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**

Note 1 to entry: It may also be supplied from a generator set.

3.5.103**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**

3.6 Definitions relating to parts of an appliance**3.6.3 Addition:**

Note 101 to entry: 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

3.6.101**electrode**

that part of an **electric fishing machine** that transfers the electric power into the water

Note 1 to entry: The catching **electrode** is the **electrode** used by the fisherman, the return **electrode** is the **electrode** trailed in the water.

Note 2 to entry: The catching **electrode** is usually the anode and the return **electrode** is usually the cathode.

Note 3 to entry: This does not preclude the return **electrode** being held by the user.

3.6.102**energizer**

that part of an **electric fishing machine** that transfers the electric power into the **electrodes**

3.6.103**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

3.7 Definitions relating to safety components

Addition:

3.7.101**biased-off switch**

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

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.

5.101 *If there is no indication as to which of the output terminals is to be connected to the return **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.

Hand-held parts of **electric fishing machines** shall be IPX7.

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 ISO 7000-0790 (2004-01);
- the catching **electrode** and return **electrode** terminals of alternating current machines and pulsed voltage machines using AC shall be identified by symbols IEC 60417-5036 (2002-10) and IEC 60417-5017 (2006-08) as appropriate. If the return **electrode** is not grounded it need not be marked.
- the catching **electrode** and return **electrode** terminals of direct current machines and pulsed voltage machines using DC shall be identified by symbols IEC 60417-5005 (2002-10) and IEC 60417-5006 (2002-10) as appropriate.

7.6 Addition:



[symbol IEC 60417-5017
(2006-08)]

earth (ground)

7.12 Addition:

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 IEC 60417-5017 (2006-08), symbol IEC 60417-5036 (2002-10) or symbol ISO 7000-0790 (2004-01) are marked on the appliance, their 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.

The instructions for **electric fishing machines** that are supplied from a motor-generator set with an accessible neutral or incorporate a motor-generator set or generator with an accessible neutral shall contain the substance of the following warning.

WARNING: Ensure the generator neutral is not connected to the enclosure of the motor-generator set or **electric fishing machine**.

7.12.9 Not applicable.

7.14 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 IEC 60417-5017 (2006-08), symbol IEC 60417-5036 (2002-10) and symbol ISO 7000-0790 (2004-01) 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 with the most unfavourable supply voltage between 0,85 and 1,1 times **rated voltage**.*

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:

For **mains-operated electric fishing machines**, compliance is checked by the tests of 16.2, 16.3 and 16.101.

16.101 Immediately after the test of 16.3, 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.

22.12 Addition:

The requirement is not applicable to the **electric fishing machine** output terminal assembly including the terminal knobs and washers.

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 101.

Table 101 – 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,

- it shall be fitted with a tilt switch that disables the **electric fishing machine** when it is tipped more than 65° forward and 45° backwards from the vertical, while it is held as in normal use;
- the tilt switch shall 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**. The disconnection may be on the input side of a transformer supplying the **output circuit**.

Compliance is checked by inspection and test.

22.103 In **mains-operated electric fishing machines**, 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.

22.104 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.

22.105 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.

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

Compliance is checked by inspection.

22.107 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.

22.108 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.

22.109 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.

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

Compliance is checked by inspection.

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

The **biased-off switch** shall be recessed or guarded to prevent accidental operation.

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

Compliance is checked by inspection and by applying a cylindrical rod having a diameter of 40 mm and a hemispherical end to the switch. The appliance shall not operate.

22.112 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.

22.113 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.

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

Compliance is checked by inspection and by the following test.

Test probe of IEC 61032 shall be applied to the interlock with a force not exceeding 5 N. The interlock shall not release.

22.114 Fixed electric fishing machines used to provide barriers to all animals living in water shall be fitted with an emergency stop device that removes all voltage exceeding 12 V from the **electrodes**.

The actuating member of the emergency stop device shall be coloured red.

Compliance is checked by inspection and 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 the fixed wiring shall be provided with a **supply cord** fitted with a plug.

Compliance is checked by inspection.

25.7 Replacement:

Supply cords 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.

26 Terminals for external conductors

This clause of Part 1 is applicable except as follows.

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.

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 N ± 1 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. After the test, the conductor shall not show deep or sharp indentations.

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 Addition:

*For **electric fishing machines** by means of which water is electrified for the purpose of catching fish, 30.2.2 is applicable. For other appliances, 30.2.3 is 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; test method 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 ± 0,02 mm. The pin is so loaded that the force exerted along its axis is 10 N ± 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.

IECNORM.COM : Click to view the full PDF of IEC 60335-2-86:2018

Annexes

The annexes of Part 1 are applicable except as follows.

Annex A (informative)

Routine tests

A.1 Earth continuity test

Addition:

*The test should also be applied to equipotentially bonded parts in boats containing boat mounted **electric fishing machines**. The calculated resistance between the parts should not exceed 0,1 Ω .*

IECNORM.COM : Click to view the full PDF of IEC 60335-2-86:2018

Annex S (normative)

Battery-operated appliances powered by batteries that are non-rechargeable or not recharged in the appliance

This annex of Part 1 is applicable except as follows:

Add the following clause:

6 Classification

6.2 Addition:

Battery compartments in **portable electric fishing machines** that contain voltages exceeding 24 V shall be IPX7.

7 Marking and instructions

7.1 Addition:

Battery-operated electric fishing machines shall be marked with the prohibition sign “connection to mains-operated equipment prohibited” or with the substance of the following:

WARNING: Do not connect to mains-operated equipment.

7.6 Addition:



connection to mains-operated equipment prohibited

Add the following subclause:

7.8 Addition:

For **battery-operated electric fishing machines**, the supply terminals for connection of the battery shall be clearly indicated by symbol IEC 60417-5005 (2002-10) if of positive polarity, and by symbol IEC 60417-5006 (2002-10) if of negative polarity, unless the polarity is irrelevant.

7.12 Addition:

If the prohibition sign “connection to mains-operated equipment prohibited” is used, its meaning shall be explained.

Add the following subclause:

7.14 Addition:

If the prohibition sign “connection to mains-operated equipment prohibited” is marked on the appliance, the outer diameter of the circle shall be at least 15 mm.

Add the following clause:

8 Protection against access to live parts

8.S.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**.*

Add the following clause:

16 Leakage current and electric strength

16.S.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 DC 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.S.102 Immediately after the tests of 16.3 and 16.S.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.

Add the following clause:

22 Construction

22.S.101 **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.

25 Supply connection and external flexible cords

Add the following subclauses:

25.7 Addition:

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

25.8 *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.S.102 Battery-operated 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 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, marked on the appliance.

Compliance is checked by inspection.

IECNORM.COM : Click to view the full text of IEC 60335-2-86:2018