INTERNATIONAL STANDARD

ISO 13297

Second edition
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Small craft — Electrical systems — Alternating current installations

Petits navires — Systèmes électriques — Installations de distribution de courant alternatif

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this International Standard may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

International Standard ISO 13297 was prepared by Technical Committee ISO/TC 188, *Small craft*.

This second edition cancels and replaces the first edition (ISO 13297:1995), of which it constitutes a technical revision.

Annex A and B form a normative part of this International Standard. Annexes C and D are for information only.

Introduction

Annex A specifies conductor requirements. Annex B specifies instructions to be included with the owner's manual (ISO 10240). Annex C provides information on recommended system tests to be performed upon completion of the a.c. installation.

Compliance with this International Standard will not, by itself, provide protection against explosion, fire and electrical shock hazard. The manufacturer also needs to comply with additional standards related to protection against the same possible hazards. These additional standards are listed in annex D, with a brief description of their contents. For complete understanding of the requirements, the manufacturer needs to refer to the actual standard. Compliance with all these International Standards will ensure a high level of safety in all craft, particularly in those using petrol or liquefied petroleum (LPG).

Small craft — Electrical systems — Alternating current installations

1 Scope

This International Standard specifies the requirements for the design, construction and installation of low-voltage alternating current electrical systems which operate at nominal voltages of less than 250 V single phase on small craft of hull length up to 24 m.

NOTE This International Standard does not cover three-phase installations.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this International Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO 8846:1990, *Small craft — Electrical devices — Protection against ignition of surrounding flammable gases*.

ISO 9094-1:—[1)], *Small craft — Fire protection — Part 1: Craft with a hull length of up to and including 15 m*.

ISO 10133:2000, *Small craft — Electrical systems — Extra-low-voltage d.c. installations*.

ISO 10240:1995, *Small craft — Owner's manual*.

IEC 60079-0:1998, *Electrical apparatus for explosive gas atmospheres — Part 0: General requirements*.

IEC 60446:1999, *Basic and safety principles for non-machine interface marking and identification — Identification of conductors by colours or numerals*.

IEC 60529:1989, *Degrees of protection provided by enclosures (IP code)*.

IEC 60947-7-1:1989, *Low-voltage switchgear and controlgear — Part 7: Ancillary equipment — Section One: Terminal blocks for copper conductors*.

3 Terms and definitions

For the purposes of this International Standard, the following terms and definitions apply.

1) To be published.

3.1
craft's ground
craft's earth
ground (earth) which is established by a conducting connection (intended or accidental) with the common ground (potential of the earth's surface), including any conductive part of the wetted surface of the hull

3.2
residual (differential) current device
ground-fault circuit interrupter
RCD
GFCI
electromechanical switching device, or association of devices, designed to make, carry and break currents under normal service conditions and to cause the opening of contacts when the residual current attains a given value under specified conditions

NOTE RCD/GFCI serve to reduce the risk of injury to people from electrical shock.

3.3
polarization transformer
transformer which automatically orientates the neutral and live conductors in the system in the same polarity orientation as the polarized system of the craft

3.4
isolation transformer
transformer with protective separation between the input and output windings and the protective conductor

3.5
neutral conductor
conductor connected to the neutral point of a system and capable of contributing to the transmission of electrical energy

3.6
protective earthing conductor
protective grounding conductor
conductor, not normally carrying current, used for some measure of protection against electric shock, for electrically connecting any of the following parts of electrical equipment to the craft's ground (earth) and to the shore a.c. grounding conductor through the shore-power cable:

a) exposed conductive parts of electrical equipment;

b) extraneous conductive parts;

c) the main grounding (earthing) terminal;

d) earth electrode(s);

e) the earth point of a source, or an artificial neutral.

3.7
live conductor
conductor or conductive part intended to be energized in normal use, including a neutral conductor

3.8
ignition-protected equipment
equipment designed and constructed to comply with ISO 8846

3.9
overcurrent protection device
device, such as a fuse or circuit-breaker, designed to interrupt the circuit when the current flow exceeds a predetermined value for a predetermined time

3.10
panel-board
switchboard
assembly of devices for the purpose of controlling and/or distributing electrical power

NOTE Examples of devices are circuit-breakers, fuses, switches, instruments and indicators.

3.11
polarized system
system in which the neutral and live conductors are connected in the same manner to all terminals on devices or receptacles (socket outlets) in a circuit

3.12
shore-power inlet
fitting designed for mounting on a craft, of a shrouded male type, to connect to the female connector on the craft end of the shore-power cable, in order to make the electrical connection for transmission of electrical energy

3.13
trip-free circuit-breaker
mechanical switching device capable of making, carrying and breaking currents under normal circuit conditions and also making, carrying for a specified time and breaking currents under specified abnormal circuit conditions, such as those of overload or short circuit, and which are designed so that the resetting means cannot be manually held in place to override the current-interrupting mechanism

3.14
accessible
capable of being reached for inspection, removal or maintainance without removal of the permanent structure of the craft

3.15
readily accessible
capable of being reached quickly and safely for effective use without the use of tools

3.16
sheath
uniform and continuous protective tubular covering of metallic or non-metallic material around one or more insulated conductors

EXAMPLES Moulded rubber, moulded plastic, woven sleeving or flexible tubing.

3.17
conduit
part of a closed wiring system of circular or non-circular cross-section for insulated conductors and/or cables in electrical installations, allowing them to be drawn in and/or replaced

3.18
cable trunking
system of closed enclosures comprising a base with a removable cover intended for the complete surrounding of insulated conductors, cables or cords and for the accommodation of other electrical equipment

3.19
double-pole circuit-breaker
device intended to interrupt both the neutral and live conductors in a circuit simultaneously when a designated current is exceeded for a predetermined time

3.20
captive-spade terminal
conductor terminal component which is maintained in the connection to the screw or stud even when the threaded terminal fastener is loose

3.21
exposed conductive part
conductive part of electrical equipment, which can be readily touched and which is not normally live, but which may become live under fault conditions

3.22
fuse
device that, by fusing of one or more of its specifically designed and proportioned components, opens a circuit in which it is inserted by breaking the current when this exceeds a given value for a sufficient time

NOTE The fuse comprises all the parts that form the complete device.

3.23
galvanic isolator
device installed in series with the a.c. protective conductor of the shore-power cable to block low-voltage d.c. galvanic current flow, but permit the passage of alternating current normally associated with the protective conductor

4 General requirements

4.1 The protective conductor insulation shall be green or green with a yellow stripe. Neither colour shall be used for current-carrying conductors.

NOTE The equipotential bonding conductor of the d.c. electrical system (see ISO 10133) also uses green, or green with a yellow stripe, insulation and is connected to various exposed conductive parts of direct-current electrical devices, other extraneous conductive parts and the d.c. negative ground/earth.

4.2 The protective conductor shall be connected to the craft's d.c. negative ground (earth) as close as practicable to the battery (d.c.) negative terminal.

NOTE If an RCD (whole-craft residual current device) or an isolation transformer is installed in the main supply circuit of the a.c. system (see 8.2), the negative ground terminal of the d.c. system need not be connected to the a.c. shore ground (protective conductor).

4.3 For craft with fully insulated d.c. systems (see ISO 10133), the a.c. protective conductor shall be connected to the hull of a metallic hull craft, the craft external ground (earth) or the craft lightning-protection ground plate, if fitted.

4.4 Metallic craft hulls shall not be used as conductors.

4.5 The protective conductor shall be connected to metallic hulls at a location above any anticipated water accumulation.

4.6 Individual circuits shall not be capable of being energized by more than one source of electrical power at a time. Each shore-power inlet, generator or inverter is a separate source of electrical power. The transfer from one power-source circuit to another shall be made by a means which opens all current-carrying conductors, live and neutral, before closing the other source circuit, prevents arc-over between contacts and is interlocked by mechanical or electromechanical means. Both current-carrying conductors, live and neutral, shall be broken simultaneously when changing power sources.

4.7 Energized parts of electrical equipment shall be guarded against accidental contact by the use of enclosures of at least IP 2X type, in accordance with IEC 60529, or other protective means which shall not be used for non-electrical equipment. Access to energized parts of the electrical system shall require the use of hand tools or have a protection of at least IP 2X, unless otherwise specified. A suitable warning sign shall be displayed (see 5.2).

4.8 The neutral conductor shall be grounded (earthed) only at the source of power, i.e. at the onboard generator, the secondary of the isolation or polarization transformer, or the shore-power connection. The shore-power neutral shall be grounded through the shore-power cable and shall not be grounded on board the craft.

4.9 A galvanic isolator or other suitable device may be fitted in the protective conductor to resist imported stray galvanic current flow while permitting the passage of a.c. current, if present. Galvanic isolators shall be designed to withstand the application of power from a short-circuit test from a source capable of delivering 5 000 A r.m.s. symmetrically to its output test terminals for the time required for the circuit-breaker in the test circuit to trip. After three applications of the short-circuit test, the electrical and mechanical characteristics of the isolator shall be unchanged.

5 Marking

5.1 Shore-power inlets shall be marked to indicate voltage, current, shock hazard symbol  and read owner's manual symbol  .

5.2 A permanently mounted waterproof warning sign shall be located at the panel-board on the craft. The sign shall include the information shown in Figure 1a) or 1b).

Warning Electrical shock hazard Fire hazard Read owner's manual

a) Suggested warning sign using symbols

WARNING — To minimize shock and fire hazards:

1) Turn off craft's shore-power connection switch before connecting or disconnecting shore-power cable.

2) Connect shore-power cable to craft's inlet before connecting to shore-power source.

3) If polarity indicator is activated, immediately disconnect cable.

4) Disconnect shore-power cable at shore-power source first.

5) Close shore-power inlet cover tightly.

DO NOT ALTER SHORE-POWER CABLE CONNECTORS.

b) Suggested warning sign with text in language appropriate to the country of use

Figure 1 — Suggested warning signs

NOTE In Figure 1 b), item 3 is required only if a polarity indicator is installed in the system and items 2, 4 and 5 are not required for permanently connected shore-power cable installations.

5.3 Switches and controls shall be marked to indicate their function, unless the purpose of the switch is obvious and if operation of the switch could not, under normal operating conditions, cause a hazardous condition.