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Small craft — Electrical systems — Alternating and direct current installations

Petits navires — Installations électriques — Installations à courant alternatif et continu

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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.

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This document was prepared by Technical Committee ISO/TC 188, *Small craft*, in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 464, *Small craft*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This fifth edition of ISO 13297 cancels and replaces ISO 13297:2014 and ISO 10133:2012, which have been technically revised.

The main changes compared to the previous editions are as follows:

— combined the standard for alternating current (ISO 13297:2014) and the standard for direct current (ISO 10133:2012) into a single marine electrical standard.

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Small craft — Electrical systems — Alternating and direct current installations

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1 Scope

This document specifies the requirements for the design, construction and installation of the following types of DC and AC electrical systems, installed on small craft either individually or in combination:

a) extra-low-voltage direct current (DC) electrical systems that operate at nominal potentials of 50 V DC or less;

b) single-phase alternating current (AC) systems that operate at a nominal voltage not exceeding AC 250 V.

This document does not cover the following:

— electrical propulsion systems of direct current less than 1 500 V DC, single-phase alternating current up to 1 000 V AC, and three-phase alternating current up to 1 000 V AC, which are addressed by ISO 16315;

— any conductor that is part of an outboard engine assembly and that does not extend beyond the outboard engine manufacturers supplied cowling;

— three-phase AC installations that operate at a nominal voltage not exceeding 500 V AC, which are addressed by IEC 60092-507.

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.

ISO 7010:2019, *Graphical symbols — Safety colours and safety signs — Registered safety signs*

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

ISO 10240:2019, *Small craft — Owner's manual*

IEC 60309-2:1999, *Plugs, socket-outlets and couplers for industrial purposes — Part 2: Dimensional interchangeability requirements for pin and contact-tube accessories*

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

3 Terms and definitions

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

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

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— IEC Electropedia: available at http://www.electropedia.org/

3.1
craft's ground/earth
protective grounding
connection, provided for safety purposes, that is established by a conducting connection with the common ground/earth (potential of the earth's surface)

3.2
equipotential bonding conductor
normally non-current-carrying conductor used to put various *exposed conductive parts* (3.15) of direct current electrical devices and *extraneous conductive parts* (3.33) at a substantially equal potential

3.3
engine negative terminal
terminal on the engine, starter or solenoid to which the negative battery cable is connected

3.4
main grounding
earthing point
main point that provides connection for the DC negative conductor, AC *protective grounding conductor* (3.10) and bonding conductor to the craft's ground that is established by a conducting connection (intended or accidental) with the common ground (potential of the earth's surface)

Note 1 to entry: It can include any conductive part of the wetted surface of the hull in permanent contact with the water, depending on the overall system design.

3.5
overcurrent protection device
device designed to interrupt the circuit when the current flow exceeds a predetermined value for a predetermined time

EXAMPLE A *fuse* (3.29) or circuit breaker.

3.6
residual current device
RCD
electro-mechanical 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 1 to entry: RCDs serve to reduce the risk of injury to people from electrical shock hazard, and damage to equipment from leakage of stray currents to earth or to other circuits.

3.7
polarization transformer
transformer that automatically orientates the neutral and *active (phase) conductors* (3.12) in the system in the same polarity orientation as the *polarized system* (3.17) of the craft

3.8
isolation transformer
transformer installed in the shore power supply circuit on a craft to electrically isolate all the normally *live conductors* (3.11) and the *protective conductor* (3.10) on the craft from the AC system conductors of the shore power supply

3.9
neutral conductor
conductor intentionally maintained at ground potential and capable of contributing to the transmission of electrical energy

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3.10
protective 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 AC grounding conductor through the shore power cable:

a) *exposed conductive parts* (3.15) of electrical equipment;

b) *extraneous conductive parts* (3.33);

c) the main grounding (earthing) terminal;

d) earth electrode(s);

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

3.11
live conductor
conductor or conductive part intended to be energized in normal use, including a *neutral conductor* (3.9)

3.12
active (phase) conductor
conductor that is maintained at a difference of potential from the *neutral conductor* (3.9) or *protective conductor* (3.10)

Note 1 to entry: In a system that does not include a neutral or protective conductor, all conductors are considered active conductors.

3.13
ignition-protected
<equipment> designed and constructed to give protection against ignition of surrounding flammable gases

Note 1 to entry: The protection against ignition of surrounding flammable gases is covered in ISO 8846:1990.

3.14
system voltage
nominal voltage supplied to the craft from a power source

3.15
exposed conductive part
conductive part of electrical equipment, which can be touched and which is not normally live, but which can become live under fault conditions

3.16
panel board
switchboard
assembly of devices for the purpose of controlling and/or distributing electrical power

Note 1 to entry: It can include devices such as circuit breakers, *fuses* (3.29), switches, instruments, and indicators.

3.17
polarized system
system in which the *live conductors* (3.11) (active and neutral) are connected in the same relation to all terminals on devices or receptacles (socket outlets) in a circuit

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3.18
fully insulated two-wire DC system
system in which both positive and negative poles remain isolated from the ground (earth), e.g. not connected to the water through a metallic hull, the propulsion system or earthed through the AC *protective conductor* (3.10)

Note 1 to entry: Some systems can use a momentary ground connection for engine starting purposes and can remain isolated.

3.19
self-limiting
device whose maximum output is restricted to a specified value by its magnetic or electrical characteristics

3.20
two-wire DC system with negative ground
system in which the DC negative is connected to the ground

3.21
shore power appliance 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

3.22
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 is designed so that the resetting means cannot be manually held in place to override the current-interrupting mechanism

3.23
accessible
capable of being reached for inspection, removal or maintenance without removal of permanent craft structure

3.24
readily accessible
capable of being reached for use, inspection, removal or maintenance without the use of tools

3.25
sheath
uniform and continuous tubular protective covering of metallic or non-metallic material around one or more insulated conductors

Note 1 to entry: Examples of appropriate materials include moulded rubber, moulded plastic, woven sleeving or flexible tubing.

3.26
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

3.27
cable trunking
system of closed enclosures comprising a base with a removable cover intended for the complete surrounding of insulated conductors, cables, cords and for the accommodation of other electrical equipment

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3.28
double-pole circuit breaker
device intended to interrupt both the *neutral conductor* (3.9) and *active (phase) conductors* (3.12) in a circuit simultaneously when a designated current is exceeded for a predetermined time

3.29
fuse
protective device that interrupts the circuit irreversibly when the current flow reaches a specified value for a specific time

[SOURCE: ISO 8820-1:2014, 3.2, modified – Note 1 to entry has been deleted.]

3.30
galvanic isolator
device which can be installed in series with the AC *protective conductor* (3.10) of the shore power cable to block low voltage DC galvanic current flow, but permits the passage of AC normally associated with the protective conductor

3.31
inverter
device powered by a DC source, designed primarily to provide AC power at a required voltage and frequency

3.32
inverter/charger
device designed to supply either AC power to a craft's electrical system or to utilize the craft's AC electrical distribution system to charge or maintain a battery or batteries supplying DC

3.33
extraneous conductive part
conductive part liable to introduce a potential, generally ground/earth potential, and not forming part of the electrical installation

3.34
ground plate
means to conduct the electrical current from a craft's conductive element to the water

3.35
craft
small craft
recreational boat, and other watercraft using similar equipment, of up to 24 m length of hull (L_H)

Note 1 to entry: The measurement methodology for the length of hull is defined in ISO 8666.

[SOURCE: ISO 8666:2020, 3.15, modified – Note 1 to entry has been added.]

4 General requirements, DC and AC systems

4.1 The hull of a metallic hull craft shall not be used as a circuit conductor.

4.2 Craft equipped with both DC and AC electrical systems shall have their distribution from either separate panel boards, or from a common one with a partition, or from other positive means to separate clearly the AC and DC sections from each other, and these shall be clearly identified.

4.3 Wiring diagrams to identify circuits, components and conductors shall be included with the craft.

After completing an AC installation, it is recommended to perform a system test according to Annex C.

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