TECHNICAL REPORT

ISO/TR 10134

First edition
2020-05

Small craft — Electrical devices — Established practices for the design, construction and installation of lightning-protection systems

Petits navires — Dispositifs électriques — Pratiques établies pour la conception, la construction et l'installation de dispositifs de protection contre la foudre

Reference number
ISO/TR 10134:2020(E)

ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Fax: +41 22 749 09 47
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

Contents

Page

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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 188, *Small craft*.

This first edition of this Technical Report cancels and replaces the second edition of the former International Standard (ISO 10134:2003).

The main changes compared to the previous International Standard are as follows:

— transformation into an informative document.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

The probability of a lightning strike to a recreational craft varies with geographic location and time of year, but when the conditions that create an electrical discharge between clouds and the earth exist, there is nothing that can be done to prevent the lightning discharge. Craft can be struck in open water or when tied to the dock. The presence of a lightning-protection system on a craft cannot provide complete protection from equipment damage or personal injury and such protection is not implied in this Technical Report.

Small craft — Electrical devices — Established practices for the design, construction and installation of lightning-protection systems

1 Scope

This document describes established practices for the design, construction and installation of lightning-protection systems fitted on small craft of hull length up to 24 m.

2 Normative references

There are no normative references in this document.

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

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

3.1
air gap
interruption of a conductive path by a small air space not exceeding 2 mm in order to prevent the passage of low-voltage current without interrupting the flow of lightning current

3.2
air terminal
uppermost part of the lightning-protection system, intended to dissipate the charge or start the lightning ground process

3.3
lightning ground plate
lightning ground strip
means to conduct the electrical current from a boat's conductive elements to the water in which the boat floats

3.4
lightning-protective mast
conductive structure or means for electrical connection of an *air terminal* (3.2) to the *lightning ground plate* (3.3)

3.5
side flash
an arc-over discharge that occurs from the lightning-protection system to any metal object

3.6
lightning bonding conductor
conductor intended to be used for potential equalization between metal bodies and the lightning-protection system

3.7
lightning grounding conductor
conductor installed to connect the *air terminal* (3.2) or the *lightning-protective mast* (3.4) to the *lightning ground plate* (3.3)

3.8
protection zone
zone below a grounded *air terminal* (3.2), mast or overhead ground wire which is substantially immune to direct strokes of lightning

Note 1 to entry: Complete protection from equipment damage or personal injury is not implied.

Note 2 to entry: A lightning-protection system offers no protection when the boat is out of water and is not intended to afford protection if any part of the boat comes in contact with power lines while afloat or ashore.

4 General

4.1 Protection of persons and small craft from lightning is dependent upon a combination of design and maintenance of equipment and on personnel behaviour. The established practices described in this document can be considered when designing and installing a lightning-protection system. Due to the wide variation in structural design of boats and the unpredictable nature of lightning, specific recommendations cannot be made to cover all cases.

4.2 An adequate lightning grounding conductor or lightning-protective mast is obtained when the entire circuit from the top of the lightning-protective mast to the lightning ground plate has a mechanical strength and a conductivity not less than that of a 21 mm^2 copper conductor, and when the path to ground followed by the conductor is essentially straight. Additional recommendations can be found in IEC 60092-352.

4.3 If there are large metal objects such as tanks, engines, deck winches, stoves, etc. within 2 m of any lightning grounding conductor, there will be a strong tendency for sparks or side flashes to jump from the grounding conductor to the metal object at the closest point. Damage from such side flashes can be prevented by an interconnecting lightning bonding conductor at least equivalent to 13 mm^2 copper (see 5.2.1), provided at all places where the side flashes are likely to occur. Additional recommendations can be found in IEC 60092-352.

4.4 Large metallic objects which are not part of the electrical system of the craft and which are not already grounded due to their own functional or other practices can be grounded directly to the lightning ground plate, provided that it is not practical to interconnect with the lightning grounding conductor or lightning bonding conductor as discussed in 4.2 and 6.4.

4.5 Where a lightning-protection system is installed on a craft, it is advised that the owner's manual include the information given in Annex A.

5 Materials

5.1 Corrosion resistance

The material used in a lightning-protective system should be resistant to corrosion. If, as in certain installations, it is impractical to avoid a junction of dissimilar metals, the corrosion effects can be reduced by using suitable platings or special connectors that are galvanically compatible with both metals which are available for such purposes.

5.2 Wire conductors

5.2.1 Either the wire conductors are of stranded copper of cross-sectional area not less than 13 mm^2, or their conductivity is equal to or greater than that of 13 mm^2 copper wire. Additional recommendations can be found in IEC 60092-352.

5.2.2 The size of any strand of a bare copper wire is not less than 0,71 mm^2. Insulated copper wires have at least 19 strands.

5.2.3 The thickness of metal ribbon or strip is equal to or greater than 1 mm.

6 Installation

6.1 General precautionary measure

Side flashes and the induction of high voltage to the craft wiring are minimized when lightning conductors in proximity to the craft wiring are not routed in parallel to the craft wiring.

6.2 Conductive joints

Conductive joints are made and supported so as not to damage the conductors and to provide a conductivity equal to that of the conductor.

6.3 Height of lightning-protective mast

6.3.1 The height of lightning-protective masts provides the zone of protection described in 6.3.2 to 6.3.4.

6.3.2 For mast heights not exceeding 15 m above the water, the base radius is approximately equal to the mast height, *h* (see Figure 1).

6.3.3 For mast heights exceeding 15 m above the water, the zone of protection is based on the striking distance of the lightning stroke.

Since the lightning stroke can strike any grounded object within the striking distance of the point from which final breakdown to ground occurs, the zone of protection is defined by a circular arc (see Figure 2).

The radius of the arc is the striking distance (30 m). The arc passes through the top of the mast and is tangent to the water. If more than one mast is used, the zone of protection is defined by arcs to all masts.

6.3.4 Additional lightning-protective means are erected to form overlapping zones of protection to protect a craft of which the size renders the use of a single mast impractical.

NOTE The protection zone afforded by any configuration of masts or other elevated, conductive and grounded objects can readily be determined graphically. Increasing the height of a mast above the striking distance does not increase the protection zone.