INTERNATIONAL STANDARD

ISO 16273

Second edition
2020-09

Ships and marine technology — Night vision equipment for high-speed craft — Operational and performance requirements, methods of testing and required test results

Navires et technologie maritime — Équipement de vision nocturne pour navires à grande vitesse — Exigences opérationnelles et de performance, méthodes d'essai et résultats d'essai exigés

iTeh STANDARD PREVIEW
(standards.iteh.ai)
ISO 16273:2020
https://standards.iteh.ai/catalog/standards/sist/9af7b6a6-6a4b-4622-8c55-95cfdf4960b9/iso-16273-2020

Reference number
ISO 16273:2020(E)

© ISO 2020

iTeh STANDARD PREVIEW
(standards.iteh.ai)
ISO 16273:2020
https://standards.iteh.ai/catalog/standards/sist/9af7b6a6-6a4b-4622-8c55-95cfdf4960b9/iso-16273-2020

COPYRIGHT PROTECTED DOCUMENT

© ISO 2020

All rights reserved. Unless otherwise specified, or required in the context of its implementation, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

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

Published in Switzerland

© ISO 2020 – All rights reserved

Contents

Page

iTeh STANDARD PREVIEW
(standards.iteh.ai)
ISO 16273:2020
https://standards.iteh.ai/catalog/standards/sist/9af7b6a6-6a4b-4622-8c55-
93ca4f00b97b/iso-16273-2020

© ISO 2020 – All rights reserved

iTeh STANDARD PREVIEW
(standards.iteh.ai)
ISO 16273:2020
https://standards.iteh.ai/catalog/standards/sist/9af7b6a6-6a4b-4622-8c55-95cfdf4960b9/iso-16273-2020

© ISO 2020 – All rights reserved

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.

iTeh STANDARD PREVIEW
(standards.iteh.ai)

This document was prepared by Technical Committee ISO/TC 8, *Ships and marine technology*, Subcommittee SC 6, *Navigation and ship operations*.

ISO 16273:2020
https://standards.iteh.ai/catalog/standards/sist/9af7b6a6-6a4b-4622-8c55-

This second edition cancels and replaces the first edition (ISO 16273:2003), which has been technically revised.

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

— definitions 3.5 "performance check", 3.6 "performance check (EMC)", 3.7 "performance test" 3.8 "single operator action", 3.9 "field of view" and 3.10 "instantaneous field of view" have been added;

— 4.8 "Stabilisation of the field of view against the motions of the vessel" has been added;

— 4.10 "Clear view", former 4.11, has been clarified;

— 4.13 "Line of sight" has been added;

— 4.15 "Presentation of information", former 4.16, has been modified;

— 4.22 "Interfacing" has been modified;

— 5.1.2 "Performance test" has been added;

— 5.1.3 "Performance check", former 6.3, has been modified;

— 5.1.4 "Performance check (EMC)" has been added;

— 5.2.3 "Roll and pitch test", former 6.2.2, has been modified;

— 5.4.2.8 "Wind endurance test" has been added;

— 5.4.3 "Test of thermal imaging systems", former 7.2, has been modified;

© ISO 2020 – All rights reserved

— 5.4.3.2, Table 2 "Atmospheric extinction coefficients for different wavelength ranges" values have been adjusted;

— 5.4.4 "Test of active image-intensifier systems", former 7.3, has been modified and testing of non-visible illumination has been added;

— 5.5 "Sea trials", former Clause 8, has been modified, the surface of test specimen has been specified;

— Annex D (normative) "Measurement of MTDP (minimum temperature difference perceived) of thermal imagers" has been added;

— Annex E (normative) "Stabilisation test for thermal imaging systems" has been added.

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..

iTeh STANDARD PREVIEW
(standards.iteh.ai)
ISO 16273:2020
https://standards.iteh.ai/catalog/standards/sist/9af7b6a6-6a4b-4622-8c55-95cfdf4960b9/iso-16273-2020

© ISO 2020 – All rights reserved

Introduction

This document has been developed to support the implementation of the International Code of Safety for High-Speed Craft (HSC code), Chapter 13, of the International Maritime Organisation (IMO), and the IMO performance standards for night vision equipment for high-speed craft in the IMO Resolution MSC.94 (72)

iTeh STANDARD PREVIEW
(standards.iteh.ai)
ISO 16273:2020
https://standards.iteh.ai/catalog/standards/sist/9af7b6a6-6a4b-4622-8c55-95cfdf4960b9/iso-16273-2020

© ISO 2020 – All rights reserved

iTeh STANDARD PREVIEW
(standards.iteh.ai)

ISO 16273:2020
https://standards.iteh.ai/catalog/standards/sist/9af7b6a6-6a4b-4622-8c55-95cfdf4960b9/iso-16273-2020

Ships and marine technology — Night vision equipment for high-speed craft — Operational and performance requirements, methods of testing and required test results

1 Scope

This document specifies operational and performance requirements and methods of testing for night vision equipment fitted to high-speed craft.

NOTE In this document, the text identical to IMO Resolution MSC.94 (72) is printed in italics; references to the paragraphs concerned in the IMO Resolution are given in brackets.

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 9335, *Optics and photonics — Optical transfer function — Principles and procedures of measurement*

iTeh STANDARD PREVIEW
(standards.iteh.ai)

ISO 15529, *Optics and photonics — Optical transfer function — Principles of measurement of modulation transfer function (MTF) of sampled imaging systems*

IEC 60945, *Maritime navigation and radiocommunication equipment and systems — General requirements — Methods of testing and required test results*

ISO 16273:2020
https://standards.iteh.ai/catalog/standards/sist/9af7b6a6-6a4b-4622-8c55-95c8f4960b9/iso-16273-2020

IEC 61162, *Maritime navigation and radiocommunication equipment and systems — Digital Interfaces*

IEC 62288:2014, *Maritime navigation and radiocommunication equipment and systems — Presentation of navigation-related information on shipborne navigational displays — General requirements, methods of testing and required test results*

IEC 62388:2013, *Maritime navigation and radiocommunication equipment and systems — Shipborne radar — Performance requirements, methods of testing and required test results*

IEC 62923, *Maritime navigation and radiocommunication equipment and systems — Bridge alert management (all parts)*

IMO Resolution A.694(17), *General requirements for shipborne radio equipment forming part of the global maritime distress and safety system (GMDSS) and for electronic navigational aids*

IMO Resolution MSC.94(72), *Performance standards for night vision equipment for high speed craft*

IMO Resolution MSC.191(79), *Performance standards for the presentation of navigation-related information on shipborne navigational displays*

IMO Resolution MSC.302(87), *Adoption of performance standards for Bridge Alert Management*

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

© ISO 2020 – All rights reserved

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

3.1
night vision equipment
technical fixed means enabling the position and aspect of objects above the water surface relative to one's own craft to be detected at night

[SOURCE: IMO MSC.94(72) 4]

3.2
high-speed craft
HSC
craft capable of a maximum speed in metres per second (m/s) equal to or exceeding $3{,}7V^{0{,}1667}$, where V is the displacement corresponding to the design waterline

[SOURCE: IMO HSC Code 2000]

3.3
test target for sea trials
target that simulates the real hazard of a surface object that can be found at sea such as, small unlit boats, floating logs, oil drums, containers, buoys, ice, hazardous waves and whales

[SOURCE: IMO MSC.94(72) 4]

3.4
lit vessel
vessel that, in addition to the standard navigation lights, has a row of five unshielded lamps with a luminous flux of 460 lm at 1 m horizontal spacing and 4 m above sea level

iTeh STANDARD PREVIEW
(standards.iteh.ai)

Note 1 to entry: This is equivalent to e.g. 21 W, 12 V.

ISO 16273:2020
https://standards.iteh.ai/catalog/standards/sist/9af7b6a6-6a4b-4622-8c55-95cfdf4960b9/iso-16273-2020

3.5
performance check
short functional test carried out during or after a technical test to confirm that the equipment operates

[SOURCE: IEC 60945:2002, 3.1.4]

3.6
performance check (EMC)
short functional test carried out during or after an EMC test to confirm that the equipment complies with the required immunity performance criteria

[SOURCE: IEC 60945:2002, 3.1.5]

3.7
performance test
measurement or a group of measurements carried out during or after a technical test to confirm that the equipment complies with selected parameters as defined in the equipment standard

[SOURCE: IEC 60945:2002, 3.1.6]

3.8
single operator action
procedure achieved by no more than one hard-key or soft-key action, excluding any necessary cursor movements, or voice actuation using programmed codes

[SOURCE: MSC.252(83), Appendix 1]

3.9
field of view
FoV
solid angle through which a detector with mounted optic is sensitive to electromagnetic radiation

© ISO 2020 – All rights reserved

3.10
instantaneous field of view
iFoV
angle subtended by a single detector element on the axis of the optical system

Note 1 to entry: iFoV is used as measure of the spatial resolution of a remote sensing imaging system.

4 Performance requirements

4.1 Functions and their availability

[IMO MSC.94(72), 5.1] *At night, night vision equipment* shall *be capable of detecting objects* at least each second *above the water's surface within a certain distance from one's own craft, and of displaying the information pictorially in real time,* at least each second*, to assist in collision avoidance and safe navigation.*

This requirement is fulfilled if the sea trials in 5.5 and the requirement in 4.4 are met.

4.2 Continuous operation

[IMO MSC.94(72), 5.2.1] *Night vision equipment on board HSC, while navigating at sea,* shall *be capable of continuous operation from after sunset until before sunrise. After the equipment has been switched on it* shall *be operational in less than 15 minutes.*

See 5.4.2.4.

iTeh STANDARD PREVIEW
(standards.iteh.ai)

4.3 Standard test target

[IMO MSC.94(72), 5.2.2] *The standard test target* shall *be a black metal target of such a size that when at least 50 % is immersed, 1,5 m long and 0,5 m high remains above the water at right angles to the desired direction of detection. Administration may use other smaller targets to reflect local conditions.*

ISO 16273:2020
https://standards.iteh.ai/catalog/standards/sist/9d7b6a6-6a4b-4622-8c55-95cfdf4960b9/iso-16273-2020

See 5.5.2 for more detailed specification of the standard test target.

4.4 Detection range

[IMO MSC.94(72), 5.2.3] *With the required field of view, the equipment* shall *detect the standard test target at a distance of not less than 600 m with a minimum probability of 90 %, when the target has been immersed in the sea for at least 24 hours under mean starlight conditions without clouds and without moon.*

See 5.4.3.2, 5.4.4.5 and 5.5.4.2.

4.5 Field of view

[IMO MSC.94(72), 5.2.4] *The required horizontal field of view* shall *be at least 20°, 10° on either side of the bow. The vertical field of view* shall *be at least 12° and* shall *be sufficient to enable the equipment to fulfill the performance requirements of MSC.94(72) as well as being able to see the horizon.*

Optionally other fields of view may be provided. Their selection shall *be made with a non-locking switch, which returns to the required field of view when released.*

See 5.4.2.5.

4.6 Pan and tilt ranges of the field of view

[IMO MSC.94(72), 5.2.5] *The axis of the field of view of the equipment* shall *be capable of being moved at least 20° horizontally to either side.*

© ISO 2020 – All rights reserved

The elevation axis of the field of view shall *be capable of being adjusted of at least 10° to compensate for the trim of the craft.*

See 5.4.2.6.

4.7 Speeds of panning of the field of view

[IMO MSC.94(72), 5.2.6] *By activation of a single control element, the axis of the field of view* shall *be capable of being returned automatically to the ahead position at a minimum angular speed of 30°/s. The system* shall *be capable of panning at a minimum angular speed of 30°/s.*

The minimum angular speed shall be at least 30°/s. The operational angular speed may be lower.

See 5.4.2.6.

4.8 Stabilisation of the field of view against the motions of the vessel

The imaging system shall not show a shift of more than the instantaneous field of view (iFoV) (e.g. 0,83 mrad) when looking onto a fixed onshore target under ship's movement at sea. Ship movement at sea as defined in 4.11.

See 5.2.3.

4.9 Heading marker indication

iTeh STANDARD PREVIEW
(standards.iteh.ai)

[IMO MSC.94(72), 5.2.7] *When inside the field of view, the graphical ahead mark of the craft* shall *be indicated on the display with an error not greater than ±1°.*

When the sensor/camera is orientated right ahead, the graphical heading marker shall be displayed in the centre with an error not greater than +/-1°.

ISO 16273:2020
https://standards.iteh.ai/catalog/standards/sist/9af7b6a6-6a4b-4622-8c55-93cfdf490b59/iso-16273-2020

When outside the field of view, a visual indication of relative bearing with an error not greater than ±1° shall *be provided.*

See 5.4.2.6.

4.10 Clear view

[IMO MSC.94(72), 5.2.9] *Arrangement* shall *be provided to ensure efficient cleaning of the sensor head/lens from the operating position. Administration may require some additional facilities such as de-icing.*

Essential cleaning of the sensor head and/or lens shall be performed before the use of the night vision equipment. During operation, mainly dried salt mist and spray can occur that shall be removed by a cleaning device to get back a clear view. The technical way how to achieve that result is left to the discretion of the manufacturer of the device.

See 5.4.2.7.

4.11 Roll and pitch

[IMO MSC.94(72), 5.2.8] *The performance of the night vision equipment* shall *be such that when the craft is rolling and/or pitching up to ±10°, the performance requirements in this* document shall *be complied with.*

See 5.2.3.

4.12 Optical interference

[IMO MSC.94(72), 5.2.10] *Measures* shall *be taken, to ensure that objects commonly encountered at sea and in ports* shall *not be displayed less clearly on the monitor of the night vision equipment because of dazzle effects, reflection, blooming, or any other effects due to the surroundings.*

 © ISO 2020 – All rights reserved

See 5.2.4.

4.13 Line of sight

Vibrations shall not disturb the created image for the operator.

See 5.2.5.

4.14 Controls and ergonomics

[IMO MSC.94(72), 6] *The night vision equipment* shall *be designed in accordance with sound ergonomic principles.*

The number of operational controls shall *be limited to the minimum required for operation.*

Whilst in operational mode, double functions of controls shall *be avoided on such controls as for pan, vertical trim, field of view and other essential functions.*

The functions of the individual operational controls shall *be clearly labelled.*

The operational functions of night vision equipment shall *be activated directly through the operational controls; menu-driven controls* shall *be avoided.*

The operational controls shall *be clearly identifiable in the dark. If illumination is used, the brightness* shall *be adjustable.*

iTeh STANDARD PREVIEW

The operational controls of night vision equipment shall *meet the requirements of IMO Resolution A.694(17) as well as applicable requirements of* IEC 60945 and IEC 60447.

(standards.iteh.ai)

4.15 Presentation of information

ISO 16273:2020
https://standards.iteh.ai/catalog/standards/sist/9af7b6a6-6a4b-4622-8c55-95cfdf4960b9/iso-16273-2020

[IMO MSC.94(72), 6.3] *the status of operation of the equipment* shall *be continuously displayed.*

The display shall *be non-dazzling and non-flickering. The display* shall *be capable of displaying a visible image of at least 180 mm in diagonal.*

The selected field of view, if more than one is provided, (see 4.5) shall *be continuously indicated at the operating position.*

The image shall be presented on the display, with the same aspect ratio as the sensors, as default (natural picture).

Any processing of the image on user demand is allowed as a temporary aid to enhance the detection of objects. The fact that any processing is in operation shall be permanently indicated by means next to the image. The navigation personnel shall be able to return to the unaltered image, only processed by an automatic gain control algorithm, in a one-handed single operator action. The latency period of the processing shall not exceed 250 ms. Unaltered means that only point operations which not consider the pixels neighbourhood, are applied to the image raw data, such as contrast and brightness enhancement or tone mapping.

Additional information may be displayed, but shall not mask, obscure or degrade essential information required for the display by its primary task as specified in this document.

The refresh rate for an optical system shall be at least 60 Hz.

The presentation of navigation-related information on navigational displays shall be in accordance with MSC.191(79) and IEC 62288.

See 5.4.2.2.

© ISO 2020 – All rights reserved