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

iTeh STANDARD PREVIEW
*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*
(standards.iteh.ai)

ISO 16273:2003

<https://standards.iteh.ai/catalog/standards/sist/2e6d1687-5d5e-485b-acf3-9c557a13dd1c/iso-16273-2003>

PDF disclaimer

This PDF file may contain embedded typefaces. In accordance with Adobe's licensing policy, this file may be printed or viewed but shall not be edited unless the typefaces which are embedded are licensed to and installed on the computer performing the editing. In downloading this file, parties accept therein the responsibility of not infringing Adobe's licensing policy. The ISO Central Secretariat accepts no liability in this area.

Adobe is a trademark of Adobe Systems Incorporated.

Details of the software products used to create this PDF file can be found in the General Info relative to the file; the PDF-creation parameters were optimized for printing. Every care has been taken to ensure that the file is suitable for use by ISO member bodies. In the unlikely event that a problem relating to it is found, please inform the Central Secretariat at the address given below.

iTeh STANDARD PREVIEW
(standards.iteh.ai)

ISO 16273:2003

<https://standards.iteh.ai/catalog/standards/sist/2e6d1687-5d5e-485b-acf3-9c557a13dd1c/iso-16273-2003>

© ISO 2003

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 ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

Published in Switzerland

Contents

Page

Foreword	iv
1 Scope	1
2 Normative references	1
3 Terms and definitions	1
4 General and operational requirements	2
5 General test conditions	7
6 Environmental tests	7
7 Laboratory tests	8
8 Sea trials	11
Annex A (informative) Range prediction calculation	14
Annex B (informative) Infrared illuminator, typical plots	16
Annex C (informative) Sea trial record	17
Bibliography	20

iTeh STANDARD PREVIEW
(standards.iteh.ai)

ISO 16273:2003

<https://standards.iteh.ai/catalog/standards/sist/2e6d1687-5d5e-485b-acf3-9c557a13dd1c/iso-16273-2003>

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 2.

The main task of technical committees is to prepare International Standards. 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 document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 16273 was prepared by Technical Committee ISO/TC 8, *Ships and marine technology*, Subcommittee SC 6, *Navigation*.

iTeh STANDARD PREVIEW (standards.iteh.ai)

ISO 16273:2003

<https://standards.iteh.ai/catalog/standards/sist/2e6d1687-5d5e-485b-acf3-9c557a13dd1c/iso-16273-2003>

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 International Standard applies to operational and performance requirements and methods of testing for night vision equipment fitted to high-speed craft in accordance with the International Code of Safety for High-Speed Craft (HSC code), Chapter 13, of the International Maritime Organisation (IMO) and the IMO performance standards MSC.94 (72) for night vision equipment for HSC.

All texts of this International Standard, whose wording is identical to that in IMO MSC.94 (72), are printed in italics and the resolution and paragraph numbers are indicated in brackets.

It is expected that both performance requirements and test procedures will need to be reviewed in the near future as data on candidate night vision systems are accumulated and correlated with performance.

iTeh STANDARD PREVIEW

2 Normative references (standards.iteh.ai)

The following referenced documents are indispensable for the application 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.

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

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

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*

International Code of Safety for High-Speed Craft (HSC Code)

STANAG 4349 (MAS/186-Land/4349, 19 June 1996)

3 Terms and definitions

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

3.1

night vision equipment

any 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

[IMO MSC.94 (72) 4]

3.2

high-speed craft

any craft to which the definition in chapter 1 of the HSC Code applies

[IMO MSC.94 (72) 4]

3.3

test target for sea trials

a 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

[IMO MSC.94 (72) 4]

3.4

lit vessel

a vessel that, in addition to the standard navigation lights, has a row of five 21 W, 12 V unshielded lamps at 1 m horizontal spacing and 4 m above sea level

4 General and operational requirements

4.1 Introduction

Requirements contained in this clause are requirements not taken up in other clauses and which cannot be verified by repeatable methods of measurement.

These requirements include the applicable general and operational requirements of IEC 60945.

The manufacturer shall declare compliance with these requirements and shall provide relevant documentation. The declarations, documentation and, where necessary, the equipment under test (EUT) shall be checked.

The manufacturer shall also declare the composition of the EUT and the category for durability and resistance to environmental conditions specified in IEC 60945 for each unit of the EUT.

4.2 Required functions and their availability (IMO MSC.94 (72) 5.1)

At night, night vision equipment shall be capable of detecting objects above the water's surface within a certain distance from one's own craft, and of displaying the information pictorially in real time, to assist in collision avoidance and safe navigation.

4.3 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.

4.4 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.

4.5 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.

4.6 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 this International Standard 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.

4.7 Pan and tilt ranges of the fields 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.

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.

4.8 Speeds of panning of the fields 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.

4.9 Heading marker indication (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 $\pm 1^\circ$.

When outside the field of view, a visual indication of relative bearing with an error not greater than $\pm 1^\circ$ shall be provided.

<https://standards.iteh.ai/catalog/standards/sist/2e6d1687-5d5e-485b-ac3-9c557a13dd1c/iso-16273-2003>

4.10 Roll or 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 $\pm 10^\circ$, the performance requirements in this International Standard shall be complied with.

4.11 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.

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.

4.13 Malfunctions, warnings, alarms and indications (IMO MSC.94 (72) 5.3)

Night vision equipment shall include a visual indication of any failure.

4.14 Software requirements (IMO MSC.94 (72) 5.4)

The operational characteristics of the software shall meet the following requirements in particular:

(IMO MSC.94 (72) 5.4.1.1) self-description of the functions implemented by means of software;

(IMO MSC.94 (72) 5.4.1.2) *display of user interface status; and*

(IMO MSC.94 (72) 5.4.1.3) *software protection against unauthorized changes.*

If certain functions of night vision equipment are implemented using software, such software shall meet the applicable requirements of IEC 60945.

If any software is used, the manufacturer shall provide a description of the functions implemented by means of software and state how the requirements have been complied with.

“Self-description of the functions implemented by means of software” means that the functions available through menus (or similar) rather than separate controls shall be clear from the menu description.

“User interface status” can be an indicator of which functions are operational.

“Software protection” can be a password or lockable cover.

4.15 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.

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.

4.16 Presentation of information (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 4.6) 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).

4.17 Durability and resistance to environmental conditions (IMO MSC.94 (72) 7.1)

Night vision equipment shall withstand the environmental conditions specified in IMO Resolution A.694 (17) and in IEC 60945. Provisions shall be made, if necessary, to protect the night vision equipment against high light conditions.

4.18 Electrical and electromagnetic interference (IMO MSC.94 (72) 7.2)

With respect to electrical and electromagnetic interference, night vision equipment shall meet the requirements of IMO Resolution A.694 (17) and IEC 60945.

4.19 Power supply (IMO MSC.94 (72) 7.3)

The power supply of night vision equipment shall meet the requirements of IMO Resolution A.694 (17) and IEC 60945.

4.20 Installation (IMO MSC.94 (72) 7.4)

Full installation instructions to meet the following requirements of 4.20 shall be included in the documentation (see 4.26).

The controls of night vision equipment shall be installed in the workstation for navigating and manoeuvring, within easy reach of the navigator.

The observation distance from a dedicated display shall not exceed 2,3 times the image diagonal (i.e. a dedicated night vision workstation).

For a general bridge display, the observation distance from the display shall not exceed 8 times the image diagonal, but shall be situated such that observation from a distance of 2,3 times the image diagonal is also possible.

The sensor of the night vision equipment shall be installed in such a way that:

- a) *the horizontal panning area required in 4.7 is free of blind sectors up to 30° on either side; and*
- b) *in the required field of view, in the direction right ahead, visibility of the water surface for the vertically tilted sensor is not reduced by more than two craft's lengths by the blind angle of own craft.*

Night vision equipment shall be installed in such a way that its operation and detection functions are not impaired by head wind and/or true wind up to 100 knots and roll and/or pitch angles up to $\pm 10^\circ$.

Its performance shall not be impaired by vibration occurring during normal craft's operation.

4.21 Maintenance (IMO MSC.94 (72) 7.5)

With respect to maintenance, night vision equipment shall meet the requirements of IMO Resolution A.694 (17) and IEC 60945. Where the manufacturer requires maintenance at specific periods, an operating hours meter shall be provided.

4.22 Interfacing (IMO MSC.94 (72) 8)

Interfaces with other radio and navigation equipment shall meet IEC 61162. A recognized international standard video output for image recording shall be provided.

4.23 Back up and fall back arrangements (IMO MSC.94 (72) 9)

In the event of failure of the pan-tilt device, the sensor shall be capable of being fixed in the ahead position while underway.

4.24 Safety precautions (IMO MSC.94 (72) 10)

The safety features of night vision equipment shall meet the requirements of IMO Resolution A.694 (17) and IEC 60945.

4.25 Marking and identification (IMO MSC.94 (72) 11)

Night vision equipment and any ancillary equipment shall be marked clearly and durably with the following data:

- identification of the manufacturer;
- equipment type number or model identification under which it was type tested;
- serial number of the unit; and
- magnetic compass safe distance.

Night vision equipment shall additionally be marked in accordance with the requirements of IMO Resolution A.694 (17) and IEC 60945.

4.26 Documentation (IMO MSC.94 (72) 12)

Night vision equipment shall be delivered complete with its technical documentation. Such documentation shall include the following information, if applicable:

General information:

- *manufacturer;*
- *type designation;*
- *general description of equipment; and*
- *ancillary equipment and description.*

iTeh STANDARD PREVIEW
(standards.iteh.ai)

ISO 16273:2003

Instructions for installation: <https://standards.iteh.ai/catalog/standards/sist/2e6d1687-5d5e-485b-acf3-9c557a13dd1c/iso-16273-2003>

- *general installation instructions;*
- *power supply (voltage, power consumption, frequency) and earthing information;*
- *identification of exposed or protected equipment.*

Operation of equipment:

- *description of functions, controls, display;*
- *description of start-up procedures;*
- *calibration of equipment and error messages;*
- *testing capabilities of equipment;*
- *description of software used and interfaces.*

Troubleshooting; maintenance and service:

- *special tools required, maintenance material and spare parts (e.g. fuses, spare bulbs);*
- *equipment care and maintenance on board HSC;*
- *available services.*

Documentation for night vision equipment shall also meet the requirements of IMO Resolution A.694 (17) and IEC 60945.

4.27 Environmental requirements

Each item which appears in this clause is a requirement from IMO Resolution A.694 (17) as detailed in IEC 60945 and for which a repeatable method of measurement has been defined in Clause 6.

5 General test conditions

5.1 General

Environmental and safety tests shall be carried out first, followed by laboratory tests and sea trials to verify whether the same EUT meets all technical requirements. Where electrical tests are required, they shall be carried out using the normal test voltage as specified in IEC 60945.

Requirements detailed in Clause 4 for which a specific test is not detailed, shall be confirmed by a visual check of the equipment or documentation. The manufacturer shall provide a full technical specification for the EUT.

5.2 Normal temperature, humidity and extreme test conditions

Test conditions shall comply with IEC 60945.

6 Environmental tests

6.1 General

Environmental tests are intended to assess the suitability of the construction of the equipment under test (EUT) for its intended physical conditions of use. After each environmental test and, if specified, also during the test, the EUT shall comply with the requirements of a performance check. No preconditioning of the equipment shall be necessary.

6.2 Range of environmental tests

6.2.1 Test according to IEC 60945

Night vision equipment shall, as far as applicable, meet the requirements and pass the tests according to IEC 60945.

6.2.2 Roll and pitch test

This test is intended to prove the ruggedness of the system under the ship motions of 4.10.

The EUT shall be mounted on a surface capable of producing a rolling cycle from $+10^\circ$ to -10° from the horizontal in 8 s. The EUT shall be subject to the rolling cycle for 30 min during which a functional performance check (6.3) shall be performed. The EUT functions shall continue to operate without degradation during the rolling cycle.

The test shall be repeated with the EUT positioned such that a pitching cycle of $\pm 10^\circ$ is produced.

6.2.3 Optical interference

The EUT shall meet the requirements of 4.12 when tested in accordance with 8.4.3.