
**Ships and marine technology —
Searchlights for high-speed craft**

*Navires et technologie maritime — Feux de recherche pour navires à
grande vitesse*

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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 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.

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Ships and marine technology — Searchlights for high-speed craft

1 Scope

This International Standard applies to searchlights fitted to high-speed craft in accordance with the International Code of Safety for High-Speed Craft [HSC Code, IMO-Resolution MSC.36 (63) Chapter 13].

Searchlights on board high-speed craft (HSC) facilitate the detection of other vessels, offshore structures, obstructions to shipping, floating objects and living things, shorelines, as well as fixed and floating sea marks and other aids to navigation, thus providing essential information to the navigator for safe navigation, collision avoidance and search and rescue of shipwrecked persons at sea.

2 Normative references

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.

ISO 719, *Glass — Hydrolytic resistance of glass grains at 98 °C — Method of test and classification*

ISO 10012, *Measurement management systems — Requirements for measurement processes and measuring equipment*

ISO/CIE 10527, *CIE standard colorimetric observers*

CIE Publication No. 15.2, *Colorimetry*

CIE Publication No. 70, *The measurement of absolute luminous intensity distributions*

IEC 60068-2-27, *Environmental testing — Part 2: Tests — Test Ea and guidance: Shock*

IEC 60092-101, *Electrical installations in ships — Part 101: Definitions and general requirements*

IEC 60092-201, *Electrical installations in ships — Part 201: System design — General*

IEC 60529, *Degrees of protection provided by enclosures (IP Code)*

IEC 60598-1, *Luminaires — Part 1: General requirements and tests*

IEC 60598-2-5, *Luminaires — Part 2: Particular requirements — Section 5: Floodlights*

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 A.813 (19), *General Requirements for Electromagnetic Compatibility (EMC) for all Electrical and Electronic Ship's Equipment*

IMO Resolution MSC.36 (63), *International Code of Safety for High-Speed Craft*

3 Terms and definitions

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

3.1

searchlights

locally fixed lights suitable for controlled transmission of defined light by focused light beams

3.2

high-speed craft

HSC

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

3.3

zero position of the optical light axis

position of the optical light axis of the searchlight parallel to the water surface pointing in the direction right ahead

3.4

switch-on time

period of time required for reaching 95 % of the required luminous intensity after the searchlights have been switched on

3.5

half-peak divergence

α_h

angular extent of all the radius vectors of the polar curve of luminous intensity in the specified plane having lengths greater than 50 % of the maximum

3.6

tenth-peak divergence

α_t

angular extent of all the radius vectors of the polar curve of luminous intensity in the specified plane having lengths greater than 10 % of the maximum

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4 Requirements

4.1 Required functions and their availability

At night, searchlights shall be capable of locating objects within a sufficient distance from one's own craft. The searchlights shall be provided with an electrical, hydraulic or pneumatic remote control for pan and tilt movement.

4.2 Permanent operation and life duration

Searchlights shall be suitable for permanent operation. When tested in accordance with 5.3, a life duration of the illuminant of at least 100 h shall be reached.

4.3 Luminous intensity

The luminous intensity in the focused position of searchlights shall be minimally 2×10^6 cd. This equals an illumination of 5,6 lx at a distance of 600 m with an atmospheric transmission of 0,8.

The luminous intensity of searchlights shall have its maximum in the centre of the luminous intensity distribution. With focus in any position, a homogenous luminous intensity distribution shall be ensured, i.e. the central spot area with at least 80 % of the maximum luminous intensity shall show no position with less than 80 % of the maximum luminous intensity.

The half-peak divergence α_h shall be between 3° and 8°, and the tenth-peak divergence α_t shall not exceed 14°. The half-peak divergence α_h may be smaller than 3° if focusing is possible during operation.

In case of a non-circular beam profile, the longer axis of the profile shall be orientated horizontally.

4.4 Chromaticity of the emitted light

The chromaticity of the emitted light of searchlights shall lie within corner coordinates in the International Commission on Illumination (CIE) chromaticity diagram, see Table 1.

Table 1 — Chromaticity coordinates

Chromaticity coordinates (corner coordinates)	<i>x</i>	0,452	0,310	0,310	0,443
	<i>y</i>	0,440	0,348	0,283	0,382

4.5 Switch-on time

The switch-on time of searchlights shall be max. 30 s.

3 s after the searchlights have been switched on, at least 70 % of the required luminous intensity shall be reached.

In case this requirement can only be reached from the stand-by modus, advice on this respect shall be included in the documentation, see Clause 7.

4.6 Pan and tilt ranges

The optical light axis of searchlights shall be capable of being panned at least 175° horizontally to either side and tilt min. 30° downward and min. 30° upward, starting from the zero position.

4.7 Pan and tilt speeds

The speeds of panning and tilting shall be variable in at least five different speeds in the required range.

- The minimum horizontal panning speed shall not be greater than 5°/s and the maximum horizontal panning speed shall not be smaller than 10°/s.
- The minimum vertical tilting speed shall not be greater than 0,5°/s and the maximum vertical tilting speed shall not be smaller than 5°/s.

4.8 Malfunctions, warnings, alarms and indications

The control unit of searchlights shall be fitted with an indication of the operational status and a visual indication of any failure of the searchlight. The remote control shall display the following status of the searchlight:

- stand-by, if applicable;
- on;
- fault.

Additional lights at the remote-control unit or the power supply box shall display which special part of the searchlight (for example, light source, power supply, remote control) caused a fault.

4.9 Ergonomic and operational controls

The operational controls of the searchlight shall be within easy reach from the conning position.

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

Double functions of operational controls shall be avoided. Joysticks are excluded from this requirement.

A set of operational controls shall just be used to operate only one searchlight.

If the operational controls are released by the operator, the searchlight shall remain in the last selected position and shall not be moved from this position, e.g. by wind or movement or vibration of the craft or any other influences.

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

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

The operational controls of searchlights shall meet the requirements of IMO Resolution A.694 (17) and the applicable requirements of IEC 60945.

4.10 Durability and resistance to environmental conditions

Searchlights shall be constructed in accordance with IEC 60598-1 and dimensioned in such a way that they will present no hazard to persons, in particular during operation and maintenance work. Searchlights shall be constructed in such a way that

- they can be easily cleaned inside, if applicable;
- only unbreakable and reusable gaskets are used between removable parts, as far as applicable;
- a degree of protection of at least IP 56 in accordance with IEC 60529 is reached;
- the accumulation of condensed water in the housing in hazardous quantities is avoided;
- in the case of light emission areas made of silicate glass, a type of glass of at least hydrolytic class IV in accordance with ISO 719 shall be used.

Illuminant holders shall be designed and manufactured in such a way that only the appropriate illuminant can be fitted and the illuminant can be easily replaced. Mounting of the illuminant within the searchlight in any wrong position shall not be possible. The illuminant shall be safely fitted in the searchlight.

In searchlights, only illuminants designed for and type-approved together with that particular type of searchlight shall be used.

At nominal voltage, the average lifetime of an illuminant when fitted to the searchlight should be at least 100 h.

The luminous intensity of the illuminant shall not be adjustable by any variable control.

The construction of searchlights shall be such as to assure that no disturbing reflection or refraction of light can occur and no light of a colour other than intended can be given out.

Searchlights and any accessories e.g. power-supply unit and controls, shall each be measured for their safe magnetic distance.

The materials used shall withstand the influences occurring during operation. With respect to durability and resistance to environmental conditions, searchlights shall meet the requirements specified in IMO Resolution

A.694 (17) and in the applicable requirements of IEC 60092-101 and IEC 60945, and shall comply with the vibration test in accordance with IEC 60945, with the deviations of test parameters in accordance with 5.4 and a shock test in accordance with 5.5.

4.11 Steadiness and ultimate behaviour of pane (light emitting areas)

The steadiness shall be in accordance with ISO 719, if applicable.

The required ultimate behaviour of the searchlight's pane, in case of destruction, shall meet the requirements specified in IEC 60598-2-5.

4.12 Electromagnetic compatibility (EMC)

With respect to electrical and electromagnetic compatibility, searchlights shall meet the requirements of IMO Resolutions A.694 (17) and A.813 (19) and IEC 60945.

4.13 Power supply

The power supply of searchlights shall meet the requirements of IMO Resolution A.694 (17) and IEC 60092-201.

4.14 Installation

Searchlights shall be installed in such a way that

- the emission sector of searchlights in the zero position of the optical light axis is free of obstructions,
- within the horizontal panning area of searchlights, in the sector reading 112,5° to either side, there are no obstructions with a core shadow bigger than 3°,
- two core shadows are separated by an unobstructed field of vision of at least 30°,
- in a sector from 112,5° to min. 175°, and from min. 185° to 247,5°, core shadows are kept to a minimum; inevitable core shadows covering more than 15° shall be clearly indicated on the respective operational controls,
- in the emission sector of searchlights, in the direction right ahead, visibility of the water surface for the vertically tilted searchlight is not reduced by more than two ship's lengths by the blind angle of one's own craft or 500 m, whichever is less.

With respect to installation, searchlights shall meet the requirements of IMO Resolution A.694 (17) and the applicable requirements of IEC 60598-1.

Searchlights shall be designed and mounted in such a way that their operational functions are not impaired by wind up to 100 kn and roll and/or pitch angles up to $\pm 10^\circ$.

Their light emission shall not be impaired by vibration occurring during normal operation of the craft.

4.15 Maintenance

With respect to maintenance, searchlights shall meet the requirements of IMO Resolution A.694 (17) and IEC 60598-1. The searchlight shall be accessible from a safe position and shall be capable of being opened by a person wearing heavy working gloves.