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FOREWORD

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International Standard IEC 62388 has been prepared by IEC technical committee 80: Maritime navigation and radiocommunication equipment and systems.

This standard replaces all the IEC 60936 (radar) and IEC 60872 (plotting) series of standards. Contents from the previous radar series (IEC 60936-1, IEC 60936-2, IEC 60936-3 and IEC/PAS 60936-5) and plotting series (IEC 60872-1, IEC 60872-2 and IEC 60872-3) of standards have been included as appropriate in this standard.

This standard supports the new IMO performance standards for shipborne radar, Resolution MSC.192(79) adopted by the IMO in December 2004. Resolution MSC.192(79) supersedes all previous IMO resolutions relating to radar and plotting, including IMO Resolutions A.278(VIII), A.477(XII) and MSC 64(67) Annex 4.

The text of this standard is based on the following documents:

FDIS	Report on voting
80/494/FDIS	80/504/RVD

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

The committee has decided that the contents of this publication will remain unchanged until the maintenance result date indicated on the IEC web site under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

A bilingual version of this publication may be issued at a later date.

MARITIME NAVIGATION AND RADIOCOMMUNICATION EQUIPMENT AND SYSTEMS –

Shipborne radar – Performance requirements, methods of testing and required test results

1 Scope

This International Standard specifies the minimum operational and performance requirements, methods of testing and required test results conforming to performance standards not inferior to those adopted by the IMO in Resolution MSC.192(79).

(MSC.192/2) *The radar installation, in addition to meeting the general requirements as set out in resolution A.694(17) and the related general standard,* IEC 60945*, should comply with the performance standards of* MSC.192(79). When a requirement of this standard is different from IEC 60945 the requirement in this standard takes precedence.

All text in this standard with wording identical to that in IMO resolution MSC.192(79) is printed in italics. Reference to MSC.192(79) is by the relevant requirement clause as indicated in brackets, for example (MSC.192/4.2.3). Some clauses from Resolution MSC.192(79) may be split and the requirements in this case are addressed separately.

(MSC.192/5) *The design and performance of the radar should be based on user requirements and up-to-date navigational technology. It should provide effective target detection within the safety-relevant environment surrounding own ship and should permit fast and easy situation evaluation.*

(MSC.192/1) *The radar equipment should assist in safe navigation and in avoiding collision by providing an indication, in relation to own ship, of the position of other surface craft, obstructions and hazards, navigation objects and shorelines. For this purpose, radar should provide the integration and display of radar video, target tracking information, positional data derived from own ship's position (EPFS) and geo referenced data.*

The integration and display of AIS information should be provided to complement radar. The capability of displaying selected parts of Electronic Navigation Charts (ENC) and other vector chart information may also be provided to aid navigation and for position monitoring. Radar is a technology that should be applied together with other sensor information applicable for the task in hand.

NOTE Radar is a system and its performance is a factor of all of its component parts. The type test should include the radar sensor, ancillary units and display, complete with its processing and presentation display. All of these component parts contribute to the requirements and approval to these radar standards. Other navigational systems and equipment that provide radar and/or target tracking functions, should comply with the relevant clauses of this standard according to the guidelines in Annex A. A navigation display or INS may be approved as part of a radar system when tested with the specific radar sensor and relevant ancillary units. Where the intended application for a navigation system is for collision avoidance, as a minimum requirement, the radar image should always be presented, together with the relevant functionality and performance as described in Annex A.

1.1 Purpose

(MSC.192/1) *The radar, when combined with other sensor, or reported information (for example AIS), should improve the safety of navigation by assisting in the efficient navigation of ships and protection of the environment by satisfying the following functional requirements:*

– *in coastal navigation and harbour approaches, by giving a clear indication of land and other fixed hazards;*

– *as a means to provide an enhanced traffic image and improved situation awareness;*

– *in a ship-to-ship mode for aiding collision avoidance of both detected and reported hazards;*

– *in the detection of small floating and fixed hazards, for collision avoidance and the safety of own ship; and*

– *in the detection of floating and fixed aids to navigation.*

1.2 Application of these standards

(MSC.192/2) *The Performance Standards defined by MSC.192(79)* shall *apply to all shipborne radar installations used in any configuration mandated by SOLAS independent of the type of ship, frequency band in use and the type of display, providing that no special requirements are specified in* Table 1 *and that additional requirements for specific classes of ship (in accordance with SOLAS Chapters V and X) are met.*

(MSC.192/2) *Close interaction between different navigation equipment and systems makes it essential to consider this standard in association with other relevant IMO* and IEC *standards.*

This standard applies to radar systems, navigation systems and navigation equipment which have the task of target detection and collision avoidance. Any equipment which combines these tasks and meets all of the requirements in this standard is regarded as a radar system. In support of the Collision Regulations, all available means shall be used to enhance the role of radar for safe navigation and collision avoidance. The usage of other sensors shall, where practical, observe the requirements of the standards associated with those sensors. This standard also provides guidelines and requirements for radar functionality on all navigational displays supporting the tasks of target detection, collision avoidance, general navigation and position referencing on the bridge of a ship.

The successful integration of radar with AIS, charts, databases and other sensors demands that the radar equipment is correctly set up with special attention to the critical alignment of heading(s), system index delay(s), CCRP offsets and gyro. Failure to align these parameters may cause unacceptable registration with other information and may detract from the purpose of integration. This standard has mandated requirements to provide for these alignments.

NOTE While X-band radar systems remain compatible with radar beacons, SARTs and radar enhancers, S-band systems are permitted to harness new radar technology which may not be compatible with those devices. All tests (or their equivalent) in this standard apply to both non-coherent (for example conventional-based radar) and coherent radar systems (for example pulse compression radar).

1.3 Equipment categories

This standard covers the testing of all SOLAS shipborne radar equipment. Individual equipment may be tested for a specific category of vessel. Table 1 provides a summary of the categories and basic differential capabilities for each category. The category should be indicated on the type label of the main radar electronics unit and on the related Certification of Test. Equipment approved for high speed applications should include a suffix H (for example CAT 1H) and equipment approved with a chart option should include a suffix C (for example CAT 1HC).

(MSC.192/5.3.1.1) *Recognising the high relative speeds possible between own ship and target, the equipment* should *be specified and approved as being suitable for classes of ship having normal (≤30 kn) or high (>30 kn) own ship speeds (100 kn and 140 kn relative speeds respectively).*

The additional characteristics for equipment qualified to be approved for HSC and/or for chart radar are identified in this standard. For example, HSC equipment should be compatible with own ship speeds of up to 70 kn, should be capable of tracking targets with a 140 kn relative speed and should operate between latitudes of 70 °N and 70 °S.

A chart radar should conform to all the requirements of Clause 11 in this standard. References are made to IEC 61174 (ECDIS) for specific and standalone chart functionality.

Table 1 – Performance requirements for categories of ship/craft for SOLAS V

	Category of ship/craft		
	CAT 3	**CAT 2**	**CAT 1**
Size of ship/craft	<500 gt	500 gt to <10 000 gt and HSC<10 000 gt	All ships/craft ≥10 000 gt
Minimum operational display area diameter	180 mm	250 mm	320 mm
Minimum display area	195 mm x 195 mm	270 mm x 270 mm	340 mm x 340 mm
Auto acquisition of targets	-	-	Yes
Minimum acquired radar target capacity	20	30	40
Minimum activated AIS target capacity	20	30	40
Minimum sleeping AIS target capacity	100	150	200
Trial manoeuvre	-	-	Yes
NOTE The processing capacity of AIS information should be in accordance with 10.5.2.			

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.

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

IEC 61162 (all parts), *Maritime navigation and radiocommunication equipment and systems – Digital interfaces*

IEC 61174, *Maritime navigation and radiocommunication equipment and systems – Electronic chart display and information systems (ECDIS) – Operational and performance requirements, methods of testing and required test results*

IEC 61966-4, *Multimedia systems and equipment – Colour measurement and management – Part 4: Equipment using liquid crystal display panels*

IEC 61996 (all parts), *Maritime navigation and radiocommunication equipment and systems – Shipborne voyage data recorder (VDR) – Performance requirements – Methods of testing and required test results*

ISO 9000, *Quality management systems – Fundamentals and vocabulary*

ISO 9241-8, *Ergonomic requirements for office work with visual display terminals (VDTs) – Part 8: Requirements for displayed colours*

ISO 9241-12, *Ergonomic requirements for office work with visual display terminals (VDTs) – Part 12: Presentation of information*

ISO 13406-2, *Ergonomic requirements for work with visual displays based on flat panels – Part 2: Ergonomic requirements for flat panel displays*

ISO 80416-4, *Basic principles for graphical symbols for use on equipment – Part 4: Guidelines for the adaptation of graphical symbols for use on screens and displays (icons)*

ITU-R Recommendation M.628-4:2006, *Technical characteristics for search and rescue radar transponders*

ITU-R Recomendation M.824-3:2007, *Technical parameters of radar beacons (racons)*

ITU-R Recommendation M.1176:1995, *Technical parameters of radar target enhancers*

IHO S-52:1996, *Specifications for chart content and display aspects of ECDIS*

IHO S-52 Appendix 1:1996, *Guidance on updating the ENC*

IHO S-52 Appendix 2:2004, *Colour and symbol specifications for ECDIS*

IMO SOLAS:1974, *International Convention for the Safety of Life at Sea, as amended*

IMO Resolution A.694(17):1991, *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.817(19):1995, *Performance standards for electronic chart display and information systems (ECDIS)* (as amended by MSC.64(67) Annex 5 and MSC.86(70) Annex 4)

IMO Resolution MSC.96(72), *Amendments to IMO Resolution A.824(19), Performance standards for devices to indicate speed and distance*

IMO Resolution MSC.112(73), *Revised performance standards for shipborne global positioning system (GPS) receiver equipment*

IMO Resolution MSC.191(79):2004, *Performance standards for the presentation of navigation-related information on shipborne navigational displays*

IMO Resolution MSC.192(72):2004, *Revised performance standards for radar equipment*

IMO SN/Circ.243:2004, *Guidelines for the presentation of navigation related symbols, terms and abbreviations*

CIE 15:2004, *Colorimetry*

VESA-2001-6:2001, *Flat Panel Display Measurements (FPDM)*