

INTERNATIONAL STANDARD



**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**



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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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

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This consolidated version of the official IEC Standard and its amendment has been prepared for user convenience.

IEC 62288 edition 3.1 contains the third edition (2021-12) [documents 80/1013/FDIS and 80/1017/RVD] and its amendment 1 (2024-11) [documents 80/1117/CDV and 80/1128/RVC].

In this Redline version, a vertical line in the margin shows where the technical content is modified by amendment 1. Additions are in green text, deletions are in strikethrough red text. A separate Final version with all changes accepted is available in this publication.

IEC 62288 has been prepared by IEC technical committee 80: Maritime navigation and radiocommunication equipment and systems. It is an International Standard.

This third edition cancels and replaces the second edition published in 2014. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

- a) Clause 4 has been revised to remove requirements for indications of alerts which are now given in IEC 62923-1;
- b) Clause 5 has been extensively revised to add new requirements for AIS, ASM and DSC presentation together with three new supporting annexes, Annex J, Annex K, Annex L;
- c) Annex A and Annex B have been revised to incorporate changes to IMO circular SN.1/Circ.243;
- d) Annex E has been revised to incorporate changes to IMO resolution MSC.191(79) and renamed as "Operational controls and logical grouping".
- e) two new annexes have been added, Annex H on operator actions and Annex I on default settings in support of IMO circular MSC.1/Circ.1609.

The text of this International Standard is based on the following documents:

Draft	Report on voting
80/1013/FDIS	80/1017/RVD

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

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/standardsdev/publications.

The committee has decided that the contents of this document and its amendment will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn, or
- revised.

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INTRODUCTION to Amendment 1

This amendment updates the interpretation of the bit encoding for reporting various cases of AtoN errors or failures to be compliant with the notes available in the IALA R-0126 Ed.2 published in December 2021. The amendment further corrects an inconsistency between Table L.1 of IEC 62288:2021 and Figure 4 section 4.8.4 of IALA Rec.R-0126:2021.

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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

1 Scope

This document specifies the general requirements, methods of testing, and required test results, for the presentation of navigation-related information on shipborne navigational displays in support of IMO resolutions MSC.191(79) as amended by MSC.466(101) in June 2019, and where applicable MSC.302(87).

This document also supports the guidelines included in the related IMO Circulars MSC.1/Circ.1609 on the standardization of user interface design for navigation equipment and SN.1/Circ.243 as revised in June 2019 on the presentation of navigation related symbols, terms and abbreviations.

This document also specifies the presentation of AIS data reports and the AIS Application Specific Messages defined for international use in IMO SN.1/Circ.289 and intended to be received by a ship for display onboard.

NOTE All text in this document whose wording is identical to text contained in an IMO document is printed in *italics*. Reference to the document is noted at the beginning of the paragraph. The notation contains a prefix referring to the document and a suffix with the paragraph number from the document (for example, (MSC191/1); (SN243/1), etc.).

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.

IEC 60945:2002, *Maritime navigation and radiocommunication equipment and systems – General requirements – Methods of testing and required test results*

IEC 61174, *Maritime navigation and radiocommunication equipment and systems – Electronic chart display and information system (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 62388, *Maritime navigation and radiocommunication equipment and systems – Shipborne radar – Performance requirements, methods of testing and required test results*

IEC 62923-1, *Maritime navigation and radiocommunication equipment and systems – Bridge alert management – Part 1: Operational and performance requirements, methods of testing and required test results*

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

IMO, *Seafarers' Training, Certification and Watchkeeping Code (STCW Code)*

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

IMO MSC.192(79):2004, *Performance standards for radar equipment*

IMO MSC.232(82):2006, *Revised performance standards for electronic chart display and information systems (ECDIS)*

IMO SN.1/Circ.243/Rev.2:2019+Corr.1, *Guidelines for the presentation of navigation related symbols, terms and abbreviations*

IMO SN.1/Circ.289:2010, *Guidance on the use of AIS application-specific messages*

IMO MSC.302(87):2010, *Performance standards for bridge alert management (BAM)*

IMO MSC.1/Circ.1609:2019, *Guidelines for the standardization of user interface design for navigation equipment*

IMO A.1021(26):2009, *Code on Alerts and Indications*

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

3 Terms, definitions and abbreviated terms

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

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

3.1 Terms and definitions

3.1.1

activated AIS target

(MSC191/A) *target representing the automatic or manual activation of a sleeping target for the display of additional graphically presented information*

3.1.2

automatic identification system

AIS

system which complies with the requirements set forth in Annex 3 of IMO Resolution MSC.74(69)

3.1.3**AIS Application Specific Message****AIS ASM**

AIS Messages 6, 8, 25 or 26, excluding AIS synthetic targets

Note 1 to entry: This document specifically addresses only AIS ASM defined for international use in IMO SN.1/Circ.289 and that are intended to be received by a ship for display onboard. Various Administrations have implemented application specific messages not defined in IMO SN.1/Circ.289, but are catalogued by IALA at <https://www.iala-aism.org/asm/> which, if appropriate, may be displayed using the same symbols and rules in this document.

Note 2 to entry: See Annex J.

3.1.4**AIS ASM object**

information constructed from one or more AIS ASMs

Note 1 to entry: See Annex J.

3.1.5**AIS data report**

information derived from AIS Aids to Navigation (AtoN), AIS SAR Aircraft and AIS Base Stations reports

Note 1 to entry: See Annex J.

3.1.6**AIS locating devices**

AIS-SART, EPIRB-AIS and AIS MOB stations that transmit AIS Messages 1 and 14 using the burst transmissions as described in ITU-R M.1371

Note 1 to entry: AIS MOB means information derived from a DSC Class M device capable of reporting using AIS burst transmissions.

3.1.7**AIS safety related messages**

AIS Messages 12 or 14

3.1.8**AIS synthetic target**

object generated from an AIS Message 6, 8, 25 or 26 when FI=17 VTS-generated/synthetic target; or when FI=22 or FI=23 Area Notice with "Sub-areas" set to "0" circle or point and "Area shape" set to "0" and "Radius" set to "0" and "Notice Description" set to a value in range from 64 to 74

Note 1 to entry: AIS Synthetic targets are generated by shore-based information systems (for example VTS) and transmitted through AIS base stations.

Note 2 to entry: "Notice Description" set to a value in the range from 64 to 73 represents vessel distress situations and set to a value 74 represents person distress situation. These messages may or may not have an associated GMDSS Distress Alert.

3.1.9**AIS target****reported AIS target**

(MSC191/A) *target generated from an AIS position report message* from a ship, vessel or craft, based on AIS Message 1, 2, 3 or 18

Note 1 to entry: The MMSI number within AIS Messages 1, 2, 3 or 18 identifies the source as a ship, vessel or craft in accordance with ITU-R M.585-8:2019, Annex 1, Sections 1 and 5.

Note 2 to entry: AIS Class A uses Messages 1, 2 and 3. AIS Class B uses Message 18.

3.1.10

alarm

(MSC.302/A) *condition requiring immediate attention and action by the bridge team, to maintain the safe navigation of the ship*

Note 1 to entry: An alarm is a *high-priority alert*.

3.1.11

alert

(MSC.302/A) *announcement of abnormal situations and conditions requiring attention.*

Note 1 to entry: Alerts are divided in four priorities: emergency alarms, alarms, warnings and cautions. An alert provides information about a defined state change in connection with information about how to announce this event in a defined way to the system and the operator.

3.1.12

associated target

(MSC191/A) *target simultaneously representing a tracked radar target and a reported AIS target having similar parameters (for example, position, course, speed, etc.) and which comply with an association algorithm*

3.1.13

brilliance

adjustment of luminance of a display for ambient light

EXAMPLE Control of backlight for LCD (liquid crystal display).

3.1.14

caution

(MSC.302/A) *awareness of a condition which does not warrant an alarm or warning condition, but still requires attention out of the ordinary consideration of the situation or of given information*

Note 1 to entry: A caution is the *lowest priority of an alert*.

3.1.15

consistent common reference point

CCRP

(MSC191/A) *location on own ship, to which all horizontal measurements such as own ship position, heading, and target range, bearing, relative course, relative speed, closest point of approach (CPA) or time to closest point of approach (TCPA) are referenced, typically the conning position of the ship*

Note 1 to entry: An alternative location (or multiple locations) may be used, as necessary, where clearly indicated or distinctively obvious, for example, the origin of the reference axis of the ship.

3.1.16

composite presentation

integrated presentation that is derived from the simultaneous display of information from two or more navigational systems or from other pieces of equipment

3.1.17

dangerous target

(MSC191/A) *tracked radar or reported AIS target with a predicted CPA and TCPA that violates values preset by the user*

Note 1 to entry: The respective target is marked by a "dangerous target" symbol.

3.1.18**dead reckoned position****DR**

position extrapolated from the last accepted position update, based on present course and speed, and updated on a time interval

3.1.19**display base**

(MSC191/A) *level of information which cannot be removed from the ECDIS display, consisting of information which is required at all times in all geographic areas and all circumstances*

Note 1 to entry: It is not intended to be sufficient for safe navigation.

3.1.20**display equipment**

device capable of representing information visually

3.1.21**doubtful integrity**

state when integrity cannot be verified

3.1.22**DSC received call**

information generated from a received DSC message

Note 1 to entry: DSC received call may be available from all DSC-compliant equipment classes which are able to provide information through a standardized interface.

3.1.23**electronic chart display and information system****ECDIS**

system which complies with the requirements set forth in IMO Resolution MSC.232(82)

3.1.24**electronic chart information**

electronic chart database(s)

EXAMPLE ENC.

3.1.25**electronic navigational chart****ENC**

(MSC191/A) *database standardised as to content, structure and format according to IHO S-57 and its Appendix B.1 and issued by, or on the authority of, a Government*

3.1.26**emergency alarm**

(MSC.302/A) *alarms which indicate immediate danger to human life or to the ship and its machinery exists and require immediate action*

Note 1 to entry: An emergency alarm is the *highest priority of an alert*.

3.1.27**estimated position****EP**

position extrapolated from the last accepted position update, based on present course and speed (STW), including effects of wind, tide, current, and updated on a time interval

3.1.28

fix

position of own ship determined, without reference to any former position

3.1.29

heading

(MSC191/A) horizontal *direction in which the bow of a ship is actually pointing* at any instant, *expressed as an angular displacement from north*

3.1.30

icon

graphical symbol with a particular meaning used to convey information independent of language

Note 1 to entry: Icons may be used for visual identification or reinforcement of a textual description, to invoke a function, or to open an object when selected with the cursor.

3.1.31

important indication

(MSC191/A) *marking of an operational status of displayed information which needs special attention, for example, information with low integrity or invalid information*

Note 1 to entry: The important indication is not part of alert classification.

3.1.32

indication

display of regular information and conditions, not part of alert management

3.1.33

integrated navigation system

INS

system which complies with the requirements set forth in IMO Resolution MSC.252(83) as amended by IMO Resolution MSC.452(99)

3.1.34

integrity

property of information as being within the specified accuracy in a timely, complete and unambiguous manner

3.1.35

line of position

LOP

plotted line on which own ship is located determined by observation or measurement of the range or bearing to an aid to navigation or other charted element

3.1.36

lost target

(MSC191/A) tracked radar or reported *target* for which the system is no longer receiving *valid position data*

Note 1 to entry: The target is *represented* by a "lost target" symbol.

3.1.37

maritime safety information

MSI

(SOLAS IV/2) *navigational and meteorological warnings, meteorological forecasts and other urgent safety-related messages broadcast to ships*

Note 1 to entry: MSI is promulgated using NAVTEX and EGC services (see IMO MSC.468(101)).

3.1.38**menu**

area of the display that is allocated to a structured list of options for the selection and entry of operational parameters, data and commands

3.1.39**multifunction display**

single visual display unit that can present, either simultaneously or through a series of selectable pages, information from multiple systems or equipment

Note 1 to entry: A multifunction display may typically be part of an INS (for example, providing dedicated presentation modes conforming to both radar and ECDIS presentation requirements), and may replace their individual display units.

3.1.40**operational display area**

(MSC191/A) *area of the display used to graphically present electronic chart and/or radar information, excluding the user dialogue area*

Note 1 to entry: *On the chart display this is the area of the chart presentation. On the radar display this is the area encompassing the radar video image.*

3.1.41**past positions**

(MSC191/A) *time-spaced marks on the past track of own ship, or a tracked radar or reported AIS target*

3.1.42**permanent**

property of information as existing for a long time (or forever) without change

3.1.43**persistent**

property of information as existing continuously

3.1.44**radar**

system which complies with the requirements set forth in IMO Resolution MSC.192(79)

3.1.45**radar echo**

returned radar signal (i.e. "paint") appearing in the radar video image

3.1.46**radar video image**

set of displayed information constructed from radar echoes processed, for example by anti-clutter means and other tools

3.1.47**readily available**

<information> directly accessible

Note 1 to entry: For example, in a top-level menu, from a screen function, or an icon, etc.

3.1.48**selected target**

(MSC191/A) *target selected manually or automatically for the display of detailed alphanumeric data, information and text in a separate user dialogue area*

Note 1 to entry: *The target is represented by a "selected target" symbol.*

3.1.49

simple operator action

(MSC252/A1) *procedure achieved by no more than two hard-key or soft-key actions, excluding any necessary cursor movements, or voice actuation using programmed codes or equivalent alternative means*

3.1.50

single operator action

(MSC252/A1) *procedure achieved by no more than one hard-key or soft-key action, excluding any necessary cursor movements, or voice actuation using programmed codes*

3.1.51

sleeping AIS target

(MSC191/A) *AIS target indicating the presence of a vessel equipped with AIS in a certain location*

Note 1 to entry: *The target is represented by a "sleeping target" symbol indicating the vessel's orientation. No additional information is presented until the AIS target is activated.*

3.1.52

standard display

(MSC191/A) *level of information that should be shown when a chart is first displayed on ECDIS*

Note 1 to entry: *The level of the information it provides for route planning or route monitoring may be modified by the user according to the user's needs.*

3.1.53

target tracking system

system which complies with the requirements set forth in IMO Resolution MSC.192(79)

3.1.54

task-at-hand

specific navigation-related activity performed by a user

EXAMPLE Route planning, route monitoring, target tracking, collision avoidance.

3.1.55

tracked radar target

object, fixed or moving, which is tracked by a radar or target tracking function

3.1.56

trial manoeuvre

(MSC191/A) *facility used to assist the user to perform a simulated manoeuvre for navigation and collision avoidance purposes, by displaying the predicted future status of all tracked radar and reported AIS targets as a result of the simulated manoeuvres*

3.1.57

user-added electronic chart information

electronic chart information manually entered by the user for presentation

EXAMPLE Navigational notes, safety zones of interest, local notices to mariners.

3.1.58

user-configured presentation

(MSC191/A) *auxiliary presentation configured by the user for a specific task-at-hand*

Note 1 to entry: *The presentation may include radar and/or electronic chart information, in combination with other navigational or ship related data.*

3.1.59**user dialogue area**

(MSC191/A) *area of the display consisting of data fields and/or menus that is allocated to the interactive presentation and entry or selection of operational parameters, data, information, text and commands mainly in alphanumeric form*

3.1.60**validity**

property of information as conforming to specified criteria, and the marking of such information as being "valid" or "invalid" (i.e. "good" or "no good") for its intended use

3.1.61**warning**

(MSC.302/A) *alert for condition requiring immediate attention, but no immediate action by the bridge team*

Note 1 to entry: *Warnings are presented for precautionary reasons to make the bridge team aware of changed conditions which are not immediately hazardous, but may become so if no action is taken.*

3.2 Abbreviated terms

DAC designated area code

FI function identifier

MID maritime identity digits

VTs vessel traffic services

4 General requirements for all displays on the bridge of a ship**4.1 Relationship to IMO standards**

(MSC191/1) IMO resolution MSC.191(79) *harmonizes the requirements for the presentation of navigation-related information on the bridge of a ship to ensure that all navigational displays adopt a consistent human machine interface philosophy and implementation.*

(MSC191/1) IMO resolution MSC.191(79) *supplements and, in the case of a conflict, takes priority over, the presentation requirements of the individual performance standards adopted by the IMO for relevant navigational systems and equipment and covers the presentation of navigation-related information by equipment for which Performance Standards have not been adopted by the IMO.*

This document supplements and, in the case of a conflict, takes priority over, the presentation requirements of the individual testing standards for relevant navigational systems and equipment and covers the presentation of navigation-related information by equipment for which testing standards are not available.

NOTE 1 Individual testing standards are, for example, standards for specific equipment published by IEC or ISO. An example of equipment without a testing standard at the time of publishing of this document is navigation lights control.

(MSC302/3.6) *In case of conflict with alert requirements of existing performance standards, the present Performance standards (MSC.302(87)) will take precedence.*

NOTE 2 In case of conflict for alert presentation related issues, the priority of IMO performance standards is from the highest MSC.302(87), MSC.252(83), MSC.191(79), after which all performance standards are equal.

(MSC191/2) IMO resolution MSC.191(79) as amended by IMO resolution MSC.466(101) *specifies the presentation of navigational information on the bridge of a ship, including the consistent use of navigational terms, abbreviations, colours and symbols, as well as other presentation characteristics.*

(MSC191/2) IMO resolution MSC.191(79) *also addresses the presentation of information related to specific navigational tasks by recognising user selected presentations in addition to presentations required by the relevant individual performance standards adopted by the IMO.*

This document further addresses the guidelines for the presentation of navigation-related symbols, terms and abbreviations in Safety of Navigation circular SN/Circ.243.

(MSC191/3) This document *is applicable to any display equipment associated with the navigational systems and equipment for which individual performance standards have been adopted by the IMO.* It addresses the stand-alone displays for radar, ECDIS, multifunction displays and composite presentations that integrate information derived from two or more systems. This document *also addresses display equipment associated with navigational systems and equipment for which individual performance standards have not been adopted by the IMO.*

(MSC191/3) *The general principles* and the physical characteristics specified in Clause 4 and Clause 7, respectively, of this document *are applicable to all displays on the bridge of a ship.*

Some requirements set forth in MSC.191(79) duplicate requirements set forth in other IMO documents or in the IEC standards further specifying the methods of test and required test results for those requirements (for example, IEC 60945, IEC 61174, IEC 61993-2, IEC 62388, etc.). Where this document duplicates a requirement in another standard, the method(s) of test for that requirement may refer to the other standard. Manufacturers may offer relevant test data from compliance tests to other standards as evidence of compliance with appropriate tests of this document.

AIS messages are defined in ITU-R M.1371. The IMO performance standards for Presentation and Radar use the term "AIS targets" and "reported targets" for targets received by AIS messages and use the term "AIS information" for information related to these AIS targets.

NOTE 3 The word "target" as used in "radar target", "AIS target" and "reported target" derives from the original development of radar for gunnery control.

The IMO performance standards for Integrated Navigation System (INS) refers to the following types of AIS messages:

- AIS targets;
- AIS reports of AtoNs;
- AIS safety related and binary messages;
- Application Specific Messages (ASM).

This document refers to the following types of AIS messages (see Annex K):

- AIS targets;
- AIS data reports;
- AIS locating devices;
- AIS synthetic targets;
- AIS safety related messages;
- AIS ASM.

This document uses the following terms for the concept that IMO refers to as "AIS targets" and "reported targets":

- AIS targets;
- AIS data reports;
- AIS locating devices;

- AIS synthetic targets.

IMO use the term "AIS report of AtoNs" for the concept referred to as:

- "AIS AtoNs" in this document.

NOTE Additional technical guidance on AIS ASM can be found in IMO SN.1/Circ.289.

The additional guidance on display and dialogue design in IMO MSC/Circ.982 is referenced in Annex C.

4.2 Application of IEC 60945

4.2.1 Remark

If display equipment is permitted to be monochrome, then the colour-related requirements specified in 4.5.1, 4.7.1, 4.7.2, 4.7.3 and 4.8.2 will not apply.

4.2.2 General requirements

4.2.2.1 Requirement

(MSC191/3) *In addition to the general requirements set forth in IMO Resolution A.694(17) and further specified in IEC 60945, display equipment shall meet the requirements set forth in IMO Resolution MSC.191(79) and further specified in this document, as applicable.*

4.2.2.2 Methods of test and required results

See Annex D for guidance in the application of IEC 60945 for testing.

4.3 Arrangement of information

4.3.1 Consistency of layout and logical grouping

4.3.1.1 Requirement

(MSC191/5.1.1 as amended by MSC.466) *The presentation of information shall be consistent within the user interface with respect to screen layout and arrangement of information, for example, with respect to concepts, terminology, labelling and interaction paradigms used across the application and from screen to screen and/or from page to page. Data and control functions shall be logically grouped according to their function or the task-at-hand, see Annex E. Clause E.2 defines groups of related navigational information. Priority information essential to the task-at-hand shall be identified for each application (for example, radar, ECDIS, etc.), permanently or persistently displayed, as appropriate for the application, and presented to the user in a prominent manner by, for example, use of position (for example, screen location), size and colour.*

(MSC/Circ.1609/Appendix 3/1) *Clause E.2 defines groups of related navigational information that shall be displayed together on the user interface, to enable the user to quickly locate and react to essential navigation information, if available on the screen. Logical grouping in Clause E.2 applies to radar equipment, ECDIS and minimum INS functions. Logical grouping in Clause E.2 may be applied to other electronic navigation equipment and navigation sensors where applicable, to improve standardization and usability.*

(MSC/Circ.1609/Appendix 3/2) *Clause E.2 does not specify where the groups of information should appear on the screen, or the order in which the individual information elements should be grouped. The groups of related navigational information presented on the user interface are not limited to the information listed in Clause E.2. The groups in Clause E.2 may be extended by associated information. These groupings apply to both mandatory and non-mandatory information. Within an individual group, it is not required to display all information, only to group it, if displayed.*

4.3.1.2 Methods of test and required results

The methods of test and the required results are as follows:

- a) confirm by analytical evaluation that the arrangement, logical grouping, operation and identification of controls, screen displays and indications are in accordance with Annex E and IEC 60945:2002, 4.2.1.2 through 4.2.1.5;
- b) confirm by analytical evaluation that the concepts, terminology, labelling and interaction paradigms, screen layout and arrangement of information is consistent from screen to screen and/or page to page;
- c) confirm by analytical evaluation that priority information essential to the task-at-hand is identified and permanently or persistently displayed in a prominent manner, as appropriate, for each application.

4.3.2 Consistent presentation of information

4.3.2.1 Requirement

(MSC191/5.1.2) *The presentation of information shall be consistent with respect to:*

- numerical *values* (for example, position, speed, distance, time, etc.);
- *units*;
- *meaning* of information (for example, using the terms and abbreviations in Annex B);
- *sources* of information (for example, using the terms and abbreviations in Annex B);
- *validity* of information (see also 4.8.1 and 4.8.2); and
- *integrity* of information, if available (see also 4.8.1 and 4.8.2).

(See also IEC 60945:2002, 4.2.1.5)

4.3.2.2 Methods of test and required results

Confirm by observation that numerical values and their units, the meaning and source(s) of information, and the validity and integrity of information are presented in a consistent manner.

4.3.3 Separation of operational display area

4.3.3.1 Requirement

(MSC191/5.1.3) *The presentation of information shall be clearly separated into one or more operational display areas (for example radar, chart) and one or more user dialogue areas (for example, menus, data, control functions).*

4.3.3.2 Methods of test and required results

Confirm by observation that the presentation is clearly separated into one or more operational display areas and one or more user dialogue areas.

4.4 Readability

4.4.1 Readability under all ambient light conditions

4.4.1.1 Requirement

(MSC191/5.2.1) *The presentation of alphanumeric data, text, symbols and other graphical information (for example, chart information, radar echoes or a radar video image, etc.) shall support readability from typical user positions (i.e. with respect to reading distance) under all ambient light conditions likely to be experienced on the bridge of a ship (for example, day, dusk and night), and with due consideration to the night vision of the officer of the watch. (See also 4.5.1 and 7.2.1)*

Table 1 characterizes light levels for the ambient light conditions day, dusk and night.

Table 1 – Ambient light conditions

Ambient condition	Light level
Day	200 cd/m ² ± 50 %
Dusk	10 cd/m ² ± 50 %
Night	Darkness (i.e. where the display is the predominant light source)
NOTE 1 Natural daylight is preferred for the day and dusk conditions.	
NOTE 2 The adjustment of the appropriate ambient light conditions for calibrated monitors, for example to display charted information, is described in G.1.3 d).	

NOTE 1 It is possible the white background used in the "Day" colour table provided in the IHO ECDIS Presentation Library does not support readability under all light conditions and is a risk to safety of navigation for some navigational systems and equipment, including radar. Readability can be achieved by using the black background in the "Dusk" or "Night" colour tables provided in the IHO ECDIS Presentation Library and adjusting brightness and contrast, if provided, for use under all light conditions.

Display equipment shall provide a luminance of at least 85 cd/m² measured at the centre of the display when set to the maximum brightness setting. The white luminance level of the display shall be adjustable down to 1 cd/m² ± 20 % and may be extinguishable below that point.

If provided, dimming below 0,8 cd/m² as white level shall continue to ensure readability of alerts (alarms, warnings and cautions) while readability of all other items is not required.

NOTE 2 General requirements for illumination are described in IEC 60945.

Transflective and reflective displays shall provide adjustable self-illumination suitable for all ambient light conditions likely to be experienced on the bridge of a ship (day, dusk and night) and with due consideration to the night vision of the officer of the watch. It shall be adjustable to produce display luminance at least from 1 cd/m² to 5 cd/m² under night conditions.

The luminance across the operational display area shall not have a variance of more than 30 % from the brightest point to the dimmest point.

NOTE 3 Variance is determined by the equation:

$$1 - \left(\frac{L_{\min}}{L_{\max}} \right)$$

where

$L_{\min}$ is the minimum luminance;

$L_{\max}$ is the maximum luminance measured across the operational display area, or the entire screen depending on the application.

It shall be possible to display alphanumeric data, text, symbols (see 4.6) and other graphical information using a lighter foreground (for instance character, symbol, etc.) against a dark background of high contrast, emitting as little light as possible at night. The brightest elements of the presentation shall be restricted to points and thin lines.

If display equipment is intended to present symbols for charted information (see 4.6.2), it shall provide a means or method for the user to verify that the colour black is visually distinguishable against a background set to dark grey and vice-versa.

NOTE 4 The IHO ECDIS Presentation Library provides "black-adjust" symbols BKAJ1 and BKAJ2, for the colours black and grey, respectively.

If display equipment is not intended to present symbols for charted information (see 4.6.2), it shall maintain that any colours used are visually distinguishable against the background.

NOTE 5 Visually distinguishable is at least luminance ratio 1:2 when using instrumental verification.

It is important to avoid affecting the night vision of the officer of the watch by excessive glow from displays on the bridge at night. The display shall be capable of providing a contrast of 100:1 between the 1 cd/m² white level and the black background.

NOTE 6 The white level can be created using a standardized method (i.e. RGB values or the CIE 1931 colour coordinates (x, y and L) for white) specified by the manufacturer or, if no manufacturer specification is available, using the RGB values 255, 255, 255.

4.4.1.2 Methods of test and required results

Set up the display equipment for measurements of luminance, contrast and colour according to the guidelines of IEC 61966-4 or the VESA Flat Panel Display Measurement (FPDM), see VESA-2001-6. Before measurements are taken, power up the display equipment and allow it to stabilize for the period of time specified by the manufacturer, as follows.

- a) Confirm by observation at the manufacturer's recommended viewing distance that alphanumeric data, text, symbols and other graphical information including alerts are readable under the ambient light conditions described in Table 1.
- b) For direct view displays (for example CRT (cathode ray tube), LCD (liquid crystal display) with backlight, etc.), confirm by measurement using a test image with a white square at the centre of the operational display area (to be provided by the manufacturer) that the brightness can be varied from a minimum level of at most 1 cd/m² ± 20 % to a maximum level of at least 85 cd/m² measured under dark condition. Confirm by measurement that the values for brightness used for the setup are stable after the stabilisation period defined by the manufacturer. Confirm by measurement in the night ambient condition that the contrast ratio between the 1 cd/m² white level and the black background is 100:1, minimum.
- c) For transfective and reflective displays, confirm by measurement using a test image with a white square at the centre of the operational display area (to be provided by the manufacturer) that the brightness can be adjustable at least from 1 cd/m² to 5 cd/m² under conditions of night ambient illumination to a maximum level of at least 85 cd/m² under conditions of daylight ambient illumination. Confirm by measurement that the values for brightness used for the setup are stable after the stabilisation period defined by the manufacturer. Confirm by measurement in the night ambient condition that the contrast ratio between the 1 cd/m² white level and the black background is 100:1, minimum. The ambient illumination levels shall be as specified in Table 1.

NOTE This test image is not generated internally by the display equipment.

- d) Confirm by observation that alphanumeric data, text, symbols and other graphical information including alerts can be presented using a lighter foreground against a dark background.
- e) Confirm by measurement that, when the display equipment is set to maximum brightness, the luminance does not vary across the operational display area by more than 30 % from the brightest point to the dimmest point.
- f) Confirm by observation that the brightest elements of the presentation in the night ambient light condition described in Table 1 are points and thin lines.
- g) Where display equipment is intended to present symbols for charted information, confirm by observation for each ambient light condition that the user can verify that the colour black is visually distinguishable against a background set to dark grey, and vice-versa.
- h) Where display equipment is not intended to present symbols for charted information, confirm by observation for each ambient light condition that any colours used are visually distinguishable against background.

- i) If dimming below $0,8 \text{ cd/m}^2$ as white level is provided, then confirm by observation after 10 min adaptation period to night ambient light condition by the observer that at least the alerts (alarms, warnings, cautions) are readable and different alert levels are distinguishable from each other.

4.4.2 Legibility of alphanumeric data and text

4.4.2.1 Requirement

(MSC191/5.2.2) *Alphanumeric data and text shall be presented using a clearly legible non-italic, sans-serif font. The font size shall be appropriate for the viewing distance from user positions (i.e. with respect to reading distance and viewing angles) likely to be experienced on the bridge of a ship.*

The character height in millimetres shall be not less than 3,5 times the nominal viewing distance in metres. The manufacturer's documentation shall identify the nominal viewing distance for the display equipment.

4.4.2.2 Methods of test and required results

The methods of test and the required results are as follows:

- confirm by observation that alphanumeric data and text is presented using non-italic, sans-serif font;
- confirm by measurement that the character height (i.e. the distance between the top and bottom edges of the smallest capital letter used in the presentation) in millimetres is not less than 3,5 times the nominal viewing distance in metres;
- confirm by inspection of manufacturer's documentation that the nominal viewing distance for the display equipment is identified in the manufacturer's documentation.

4.4.3 Presentation of text and icons

4.4.3.1 Requirement

(MSC191/5.2.3 as amended by MSC.466) *Text shall be presented using simple unambiguous language that is easy to understand (for example, standard marine terminology or text that provides clear meaning by its context). Navigational terms and abbreviations shall be presented using the nomenclature set forth in Annex B and Clause E.3.*

(MSC191/5.2.4 as amended by MSC.466) *When icons are used, their purpose shall be intuitively recognized by appearance, placement, and grouping as defined in Clause E.3.*

Circ.1609/Appendix 2 and Clause E.3 identify commonly-used functions on navigation equipment and for each function specifies the associated terminology, abbreviation and (where appropriate) icons to achieve consistency of presentation across navigation equipment.

For the functions listed in Clause E.3, the following applies.

- (Circ.1609/Appendix 2/2) *Where icons, terms and/or abbreviations are used, they shall meet the requirements of Clause E.3. Where a standard term, abbreviation, or icon is not available, another icon, term or abbreviation may be used, but these shall not conflict with those listed in Clause E.3.*
- (Circ.1609/Appendix 2/3) *The icons specified may indicate a status, may execute a specific function (hot key), or may provide access to a group of related functions (shortcut).*
- (Circ.1609/Appendix 2/4) *Only the shape of the icon is specified; Clause E.3 does not specify a colour scheme for icons, except for the icons depicted in colour in Table E.6 which shall follow the IHO colour scheme or similar.*

- d) (Circ.1609/Appendix 2/5) *Where appropriate and practical, a brief explanation of the purpose of an icon shall be easily obtainable by the user. This functionality shall be able to be turned off easily by the user.*

Icons used for the presentation of alerts shall be presented according to Annex F.

4.4.3.2 Methods of test and required results

The methods of test and the required results for text are as follows:

- a) confirm by analytical evaluation that text is presented using simple unambiguous language;
- b) confirm by observation that navigational terms and abbreviations are presented using the nomenclature in Annex B and in Clause E.3;
- c) confirm by inspection of documented evidence that other terminology or abbreviations, if used, are explained in the operator's manual and do not conflict with those listed in Clause E.3.

The methods of test and the required results for icons are as follows:

- d) for icons not specified in Clause E.3 or Annex F, confirm by analytical evaluation that icons and their purpose can be intuitively recognized by appearance, placement, and grouping and that these icons do not conflict with those in Clause E.3;
- e) confirm by observation that shape of icons used for data and control function are presented according to Clause E.3;
- f) confirm by observation that colours of icons specified in Table E.6 follows the IHO colour scheme or similar;
- g) confirm by observation that icons used for the presentation of alerts are presented according to Annex F (see also 5.6.1.2).

4.5 Colours and intensity

4.5.1 Discrimination of colours – Requirement

(MSC191/5.3.1) *The colours used for the presentation of alphanumeric data, text, symbols and other graphical information shall provide sufficient contrast for discrimination and identification against the background under all ambient light conditions likely to be experienced on the bridge of a ship (for example, day, dusk and night) and with due consideration to the night vision of the officer of the watch.*

(MSC191/5.3.2) *The colours and brightness shall take into account the ambient light conditions of day, dusk and night. The presentation shall support night viewing by showing lighter foreground information on a dark non-reflecting background.*

(MSC191/5.3.3) *The background colour and contrast shall be chosen to allow displayed information to be easily discriminated without degrading the colour coding aspects of the presentation.*

Display equipment may use a range of tones of basic colours, provided they are identifiable and visually distinguishable from each other. Colours used for the presentation of information in the user dialogue areas shall not detract from the presentation of information in the operational display area.

If display equipment is intended to present symbols for charted information, it shall use colours that comply with or are based upon the colours specified in the relevant IHO standards, for example the IHO ECDIS Presentation Library in IHO S-52 and its Appendices, or an equivalent set of colour tables, as far as practical.

NOTE It is possible the white background used in the "Day" colour table provided in the IHO ECDIS Presentation Library does not support readability under all light conditions and is a risk to safety of navigation for some navigational systems and equipment, including radar. Readability can be achieved by using the black background in the "Dusk" or "Night" colour tables provided in the IHO ECDIS Presentation Library and adjusting brightness and contrast, if provided, for use under all light conditions.

4.5.2 Methods of test and required results

The person conducting this test shall have passed the minimum colour vision and acuity tests required for users by IMO STCW Code Part B and have adapted to night viewing for 10 min before checking the night display.

- a) Confirm by observation that the colours used for the presentation of alphanumeric data, text, symbols and other graphical information provide sufficient contrast for identification and discrimination against the background under the ambient light conditions described in Table 1.
- b) Confirm by observation that the colours used for the presentation of alphanumeric data, text, symbols and other graphical information support night viewing by showing lighter foreground information on a dark non-reflecting background.
- c) Confirm by observation that the colours used for the presentation of alphanumeric data, text, symbols and other graphical information are identifiable and visually distinguishable from each other.
- d) Confirm by observation that the colours used in the user dialogue areas do not detract from the presentation of information in the operational display area.
- e) Where display equipment is intended to present symbols for charted information, confirm by analytical evaluation that the colours used conform to the IHO specified colours in the IHO S-52 ECDIS Presentation Library, or equivalent, as far as practical (see Clause G.1 for additional guidance).

4.6 Symbols

4.6.1 Operational information

4.6.1.1 Requirement

(MSC191/5.4.1) *Symbols used for the presentation of operational information* other than chart information shall comply with or be based upon the symbols set forth in Annex A.

(SN-Circ.243/1/3) *Where a standard symbol is not available, another symbol may be used, but this symbol shall not conflict with the symbols listed in Annex A or in the IHO S-52 ECDIS presentation library.* (For additional guidance, see also ISO 80416-4.)

Colours used for the presentation of operational information shall be discriminated from the colours used for the presentation of the radar image, target trails, additional processed radar information and electronic chart information.

For symbols for which the size is not specified by this document, the following applies: A symbol shall subtend at least 5 mm/m (17 min of arc) at the nominal viewing distance. Where accurate colour identification of a symbol is required by an individual equipment standard, then, in the absence of size requirements in that standard, the symbol shall subtend at least 8,7 mm/m (30 min of arc) at the nominal viewing distance. The use of spectrally extreme blue ($v' < 0,2$) shall be avoided for images subtending less than 35 mm/m (2° of arc) of viewing distance.

Annex A specifies standardized symbols including the size at a viewing distance of 1 m. Where the manufacturer declares a different viewing distance, the symbol size shall be measured according to the ratio to a viewing distance (e.g. a symbol of 5 mm at 1 m viewing distance shall be 7,5 mm if the declared viewing distance is 1,5 m).

4.6.1.2 Methods of test and required results

The methods of test and the required results are as follows:

- a) confirm by inspection of documented evidence that the symbols used to present operational information are presented in accordance with Annex A;
- b) confirm by measurement that the largest dimension of the symbol is at least 5 mm/m (17 min of arc) at the nominal viewing distance, and includes at least 16 pixels;
- c) where accurate colour identification is required for a symbol, confirm by measurement that the largest dimension of the symbol is at least 8,7 mm/m (30 min of arc) at the nominal viewing distance, and includes at least 29 pixels;

4.6.2 Electronic chart information

4.6.2.1 Requirement

(MSC191/5.4.2) *Symbols used for the presentation of charted information shall comply with relevant IHO standard*, for example, the IHO ECDIS Presentation Library in IHO S-52 and its Appendices, or an equivalent symbol set, as far as practical.

NOTE It is possible some symbols provided in the IHO ECDIS Presentation Library are not suitable for the display of electronic chart information on radar or in a composite presentation based upon radar. IHO S-52 and its Appendices allow minor deviations to symbology. It provides a framework and guidelines for chart symbolization from which manufacturers can derive a customized symbol set.

If symbols that deviate from the IHO S-52 ECDIS Presentation Library are used for the presentation of any chart information, then they shall:

- be legible;
- be certain and unambiguous in their meaning;
- be of sufficient size to support the nominal viewing distance (see also 4.4.2);
- have the same general shape as IHO S-52 ECDIS Presentation Library symbols used for the same or similar purpose(s).

Symbols added to the ECDIS Presentation Library shall not be confused with IHO S-52 ECDIS Presentation Library symbols.

4.6.2.2 Methods of test and required results

The methods of test and the required results are as follows:

- a) confirm by inspection of documented evidence that the symbols used to present charted information are presented in accordance with relevant IHO standards, for example IHO S-52 and its Appendices;
- b) where symbols deviate from the IHO S-52 ECDIS Presentation Library, confirm by observation that they:
 - 1) are legible;
 - 2) are certain and unambiguous in their meaning;
 - 3) are of sufficient size to support the nominal viewing distance;
 - 4) have the same general shape as IHO S-52 ECDIS Presentation Library symbols used for the same or similar purposes;
- c) confirm by observation that symbols added to the ECDIS Presentation Library cannot be confused with IHO S-52 ECDIS Presentation Library symbols.

4.7 Colour coding

4.7.1 Colour coding for discrimination

4.7.1.1 Requirement

(MSC191/5.5.1) If *colour coding is used for discrimination or conspicuousness of alphanumeric text, symbols and other graphical information all colours in each colour table shall clearly differ from one another* (see also 4.5.1).

4.7.1.2 Methods of test and required results

Confirm by observation that the colours within each colour table clearly differ from one another.

4.7.2 Colour coding of information

4.7.2.1 Requirement

(MSC191/5.5.2) If *colour coding is used*, then *the colour red shall be used for the coding of alert related information* for alarm and emergency alarm conditions unless otherwise specified by the IMO (for example in Tables 7.1.1 and 7.1.2 of the IMO A.1021(26) Code on Alerts and Indications).

If colour coding is used and if the colour red is used for other purposes than for the coding of alert related information for alarm and emergency alarm conditions, its purpose (e.g. for the indication of port vs starboard, colour of a buoy, colour of a light, etc.) shall be sufficiently clear.

4.7.2.2 Methods of test and required results

If colour coding is used, confirm by inspection of documented evidence or by observation that the colour red is used to indicate an alarm or emergency alarm condition unless otherwise specified by the IMO or unless the purpose is sufficiently clear.

4.7.3 Colour coding in combination with other attributes

4.7.3.1 Requirement

(MSC191/5.5.3). If *colour coding is used it shall be used in combination with other symbol attributes, such as size, shape and orientation*.

A specific implementation shall not rely solely on a single saturated colour. If the display equipment technology relies on the separate transmission of primary colours, the presentation of alerts shall be visible and identifiable even after the failure of any one primary colour input to the display.

4.7.3.2 Methods of test and required results

The methods of test and the required results are as follows:

- confirm by inspection of documented evidence or by observation that the colour coding is always combined with another symbol attribute;
- where the display equipment technology relies on the separate transmission of primary colours, confirm by observation that alerts remain identifiable even after transmission of each of the primary colours is disabled one at a time.

4.7.4 Flashing of information

4.7.4.1 Requirement

(MSC191/5.5.4) *Flashing of information shall be reserved for indicating the state of unacknowledged alerts*.

4.7.4.2 Methods of test and required results

Confirm by observation that flashing of information is only used for unacknowledged alerts.

4.8 Integrity marking

4.8.1 Indication of source, validity and integrity status

4.8.1.1 Requirement

(MSC191/5.6.1) *The source, validity, and where possible, the integrity of information shall be indicated. Invalid information or information with low integrity shall be clearly marked qualitatively and/or quantitatively (see important indication). Invalid information or information with low integrity may be quantitatively indicated by displaying absolute or percentage values.*

4.8.1.2 Methods of test and required results

The methods of test and the required results are as follows:

- a) confirm by observation that the source of information can be indicated;
- b) confirm by observation that the validity of information is indicated;
- c) confirm by observation that the integrity of information is indicated, where available. Where integrity is indicated quantitatively, confirm by observation that either absolute values or percentage values are displayed.

4.8.2 Colour coding of validity and integrity

4.8.2.1 Requirement

(MSC191/5.6.2) *If colour coding is used, then information with low or doubtful integrity shall be qualitatively marked by using the colour as defined in Table 2, and invalid information shall be qualitatively marked by using the colour as defined in Table 2.*

4.8.2.2 Methods of test and required results

If colour coding is used, the methods of test and the required results are as follows:

- a) confirm by observation that the colour as defined in Table 2 is used to indicate information with low or doubtful integrity;
- b) confirm by observation that the colour as defined in Table 2 is used to indicate invalid information.

4.8.3 Indication of presentation failure

4.8.3.1 Requirement

(MSC191/5.6.3) *In many cases, information on the display does not change frequently enough to make presentation failure immediately obvious to the user. In order to show that the screen is being refreshed, a means or method shall be provided to immediately make the user aware of a presentation failure on an operational display (for example, "picture freeze").*

A conspicuous periodically time-varying element shall be provided as a prominent indication of normal screen refresh (for example two alternating dots, etc.).

4.8.3.2 Methods of test and required results

Confirm by observation that a conspicuous periodically time-varying indication is provided in all presentation modes.

4.9 Alerts and indications

4.9.1 Operational status

4.9.1.1 Requirement

(MSC191/5.7.1) *The operational status of information (indications) shall be indicated as in Table 2 unless otherwise specified by the IMO (for example in Tables 7.1.1 and 7.1.2 of the Code on Alerts and Indications, 2009).*

For alerts, the equipment shall comply with IEC 62923-1.

Table 2 – Operational status of indications

Status	Visual indication	Audible signal
<i>Invalid information</i>	<i>Red</i>	<i>Silence</i>
<i>Information with low integrity</i>	<i>Yellow</i>	<i>Silence</i>
<i>Important Indications</i>	<i>Yellow</i>	<i>Silence</i>
<i>Indication</i>	<i>No special requirement</i>	<i>Silence</i>
<i>Normal state</i>	<i>Optionally green</i>	<i>Silence</i>

4.9.1.2 Method of test and required results

Confirm by inspection of documented evidence that indications are presented in accordance with Table 2 unless otherwise specified by the IMO and that the equipment complies with IEC 62923-1.

4.9.2 List of alerts

See IEC 62923-1 for the requirements and tests regarding the list of active alerts.

NOTE Resolution MSC.302 and derived IEC 62923-1 have superseded the requirement: (MSC191/5.7.2).

4.9.3 Alert related information from multiple sources

See IEC 62923-1 for the requirements and tests.

NOTE Resolution MSC.302 and derived IEC 62923-1 have superseded the requirement: (MSC191/5.7.3).

4.9.4 Speech output for alarms and warnings

See IEC 62923-1 for the requirements and tests.

4.10 Presentation mode

4.10.1 Requirement

(MSC191/5.8) *If displays are capable of presenting information in different modes, then there shall be a clear indication of the modes in use, for example:*

- *orientation* (north-up, course-up, head-up);
- *stabilisation* (ground-stabilised, sea-stabilised);
- *motion* (true, relative); *and*
- *chart projection* (Mercator, gnomonic, etc.).

The indication of chart projection is only required when electronic chart information is presented. It can be provided to the user on request.

4.10.2 Methods of test and required results

Confirm by observation that the presentation modes in use are clearly indicated.

4.11 User manuals, instructions and reference guides

4.11.1 Requirement

(MSC191/5.9) *The user manual and instructions and reference guides shall be available in the English language at least. The user manual or reference guide shall include a list of all terms, abbreviations, symbols, icons and their explanations presented by the equipment. (See also Annex A, Annex B and Annex E.)*

4.11.2 Methods of test and required results

The methods of test and the required results are as follows:

- a) confirm by observation that user manual, instructions and reference guide are available in the English language;
- b) confirm by inspection of documented evidence that the user manual and/or reference guide includes a list of all terms, abbreviations, symbols, icons and their explanations used by the system.

5 Presentation of operational information

5.1 Application

The provisions of Clause 5 are applicable to displays on the bridge of a ship that provide functionality as described in 5.2 to 5.20.

5.2 Presentation of own ship information

5.2.1 Graphical representation of own ship – Requirement

(MSC191/6.1.1) *When a graphical representation of own ship is provided, it shall be possible for the user to select either a true scaled ship's outline or a simplified symbol as set forth in Annex A. The size (length) of the ship's true scaled outline or the simplified symbol in the graphical presentation shall be the true scale size of the ship or 6 mm, at a nominal viewing distance of 1 m, whichever is greater.*

The manufacturer should adjust the symbol sizes to properly account for the nominal viewing distance of the display equipment.

Display equipment may (unless stipulated as mandatory in an equipment standard) provide the capability to automatically switch from the ship's true scaled outline to the simplified symbol when the beam of own ship's true scale outline is less than 3 mm at the nominal viewing distance, and vice versa. The true scaled outline shall not be used when the heading is not known in a gyro/THD-stabilized mode. The user shall always have the capability to select the simplified symbol in lieu of the scaled ship's outline.

(MSC191/6.1.2) *A heading line, and where appropriate a velocity vector, shall be associated with own ship symbol and shall originate at the position of the consistent common reference point (CCRP) as set forth in Annex A.*

The combination of the heading line and beam line (the minimised symbol) may be used as an alternative to the simplified symbol and may be selectable as such. Display equipment may provide the capability to automatically switch from the ship's true scaled outline to the heading and beam line when the beam of own ship's true scale outline is less than 3 mm at the nominal viewing distance, and vice versa.

5.2.2 Methods of test and required results

Where display equipment provides a graphical representation of own ship:

- a) confirm by observation that the system provides a ship's true scaled outline and a simplified symbol in accordance with Annex A;
- b) confirm by observation that the display equipment provides the user with the capability to select the representation of own ship as either the ship's true scaled outline or the simplified symbol;
- c) confirm by measurement that the size of the ship's outline is correct for the scale of the display;
- d) confirm by observation that the simplified symbol is automatically selected when the beam of the ship's true scaled outline is less than 3 mm, and vice versa;
- e) confirm by observation that the display equipment provides a heading line in accordance with Annex A;
- f) confirm by observation that the display equipment provides a velocity vector in accordance with Annex A.

Note that the minimised symbol may be used as alternative to the simplified symbol.

5.3 Presentation of chart information

5.3.1 Alteration of chart information

5.3.1.1 Requirement

It shall not be possible to alter the electronic chart information, except by update.

5.3.1.2 Methods of test and required results

Confirm by observation that it is not possible to alter the electronic chart information.

5.3.2 Colours and symbols for charted information

5.3.2.1 Requirement

(MSC191/6.2.1) *The presentation of official electronic charted information that is issued by, or on the authority of a government authorized hydrographic office, or other relevant government institution or agency (for example, ENC), shall comply with the relevant IHO standards, for example, colours and symbols specified for the IHO ECDIS Presentation Library in IHO S-52 and its Appendices, or an equivalent colour and symbol set, as far as is practicable.*

(MSC191/6.2.2) *The presentation of proprietary electronic chart information shall comply with relevant IHO standards, as far as practical, for example, be based upon the colours and symbols specified for the IHO ECDIS Presentation Library in IHO S-52 and its Appendices, or an equivalent colour and symbol set. There shall be a clear indication when the presentation is not in accordance with IHO standards.*

(MSC191/6.2.3) *The presentation of user-added electronic chart information shall comply with the relevant IHO standards, as far as practical, for example, be based upon the colours and symbols specified for the IHO ECDIS Presentation Library in IHO S-52 and its Appendices, or an equivalent colour and symbol set.*

NOTE It is possible some colours and symbols provided in the IHO ECDIS Presentation Library or otherwise specified by IHO in S-52 and its Appendices are not suitable for the display of electronic chart information on radar or in a composite presentation based upon radar. IHO S-52 and its Appendices allow minor deviations to symbology. It provides a framework and guidelines for chart symbolization from which manufacturers can derive a customized symbol set.

(MSC191/6.2.4) *If electronic chart information derived from different scales appears in the presentation, the scale boundary shall be clearly indicated as defined in the relevant IHO standards, for example, IHO ECDIS Presentation Library in IHO S-52 and its Appendices.*

5.3.2.2 Methods of test and required results

The methods of test and the required results are as follows:

- a) confirm by observation that the presentation of official and user-added electronic charted information, as applicable, is in accordance with 5.3.2.1 and 4.5.1;
- b) confirm by observation that the presentation of proprietary electronic charted information, as applicable, is either in accordance with 5.3.2.1 and 4.5.1 or that an indication is provided;
- c) when electronic chart information derived from different scales (for example, adjacent ENC cells) is displayed, confirm by observation that a scale boundary is presented between the scales.

5.4 Presentation of radar information

5.4.1 Radar video images

5.4.1.1 Requirement

(MSC191/6.3.1) *Radar video images shall be displayed by using a basic colour that provides optimum contrast. Radar echoes shall be clearly visible when presented on top of a chart background. The relative strength of radar echoes may be differentiated by tones of the same basic colour. The colours may be different for operation under different ambient light conditions (day, dusk and night) likely to be experienced on the bridge of a ship, and with due consideration to the night vision of the officer of the watch.*

Additional processed radar information that is not a part of the radar video image may be discriminated from the radar video by tones of the basic colour used to present the image. Alternatively, it may be differentiated by tones of other basic colours.

For radar displays, a dark non-reflecting background shall be used. The colour used for the radar image shall provide contrast against the background and shall be clearly visible when presented over a chart background.

NOTE 1 It is possible the "Day" table based on a white background included in the colour tables specified by IHO and provided in IHO ECDIS Presentation Library does not support readability under daylight conditions and can be a risk to safety of navigation for some navigational systems and equipment, including radar. Readability under daylight conditions can be achieved by using the black background in the "Dusk" or "Night" colour tables provided in IHO ECDIS Presentation Library and adjusting brightness and contrast, if provided.

If the colour red is used for the radar video image, then it shall be distinguishable from other uses of the colour red, for example, alarms including dangerous targets.

If electronic chart information overlays radar information (i.e. a radar video image), or a radar image overlays chart information, then the overlay may be displayed as transparent or opaque. If a transparent overlay is used, then it may be variable so that the underlying information is visible through the overlay. If an opaque chart overlay is used, then the colour fill of area objects shall be excluded. Optionally, the colour fill of point objects may also be excluded. In either case, the background of the radar image shall be the same basic colour as the chart's water surfaces.

NOTE 2 If display equipment provides facilities for the overlay of radar information that are independent of a shipborne radar system (for example, by a separate radar scan converter), then the facilities are described in the relevant clauses of IEC 62388.

5.4.1.2 Methods of test and required results

The methods of test and the required results are as follows:

- a) confirm by observation, under each of the ambient light conditions described in Table 1, that radar information is presented using a contrasting colour against the background and that the background shall be dark for radar displays;
- b) confirm by observation that radar information is clearly visible when presented on top of a chart background for the ambient light conditions described in Table 1;
- c) if the colour red is used for the radar video image, confirm by observation that it is distinguishable from other uses of the colour red, for example, alarms including dangerous targets.

5.4.2 Target trails

5.4.2.1 Requirement

(MSC191/6.3.2) If display equipment provides *target trails*, then they shall be *distinguishable from radar echoes and clearly visible under all ambient light conditions* (day, dusk and night) likely to be experienced on the bridge of a ship, and with due consideration to the night vision of the officer of the watch. Target trails may be differentiated by tones of the basic colour used for the radar video image. Alternatively, they may be distinguished by tones of another basic colour.

If display equipment provides target trails, then there shall be an indication of trail time and motion stabilisation *mode*.

5.4.2.2 Methods of test and required results

Where target trails are provided:

- a) confirm by observation that they are distinguishable from radar echoes and clearly visible under the ambient light conditions described in Table 1;
- b) confirm by observation that the trail time and motion stabilization mode are indicated.

5.5 Presentation of target information

5.5.1 Providing target information

5.5.1.1 Requirement

(MSC191/6.4.1.1) *Target information may be provided by a radar target tracking system and/or by the AIS.*

A radar target tracking system detects and tracks radar targets. Other navigational systems may provide remote presentation of tracked radar targets. These systems shall present reported radar targets in accordance with Annex A.

NOTE If display equipment provides facilities for radar target detection and tracking that are independent of a shipborne radar system, then the facilities are described in the relevant clauses of IEC 62388.

Any navigational system or equipment may provide remote presentation of reported AIS targets. These systems shall present reported AIS targets in accordance with Annex A.

Navigational system or equipment may receive information of AIS targets via an interface from a radar and receive information of AIS targets from an AIS. AIS target information from these sources shall be combined using the MMSI of each AIS target to avoid duplication of AIS targets.

NOTE Radar can report AIS targets using TTD and TLB sentence. The MMSI value included in the TLB sentence is the basis for the combination process of both radar and AIS as sources of AIS targets.

An AIS target may be repeated (see 5.5.4.1). In such case, the presentation shall be as for reported AIS target in accordance with Annex A.

5.5.1.2 Methods of test and required results

The methods of test and the required results are as follows:

- a) where display equipment provides the capability to connect to a radar target tracking system, confirm by observation that the presentation is in accordance with Annex A;
- b) where display equipment provides the capability to connect to an AIS: confirm by observation that the presentation is in accordance with Annex A;
- c) where display equipment provides the possibility to receive AIS targets both via an interface from a radar and from an AIS, use a radar simulation arrangement and an AIS simulator to provide AIS target information from both sources and confirm by observation that AIS target information has been combined from both sources to avoid duplication of AIS targets.

5.5.2 Consistent user interface for target information

5.5.2.1 Requirement

(MSC191/6.4.1.3) *As far as practical, the user interface and data format for operating and presenting tracked radar target information and reported AIS target information shall be consistent.*

5.5.2.2 Methods of test and required results

Confirm by observation that the presentation of tracked radar target information and reported AIS target information is consistent.

5.5.3 Indication of exceeding target capacity

5.5.3.1 Requirement

(MSC191/6.4.2.1) *There shall be an indication when the target tracking and/or reported target processing/display capacity is about to be exceeded unless otherwise specified in individual equipment standards (for example as a caution).*

(MSC191/6.4.2.2) *There shall be an indication when the target tracking and/or reported target processing/display capacity have been exceeded unless otherwise specified in individual equipment standards (for example as a warning).*

Target tracking means the capability of a target tracking system to track targets. Reported targets means targets reported by AIS. The manufacturer shall declare the processing and display capacity of the equipment separately for tracked and reported targets (i.e. 4 values of capacity).

NOTE A definition of minimum target capacities is given in IEC 62388.

Processing capacity means the number of targets that it is possible to process simultaneously by the equipment. Display capacity means the number of targets that it is possible to display at same time. Processing capacity may be higher than display capacity. If the manufacturer declared processing capacity is higher than the manufacturer declared display capacity, there shall be separate indications, or alerts, if specified by individual equipment standards, for exceeding the display and processing capacities.

NOTE Equipment can provide functionality to select or filter displayed targets. This can lead to a situation in which processing capacity is about to be exceeded or exceeded while the display capacity is not.

The user manual shall describe the operational consequences of the processing and displaying of current and new targets in the event that the capacity for processing or displaying has been reached and further targets occur.

5.5.3.2 Methods of test and required results

Confirm by inspection of manufacturer documentation that the processing and display capacity of the equipment are declared separately for tracked and reported targets (i.e. 4 values of capacity).

Then there are two methods of test depending on the capability of the equipment.

- a) Where display equipment provides the capability to connect to a radar target tracking system:
 - 1) confirm by observation that it provides an indication, or an alert (e.g. a caution) if specified by an individual equipment standard, that the tracked radar target display capacity is about to be exceeded, for example, when the number of tracked radar targets presented exceeds 95 % of the display capacity;
 - 2) confirm by observation that it provides an indication, or an alert (e.g. a warning) if specified by an individual equipment standard, that the tracked radar target display capacity has been exceeded when the number of tracked radar targets presented exceeds 100 % of the display capacity;
 - 3) if processing capacity is higher than display capacity, confirm by observation that it provides an indication, or an alert (e.g. a caution) if specified by an individual equipment standard, that the tracked radar target processing capacity is about to be exceeded, for example, when the number of tracked radar targets processed exceeds 95 % of the processing capacity;
 - 4) if processing capacity is higher than display capacity, confirm by observation that it provides an indication, or an alert (e.g. a warning) if specified by an individual equipment standard, that the tracked radar target processing capacity has been exceeded when the number of tracked radar targets processed exceeds 100 % of the processing capacity.
- b) Where display equipment provides the capability to connect to an AIS:
 - 1) confirm by observation that it provides an indication, or an alert (e.g. a caution) if specified by an individual equipment standard, that the reported AIS target display capacity is about to be exceeded, for example, when the number of reported AIS targets presented exceeds 95 % of the display capacity;
 - 2) confirm by observation that it provides an indication, or an alert (e.g. a warning) if specified by an individual equipment standard, that the reported AIS target display capacity has been exceeded when the number of reported AIS targets presented exceeds 100 % of the display capacity;
 - 3) if processing capacity is higher than display capacity, confirm by observation that it provides an indication, or an alert (e.g. a caution) if specified by an individual equipment standard, that the reported AIS target processing capacity is about to be exceeded, for example, when the number of reported AIS targets processed exceeds 95 % of the processing capacity;
 - 4) if processing capacity is higher than display capacity, confirm by observation that it provides an indication, or an alert (e.g. a warning) if specified by an individual equipment standard, that the reported AIS target processing capacity has been exceeded when the number of reported AIS targets processed exceeds 100 % of the processing capacity.

Confirm by inspection of the user manual that it contains a description of the operational consequences of the processing and display of current and new targets in the event that the capacity for processing or displaying has been reached and further targets occur.

5.5.4 Presentation of repeated AIS reports

5.5.4.1 Requirement

AIS Base Stations and AIS Repeater Stations may repeat AIS information and target reports with a lower update rate than transmitted from the sending vessel and with latency that is significant and variable.

If both repeated and direct AIS reports are received for the same target, the repeated reports shall not be processed for display of the AIS target or related information.

If multiple repeated AIS reports are received for the same target, only the report with the lowest repeat count shall be processed for display of the AIS target or related information.

5.5.4.2 Methods of test and required results

The methods of test and the required results are as follows:

- confirm, by analytical evaluation and using the AIS simulator to produce AIS reports for a nearby AIS target moving at 24 kn and repeated AIS reports for this target with delayed and reduced update rate (for example: delayed by 30 s with a 10 s update rate), that the repeated data is not displayed;
- confirm, by analytical evaluation and using the AIS simulator to produce two or more repeated AIS reports for a target with delayed and reduced update rate (for example: delayed by 30 s with a 10 s update rate), that only data from lowest repeat count is displayed.

5.5.5 Filtering sleeping AIS targets

5.5.5.1 Requirement

(MSC191/6.4.3.1) *It shall be possible to filter the presentation of sleeping AIS targets (for example, by target range, CPA/TCPA, AIS target class A/B, or proximity to or otherwise related to a monitored route, etc.).*

Criteria for filtering shall only include sleeping class A or sleeping class B when combined with one or more other factors, for example including CPA/TCPA, Speed, Range or Course.

(MSC191/6.4.3.2) *If a filter is applied, then there shall be a clear and permanent or persistent indication, as appropriate for the application. The filter criteria in use shall be readily available to the user.*

(MSC191/6.4.3.3) *It shall not be possible to remove individual AIS targets from the presentation.*

5.5.5.2 Methods of test and required results

The methods of test and the required results are as follows:

- a) confirm by observation that the user can filter the presentation of sleeping AIS targets and that filtering criteria includes only sleeping class A or sleeping class B combined with one or more other factors;
- b) confirm by observation that an indication is provided when sleeping targets are filtered from the presentation;
- c) confirm by observation that the indication remains while the filter is active;
- d) confirm by analytical evaluation that the filter criteria in use is readily available;
- e) confirm by observation that the user cannot remove individual AIS targets from the presentation.

5.5.6 Activation of AIS targets

5.5.6.1 Requirement

(MSC191/6.4.4.1) *If zones for the automatic activation of AIS targets are provided, they shall be the same as for automatic radar target acquisition, if available. Any user defined zones (for example, acquisition/activation zones) in use shall be presented in graphical form with their relevant symbols set forth in Annex A.*

(MSC191/6.4.4.2) *In addition, sleeping AIS targets shall be automatically activated when they meet user defined parameters (for example, target range, activation zones, CPA/TCPA or AIS target class A/B).*

Automatic activation is independent of AIS target filtering. If means are provided for automatic activation of AIS targets, then means for disabling that function shall be provided and the disable status shall be indicated.

NOTE If display equipment provides facilities for the calculation of CPA/TCPA that are independent of a shipborne radar target tracking system, then the facilities are described in the relevant clauses of IEC 62388.

5.5.6.2 Methods of test and required results

Where display equipment provides zones for the automatic activation of AIS targets:

- a) confirm by observation that the zones are the same as for automatic radar target acquisition, if provided;
- b) confirm by observation that the zones are presented in accordance with Annex A;
- c) confirm by observation that it is possible to disable automatic activation and that the disabled status is indicated;
- d) confirm by observation that both filtered and displayed sleeping AIS targets entering a zone are automatically activated when they meet user defined criteria.

5.5.7 Graphical presentation of targets

5.5.7.1 Requirement

(MSC191/6.4.5.1) *Targets shall be presented with their relevant symbols as set forth in Annex A.*

(MSC191/6.4.5.2) *Reported AIS targets shall be graphically presented at predicted positions either as sleeping or activated. Where no separate symbol is defined for the active and sleeping states, the reported AIS target shall be graphically presented with the single symbol type available in Annex A.*

EXAMPLE AIS SAR vessel (symbol 2.16) keeps all requirements for AIS sleeping target and AIS activated target except for the graphical representation of the symbol.

(MSC191/6.4.5.3) *The course and speed of a tracked radar target or an activated reported AIS target shall be indicated by a vector that clearly shows the predicted motion. The vector time (i.e. length) shall be consistent for presentation of any target regardless of its source.*

(MSC191/6.4.5.4) *The presentation of vector symbols shall be consistent irrespective of the source of information. The presentation mode shall be clearly and permanently or persistently indicated, as appropriate for the application, including for example,*

- *True/Relative motion,*
- *vector time, and*
- *stabilisation.*

(MSC191/6.4.5.5) *The orientation of the AIS target symbol shall indicate its heading (HDG). If the heading information is not received, the orientation of the AIS symbol shall be aligned to the reported course over ground (COG). If neither heading nor course over ground (COG) is available, the orientation of the AIS symbol shall be aligned towards top of the operational display area. If available, the turn or rate of turn (ROT) indicator and/or the path prediction shall indicate the manoeuvre of an activated AIS target.*

(MSC191/6.4.5.6) *Own ship's CCRP shall be used for alignment of tracked radar target symbols and reported AIS target symbols with other information on the same display.*

(MSC191/6.4.5.7) *On large scale, low range displays, a means or method to present a true scale outline of an activated AIS target shall be provided in accordance with Annex A.*

(MSC191/6.4.5.8) *It shall be possible to display the past positions of activated AIS targets.*

The user manual shall describe the length in time or in number of the past positions available for each target.

5.5.7.2 Methods of test and required results

The methods of test and the required results are as follows:

- a) confirm by observation that targets are presented with their relevant symbols according to Annex A;
- b) confirm by observation that reported AIS targets are graphically presented at predicted position as sleeping or activated targets in accordance with Annex A;
- c) confirm by observation that the predicted motion of tracked radar targets and activated reported AIS targets is clearly indicated by a vector;
- d) confirm by observation that the vector time (i.e. length) is consistent for all targets;
- e) confirm by observation that the presentation of vector symbols are consistent irrespective of the source of information;
- f) verify that the presentation mode is clearly indicated in accordance with 4.10.1;
- g) confirm by observation that the vector time is clearly indicated;
- h) confirm by observation that the orientation of the AIS target symbol clearly indicates its heading. Change the heading information to "not available" for one reported AIS target and confirm by observation that the orientation of the AIS symbol is aligned to the reported COG. Change also the COG information to "not available" for the same reported AIS target and confirm by observation that the orientation of that reported AIS target is aligned towards the top of the operational display area;
- i) confirm by observation that the turn or rate of turn (ROT) flag and/or the path prediction, if available, indicates the manoeuvre of an activated AIS target changing course;
- j) confirm by analytical evaluation that own ship's CCRP is used to align tracked radar target symbols and reported AIS target symbols with other information on the same display;
- k) confirm by observation that on large scale, low range displays, a means or method to present a true scaled outline of an activated AIS target is provided;
- l) confirm by observation that it is possible to display the past positions of activated AIS targets for the length in time or in number as described in the user manual.

5.5.8 Target selection

5.5.8.1 Requirement

(MSC191/6.4.6.1) *A target selected for the display of its alphanumeric information shall be identified by the relevant symbol set forth in Annex A. If more than one target is selected for data display, the symbols and the corresponding target data shall be clearly identified.*

5.5.8.2 Methods of test and required results

The methods of test and the required results are as follows:

- a) confirm by observation that a selected target is identified in accordance with Annex A;
- b) confirm by observation that, if more than one target is selected, the symbols and corresponding target information is clearly identified in accordance with Annex A.

5.5.9 Indication of target derivation

5.5.9.1 Requirement

(MSC191/6.4.6.2) *There shall be a clear indication to show that target information is derived from radar or AIS or from a combination of these.*

5.5.9.2 Methods of test and required results

Confirm by analytical evaluation that there is a clear indication of the source of target information.

5.5.10 Presentation of tracked radar target information

5.5.10.1 Requirement

(MSC191/6.4.6.3) *For each selected tracked radar target the following information shall be presented in alphanumeric form:*

- *source(s) of target information,*
- *measured range of target,*
- *measured bearing of target,*
- *predicted target range at the closest point of approach (CPA),*
- *predicted time to CPA (TCPA),*
- *calculated CTW of target (or calculated COG if ground stabilised),*
- *calculated STW of target (or calculated SOG if ground stabilised).*

Additional target information, where available, shall be provided to the user on request. If additional target information is available, an indication shall be provided when viewing alphanumeric information of the selected target.

If multiple targets are selected, a subset of alphanumeric data, information and text may be presented.

Target information shall be logically "paired" for presentation (i.e. range and bearing, CPA and TCPA, course and speed).

NOTE If display equipment provides facilities for the calculation of CPA/TCPA that are independent of a shipborne radar target tracking system, then the facilities are described in the relevant clauses of IEC 62388.

5.5.10.2 Methods of test and required results

The methods of test and the required results are as follows:

- a) confirm by observation that the information listed above is presented in alphanumeric form for each selected target;
- b) confirm by observation that additional information, where available, is indicated and provided to the user on request;
- c) confirm by analytical evaluation that the target information is logically "paired" for presentation.

5.5.11 Presentation of reported AIS target information

5.5.11.1 Requirement

(MSC191/6.4.6.4) *For each selected reported AIS target, the following information shall be presented in alphanumeric form:*

- *source(s)* of target information (for example, repeated);
- target *identification* (at least one of MMSI, call sign, name or IMO number);
- reported *position* and where available *its quality* (Position accuracy as " $\leq 10\text{m}$ " or " $> 10\text{m}$ " and RAIM as "not in use" or "in use");
- calculated *range* of target;
- calculated *bearing* of target;
- calculated *CPA*;
- calculated *TCPA*;
- reported *COG* (or calculated *CTW* if the display is sea stabilised). In sea stabilized display, the reported *COG* shall at least be available on demand;
- reported *SOG* (or calculated *STW* if the display is sea stabilised). In sea stabilized display, the reported *SOG* shall at least be available on demand;
- reported *navigational status*;
- reported *heading* (HDG) and reported *rate of turn* (ROT) shall also be made available.

Additional target information shall be provided to the user on request. If additional target information is available, an indication shall be provided when viewing alphanumeric information of the selected target. Additional target information consists of:

- MMSI, if not yet presented;
- call sign, if not yet presented;
- name, if not yet presented;
- IMO number, if not yet presented;
- dimensions;
- ship and cargo type;
- destination;
- ETA;
- static draught;
- DTE indicator;
- AIS class;
- if supported, extended reported AIS target information (see Table 8 and 5.18);
- if receiving of AIS safety related messages is supported, on user request, where available, a link to or full content of most recent received AIS safety related messages related to the same MMSI, see 5.19;
- optionally, if sending of AIS safety related messages is supported, a link to or full content of all AIS safety related messages sent by the own ship to the target (basis is MMSI), see 5.20.

Further target information may be presented as well.

If multiple targets are selected, a subset of alphanumeric data, information and text may be presented.

Target information shall be logically "paired" for presentation (i.e. range and bearing, CPA and TCPA, COG and SOG, heading and ROT).

(MSC191/6.4.6.5) *If the received AIS target information is incomplete, then the absent information shall be clearly indicated in the target data field as missing.*

5.5.11.2 Methods of test and required results

The methods of test and the required results are as follows.

Select a reported AIS target and:

- confirm by observation that the information listed above is presented in alphanumeric form;
- confirm by observation that all additional target information, where available, is provided to the user on request;
- confirm by analytical evaluation that the target information is logically "paired" for presentation;
- confirm by observation that there is a clear indication of absent information in the target data field.
- confirm by observation that when available there is a clear indication that additional information is available.

5.5.12 Continual update of target information

5.5.12.1 Requirement

(MSC191/6.4.6.6) *The information for a selected target shall be displayed and continually updated, until another target, AIS data report, AIS locating device or AIS synthetic target is selected for information display or, if applicable, until the user dialogue area is closed.*

NOTE Information can be displayed in a separate user dialogue area.

5.5.12.2 Methods of test and required results

The methods of test and the required results are as follows:

- confirm by observation that information displayed for a selected target is continually updated;
- confirm by observation that the information displayed for a selected target remains displayed until another target, AIS data report, AIS locating device or AIS synthetic target is selected or the user dialogue is closed.

5.5.13 Own ship's AIS information

5.5.13.1 Requirement

(MSC191/6.4.6.7) *A means or method shall be provided to present own ship AIS data on request.*

Own ship AIS data includes:

- identification (MMSI, call sign, name, IMO number);
- navigational status;
- additional information (dimensions, ship and cargo type, destination, ETA, static draught);
- if supported, extended information (see Table 8).

5.5.13.2 Methods of test and required results

Confirm by observation that it is possible to present own ship's AIS data on request.

5.5.14 Obscuring the operational display area

5.5.14.1 Requirement

(MSC191/6.4.6.8) *The display of alphanumeric data, information and text shall not obscure graphically presented operational information.*

5.5.14.2 Methods of test and required results

Confirm by analytical evaluation that the display of alphanumeric data, information and text does not obscure graphically presented operational information.

5.6 Operational alerts

5.6.1 Alert status

5.6.1.1 Requirement

(MSC191/6.4.7.1) *A clear indication of the status of the alerts and the alert criteria (i.e. identification) shall be given to the user. (See also 4.9.1 and 4.9.3.)*

The equipment shall comply with IEC 62923-1 to ensure that the status of alerts is clearly given to the user, see 4.9.1.2.

Except for IMO requirements for radar and AIS target symbols displayed in the operational area and for ECDIS highlight of danger, warnings, and caution in the chart area, only text-based visual indication of alert (e.g. in user dialog area) is mandatory. Optionally icons can be presented together with the text, see IEC 62923-1 and Annex F.

5.6.1.2 Methods of test and required results

Confirm by analytic evaluation that a clear indication of the alert criteria is provided as text to the user.

Confirm by observation that, if icons are additionally provided, they conform to IEC 62923-1 and Annex F (see also 4.4.3.2)

5.6.2 CPA/TCPA alarms

5.6.2.1 Requirement

(MSC191/6.4.7.2) *A CPA/TCPA alarm of a tracked radar or activated AIS target shall be clearly indicated and the target shall be clearly marked by a dangerous target symbol as set forth in Annex A (both acknowledged and unacknowledged state). This includes cases when CPA/TCPA alarm information is received by TTD-sentence (see IEC 61162-1).*

NOTE 1 If display equipment provides facilities for the calculation of CPA/TCPA that are independent of a shipborne radar target tracking system, then the facilities are described in the relevant clauses of IEC 62388.

CPA/TCPA alarms shall not be repeated as an alert by the equipment receiving target information by TTD sentence.

NOTE 2 The presentation of the symbol is related to state of the target and is not related to the alert functionality of the equipment.

5.6.2.2 Methods of test and required results

Confirm by observation that dangerous targets are presented in accordance with Annex A.

For equipment receiving target information by TTD sentence, confirm by observation that there are no alerts generated from targets with active CPA/TCPA alarms indicated by the TTD sentence.

5.6.3 Acquisition/activation zones warnings

5.6.3.1 Requirement

(MSC191/6.4.7.3) *If a user defined acquisition/activation zone facility is provided, a target entering or within the zone shall be clearly identified with the relevant symbol set forth in Annex A and for tracked radar targets a warning shall be given. The zone shall be identified with the relevant symbology set forth in Annex A, and shall be applicable to both tracked radar and reported AIS targets.*

A radar target tracking system shall control radar target acquisition zones. The target tracking system shall provide all warnings and indications associated with target detection and tracking including entry into or detection within an acquisition area. Other navigational systems and equipment may provide acquisition zone warnings and indications only if they provide a radar target tracking function complying to IEC 62388.

NOTE 1 The TTD sentence does not provide other navigational systems and equipment that provide remote presentation of tracked radar targets with information about whether the target was manually or automatically acquired nor the status of any automatic acquisition alert.

Any navigational system or equipment may provide remote presentation of reported AIS targets. These systems shall provide their own AIS activation zone facilities.

NOTE 2 If display equipment provides facilities for acquisition zones for the detection of radar targets that are independent of a shipborne radar target tracking system, then the facilities are described in the relevant clauses of IEC 62388.

5.6.3.2 Methods of test and required results

Where display equipment provides zones for automatic acquisition/activation:

- confirm by observation that the zones are presented with their relevant symbology in accordance with Annex A;
- confirm by observation that detected radar targets entering or within a zone are acquired;

NOTE The acquisition status of tracked radar targets is reported by the radar target tracking system, for example, in accordance with IEC 61162 (all parts).

- confirm by observation that radar targets in acquisition state are presented in accordance with Annex A;
- confirm by analytical evaluation that the zones apply to both radar targets and reported AIS targets in accordance with 5.5.7;

5.6.4 Lost target warnings

5.6.4.1 Requirement

(MSC191/6.4.7.4) *The last predicted position of a lost target shall be clearly marked by a lost target symbol on the display as set forth in Annex A, and the lost target warning shall be given if the lost target warning function is enabled. The lost target symbol shall disappear if the signal (or message) for the target is received again or after the warning has been acknowledged. A means or method shall be provided for the user to enable/disable the lost target warning function. There shall be a clear indication whether the lost target warning function for tracked radar targets and activated AIS targets is enabled or disabled. If a target is beyond a user defined range, then no warning shall be generated.*

Navigational systems and equipment that provide remote presentation of received tracked radar targets and activated AIS targets (for example by TTD sentence) shall present the lost target symbol and shall not provide warnings in lost target state.

5.6.4.2 Methods of test and required results

The methods of test and the required results are as follows:

- a) confirm by observation that, when a tracked radar target or reported AIS target that is not received from remote equipment (for example by TTD sentence) is lost, a warning is given and the last predicted position is clearly marked by the lost target symbol in accordance with Annex A;
- b) for navigational system or equipment that provides remote presentation of received tracked radar targets and activated AIS targets (for example by TTD sentence) in lost target state, confirm by observation that there is the lost target symbol and that there is no related warning;
- c) confirm by observation that the lost target symbol disappears if the signal for the target is received again or after the lost target warning has been acknowledged;
- d) confirm by observation that a means or method is provided to enable/disable the lost target warning function;
- e) confirm by observation that there is a clear indication of whether the lost target warning function for tracked radar targets and activated AIS targets is enabled or disabled;
- f) confirm by observation that no warning is generated for a lost target that is beyond the user defined range.

5.7 AIS and radar target association

5.7.1 Requirement

(MSC191/6.4.8.1) *If target information from AIS and radar tracking are both available and where the AIS and radar information are considered as one target, then as a default condition, the activated AIS target symbol and the alphanumeric AIS target information shall be automatically selected and displayed as set forth in Annex A. The user shall have the option to change the default condition to the display of tracked radar targets and shall be permitted to select either radar tracking or AIS alphanumeric information.*

(MSC191/6.4.8.2) *Where the AIS and radar information are considered as two distinct targets, one activated AIS target symbol and one tracked radar target symbol shall be displayed as set forth in Annex A. No alert shall be raised.*

NOTE If display equipment provides facilities for the automatic association of reported AIS targets with tracked radar targets that are independent of a shipborne radar target tracking system, then the facilities are described in the relevant clauses of IEC 62388.

5.7.2 Methods of test and required results

Where display equipment provides the capability to automatically associate reported AIS targets with tracked radar targets:

- a) confirm by observation that a reported AIS target associated with a tracked radar target is presented in accordance with Annex A:
 - 1) as an activated AIS target, the default condition;
 - 2) as a tracked radar target, based upon user-selection as the default condition;
- b) confirm by observation that the user can select either AIS or radar tracking information.

5.8 AIS presentation user selectors and their status indications**5.8.1 Requirement**

Where applicable (i.e. if equipment provides related functionality for presentation), the user selectors for AIS presentation shall be provided according to Table 3.

Table 3 – User selectors for AIS presentation

Selector	Function
AIS ON/OFF This is master selector for all AIS presentation	Select all AIS related graphical presentation on or off
AIS sleeping target filter Separate selector for each provided AIS sleeping target filter criteria (see 5.5.5)	Select AIS sleeping target filter for criteria N on or off ^a
AIS locating devices (see 5.14.3.1)	Select AIS locating devices presentation on or off
AIS base stations (see 5.13.3.1 a))	Select AIS base stations presentation on or off
AIS SAR aircraft (see 5.13.3.1 b))	Select AIS SAR aircraft presentation on or off
AIS AtoNs, physical (see 5.13.3.1 c) and symbol 2.10 a)	Select AIS AtoN, physical presentation on or off or unhealthy (unhealthy AtoNs include symbol '2.10a' versions "Off Posn", "Unlit", "Racon err", "Error" and "Missing")
AIS AtoNs, virtual (see 5.13.3.1 c) and symbol 2.10 b)	Select AIS AtoN, virtual presentation on or off
AIS AtoNs, mobile physical (see 5.13.3.1 c) and symbol 2.10 c)	Select AIS AtoN, mobile physical presentation on or off
AIS AtoNs, mobile virtual (see 5.13.3.1 c) and symbol 2.10 c)	Select AIS AtoN, mobile virtual presentation on or off
AIS AtoNs, synthetic (see 5.13.3.1 c) and symbol 2.10 a)	Select AIS AtoN, synthetic presentation on or off
AIS AtoNs, dimension outline (see 5.13.4 and symbol 2.10 d)	Select AIS AtoN outline presentation on or off
AIS ASMs Separate selector for each layer or sub-layers (see 5.15 and Annex J)	Select AIS ASM presentation for layer/sub-layer N on or off ^b
AIS ASMs Optionally separate selector for each display criteria (see 5.15.4.1)	Select AIS ASM presentation for criteria N on or off ^a
AIS Synthetic targets (see 5.16)	Select AIS Synthetic targets presentation on or off
AIS safety related messages (see 5.19 and symbol 5.16)	Select AIS safety related messages on or off
^a Replace "N" by each available criteria.	
^b Replace "N" by each available layer or sub-layer.	

When a user selector in Table 3 has caused any related AIS object not to be displayed, a permanent or persisting indication shall be provided (see also 5.5.5.1). The details of individual selectors shall be readily available to the user.

(MSC191/6.4.9) Where applicable (i.e. if equipment provides related functionality), *the AIS presentation status shall be indicated as follows* in Table 4.

Table 4 – AIS status indications

Function	Cases to be presented		Presentation
	<i>AIS processing switched ON/ graphical presentation switched OFF</i>	<i>AIS processing switched ON/ graphical presentation switched ON</i>	
<i>AIS ON/OFF</i>	Indicate AIS graphical presentation is switched OFF	Indicate AIS graphical presentation is switched ON	<i>Alphanumeric or graphical</i> (see Table E.4)
<i>Filtering of sleeping AIS targets</i> (see 5.5.5)	Indicate whether the <i>filter status</i> for sleeping AIS targets is switched ON or OFF	Indicate whether the <i>filter status</i> for sleeping AIS targets is switched ON or OFF	Indications may be <i>alphanumeric or graphical</i> (for example by icon)
<i>Activation of targets</i> (see 5.5.6)		Indicate the status of automatic <i>activation criteria</i> for AIS targets, including graphical presentation of automatic activation zones in use	Indications shall be <i>graphical</i> (see symbol 2.14)
<i>CPA/TCPA alarm</i> (see 5.6.2)	Indicate whether the CPA/TCPA Alarm <i>function</i> is switched ON/OFF Indicate the CPA/TCPA <i>Criteria</i> Indicate whether <i>Sleeping AIS targets</i> are <i>included</i> or <i>excluded</i> from CPA/TCPA processing	Indicate whether the CPA/TCPA Alarm <i>function</i> is switched ON/OFF Indicate the CPA/TCPA <i>Criteria</i> Indicate whether <i>Sleeping AIS targets</i> are <i>included</i> or <i>excluded</i> from CPA/TCPA processing	Indications shall be <i>alphanumeric and, if applicable, graphical</i> (for example by icon)
<i>Lost target warning</i> (see 5.6.4)	Indicate whether the Lost Target Warning <i>function</i> is switched ON/OFF If applicable, indicate the <i>Lost target Filter Criteria</i>	Indicate whether the Lost Target Warning <i>function</i> is switched ON/OFF If applicable, indicate the <i>Lost target Filter Criteria</i>	Indications shall be <i>alphanumeric and, if applicable, graphical</i>
<i>Target association</i> (see 5.7)	Indicate whether the Target Association <i>function</i> is switched ON/OFF Indicate the Association <i>Criteria</i> Indicate the target priority as AIS (<i>Default</i>) or Tracked <i>Target Priority</i>	Indicate whether the Target Association <i>function</i> is switched ON/OFF Indicate the Association <i>Criteria</i> Indicate the target priority as AIS (<i>Default</i>) or Tracked <i>Target Priority</i>	Indications shall be <i>alphanumeric</i>

5.8.2 Methods of test and required results

Where applicable, the methods of test and the required results are as follows:

- confirm by observation that the user selectors for AIS presentation are provided according to Table 3;
- confirm by observation that when a user selector in Table 3 has caused any related AIS object not to be displayed, a permanent or persisting indication is provided and that the details of individual selectors are readily available to the user;
- confirm by observation that the AIS presentation status is indicated according to Table 4.

5.9 Trial manoeuvre

5.9.1 Requirement

(MSC191/6.4.10) A *trial manoeuvre simulation* shall be clearly identified by the relevant symbol set forth in Annex A, *positioned* in a conspicuous location within the operational display area, for example, nominally centred at the bottom of the presentation area or *astern of own ship* symbol.

NOTE If display equipment provides facilities for trial manoeuvre that are independent of a shipborne radar target tracking system, then the facilities are described in the relevant clauses of IEC 62388.

5.9.2 Methods of test and required results

Where display equipment provides a trial manoeuvre simulation:

- a) confirm by observation that the manoeuvre is identified in accordance with Annex A;
- b) confirm by analytical evaluation that the symbol is positioned in a conspicuous location.

5.10 Measurement

5.10.1 Measurement from own ship

5.10.1.1 Requirement

Measurements from own ship (for example, range rings, range and bearing, cursor, tracking data) shall be made with respect to the CCRP (for example, conning position).

For consistency of measured ranges and bearings, the recommended reference location should be the conning position. Alternative reference locations may be used where clearly indicated or distinctively obvious.

5.10.1.2 Methods of test and required results

The methods of test and the required results are as follows:

- a) confirm by observation that the means of taking measurements are centred on to the CCRP and not centred on any other position except where specifically selected and clearly indicated;
- b) confirm by measurement, by comparing at least two alternative sensor inputs that have different position offsets from CCRP, that the range and bearing measurements are correct to the CCRP position and, if provided, alternative reference position;
- c) confirm by measurement that, when switching from CCRP to an alternative reference position, displayed data is changing accordingly but data transmitted via the interface remains referenced to the CCRP.

5.10.2 Bearing and range measurements

5.10.2.1 Requirement

Bearings and distances (ranges) drawn on the display, or bearing and range measurements between features already drawn on the display, shall have an accuracy no less than that afforded by the scale and resolution of the display.

Range measurements shall be in nautical miles. In addition, facilities for metric measurements may be provided. All indicated values for range measurement shall be consistent and unambiguous. Where metric range measurements are required, the accuracy shall not be inferior to other range measurements.

5.10.2.2 Methods of test and required results

The methods of test and the required results are as follows:

- a) confirm by analytical evaluation that bearings and distances are measured to an accuracy consistent with the scale and resolution of the display;
- b) confirm by observation that distances can be measured in nautical miles;
- c) confirm by observation that the units used for range measurements and range scales are consistent within the system;
- d) confirm by observation that an indication of the units used for measurement is provided.

5.11 Navigation tools

5.11.1 General requirements

Subclause 5.11 addresses user tools that are common to navigational systems and equipment. Requirements for the provision of these tools are addressed in the relevant individual performance standards. When provided, these tools shall be presented with their relevant symbol(s) as set forth in Annex A.

5.11.2 Range rings

5.11.2.1 Requirement

(MSC191/7.1.4) If *range rings are displayed*, then *the range ring scale shall be indicated*.

Range rings shall be spaced to logically separate the range scale into equal divisions. Typically from two to six range rings would be provided for nautical mile range scale units, and up to five rings for metric range scale units.

The system accuracy of range rings shall be within 1 % of the maximum range of the range scale in use or 30 m, whichever is the greater distance.

Range rings shall always be centred at the CCRP.

A means or method shall be provided to enable and disable the set of range rings (see also 6.1.4).

5.11.2.2 Methods of test and required results

Where range rings are provided:

- a) confirm by observation that range rings are presented in accordance with Annex A;
- b) confirm by observation that the range ring separation (scale) is indicated;
- c) confirm by analytical evaluation that the range ring spacing logically separates each range scale into equal divisions;
- d) confirm by measurement that the accuracy of the range rings is within ± 1 % of the range scale in use or 30 m, whichever is greater;
- e) confirm by observation that the range rings are always centred at the CCRP;
- f) confirm by observation that a means or method is provided to enable and disable the set of range rings.

5.11.3 Variable range marker (VRM)

5.11.3.1 Requirement

Variable range marker(s) (VRMs) may be provided to measure the range of any point object within the operational display area.

Each active VRM shall have a numerical readout and the readout shall have a resolution compatible with the range scale in use.

Each active VRM shall be capable of adjustment to resolution of 0,01 NM, or to appropriate metric equivalent. A coarser resolution may be provided for higher range scales. The readout shall be available in the user dialogue area or, additionally, adjacent to the cursor when the cursor is over the VRM.

The VRM shall enable the user to measure the range of an object within the operational display area with a maximum system error of 1 % of the range scale in use or 30 m, whichever is the greater distance.

It shall be possible to use each VRM to measure the range to any point within the operational area and with the specified accuracy within 5 s.

A means or method to switch each VRM on and off shall be provided.

The VRM range set by the user shall be retained when there is a change in range scale.

If means are provided to move VRM origin from the CCRP to other points within the operational display area, geographically fixed or moving with the velocity of own ship, then a means shall be provided to reset the VRM origin to the CCRP position by a simple operator action.

5.11.3.2 Methods of test and required results

Where a VRM is provided:

- a) confirm by observation that each VRM is presented in accordance with Annex A;
- b) confirm by observation that a dedicated readout is available for each active VRM;
- c) confirm that the VRMs are capable of adjustment to 0,01 NM (or appropriate metric equivalent). A coarser adjustment may be provided for ranges greater than 24 NM or appropriate metric equivalent;
- d) confirm by measurement that the accuracy of the VRMs meet the requirement using a calibrated target or marker;
- e) confirm by measurement that, when metric measurements are provided, the readout and accuracy is equivalent to those relevant to nautical miles;
- f) confirm by measurement that the range to any object within the operational display area can be measured within 5 s with the required accuracy;
- g) confirm by observation that a means or method to switch each VRM on and off is provided;
- h) confirm by observation that the range of the VRM is maintained from range scale to range scale;
- i) confirm by observation that, if means are provided to move VRM origin from the CCRP to other points, means are provided to reset the VRM origin to the CCRP position by a simple operator action.

5.11.4 Bearing scale

5.11.4.1 Requirement

A bearing scale may be provided. The bearing scale shall indicate the bearing from the CCRP.

For radar display equipment, including radar with charted information, the bearing scale shall be outside of the operational display area (i.e. around its periphery and outside of which no radar video shall be displayed). For other display equipment, the bearing scale may be inside the operational display area. It shall be numbered at least every 30° division and shall have division marks of at least 5°. The 5° and 10° division marks shall be clearly distinguishable from each other. 1° division marks may be presented where they are clearly distinguishable from each other and from the 5° and 10° division marks.

If the display is off-centred or the position of own ship is outside of the operational display area, then the bearing scale shall be suppressed or its marks shall be adjusted to represent the bearing from CCRP.

For display equipment not presenting radar, a means or method shall be provided to enable and disable the bearing scale.

5.11.4.2 Methods of test and required results

Where a bearing scale is provided:

- a) confirm by analytical evaluation that the bearing scale indicates bearings as measured from the CCRP;
- b) for radar display equipment, confirm by observation that the bearing scale is around the periphery of the operational display area;
- c) confirm by observation that the bearing scale remains centred at the CCRP (for example, in a true motion display mode);
- d) confirm by observation that the bearing scale is numbered at least every 30° and has division marks at least every 5°;
- e) confirm by observation that the 5° division marks are clearly distinguishable from the 10° division marks;
- f) where 1° division marks are provided, confirm by observation that they are clearly distinguishable from each other and from the 5° and 10° division marks;
- g) for display equipment not presenting radar, confirm by observation that a means or method is provided to enable and disable the bearing scale.

5.11.5 Electronic bearing line (EBL)

5.11.5.1 Requirement

Electronic bearing line(s) (EBLs) may be provided to measure the bearing of any point object within the operational display area, with a maximum system error of 1° at the periphery of the display.

The EBL(s) shall be capable of measurement from the CCRP relative to the ships heading and relative to true north. There shall be a clear indication of the bearing reference (i.e. true or relative).

It shall be possible to move the EBL origin from the CCRP to any point within the operational display area and to reset the EBL to the CCRP by a simple operator action.

It shall be possible to fix the EBL origin or to move the EBL origin at the velocity of own ship.

A means or method shall be provided to ensure that the user is able to position the EBL smoothly in either direction, with an incremental adjustment adequate to maintain the system measurement accuracy requirements.

It shall be possible to use the EBL to measure the bearing to any point object in the operational display area within 5 s.

Each active EBL shall have a numerical readout with a resolution of $0,1^\circ$ adequate to maintain the system measurement accuracy requirements based on a measurement uncertainty of $\pm 0,5^\circ$.

A means or method shall be provided to enable and disable each EBL.

The bearing of the EBL (i.e. set by the user) shall be retained while the EBL is enabled (for example, after a change in range scale or after a change in display orientation).

5.11.5.2 Methods of test and required results

Where an EBL is provided:

- a) confirm by observation that each EBL is presented in accordance with Annex A;
- b) confirm by measurement that the bearing to any point object within the operational display area can be measured to within an accuracy of 1° ;
- c) confirm by analytical evaluation that bearings can be measured relative to the ships heading and relative to true north, and that a clear indication of the bearing reference is provided;
- d) confirm by observation that a means or method is provided to move the origin of an EBL from the CCRP to any point within the operational display area;
- e) confirm by observation that it is possible to return the origin of the EBL to the CCRP by a simple user action;
- f) confirm by observation that a means or method is provided to fix the origin of the EBL in a geographic location;
- g) confirm by observation that a means or method is provided to move the origin of the EBL at the velocity of own ship;
- h) confirm by observation that the EBL can be rotated smoothly in either direction;
- i) confirm by observation that the incremental adjustment is at least $0,1^\circ$;
- j) confirm by measurement that the EBL can be used to measure the bearing to any point object in the operational display area within $\pm 0,5^\circ$ in less than 5 s;
- k) confirm by observation that a numerical readout with a resolution of $0,1^\circ$ is available for each active EBL;
- l) confirm by observation that a means or method is provided to enable and disable each EBL;
- m) confirm by observation that an enabled EBL remains over the same point object during a change of range scale and a change of orientation mode.

5.11.6 Parallel index lines (PI)

5.11.6.1 Requirement

Parallel index (PI) lines may be provided. If parallel index lines are provided:

- independent parallel index lines with a means or method to truncate and switch off individual lines shall be provided;
- a simple and quick means or method of setting the bearing and beam range of a parallel index line shall be provided.

The bearing and beam range of any selected parallel index line shall be available on demand.

It shall be possible to set the bearing and beam range of a parallel index line within 5 s.

PI line range settings shall remain constant when the operator changes the range scale of the display and PI line bearing settings shall remain constant when own ship heading changes.

In addition to on/off selection of individual PI lines, means shall be provided to turn on/off all PI lines as a group.

5.11.6.2 Methods of test and required results

Where parallel index lines are provided:

- a) confirm by observation that parallel index lines are presented in accordance with Annex A;
- b) confirm by observation that a means or method is provided to truncate the length of each PI line;
- c) confirm by observation that PI lines are selectable for display on/off individually and as a group including all PI lines;
- d) confirm by measurement that a means or method is provided to set the bearing or range of a parallel index line within 5 s;
- e) confirm by observation that means are provided to display the bearing and range for any parallel index line on demand;
- f) confirm by observation that the distance of a PI line from the own ship and the true bearing of PI line does not change when a different range scale is selected, when own ship heading changes, and during True motion operation.

5.11.7 Offset measurement of range and bearing

5.11.7.1 Requirement

There may be a means or method to measure the range and bearing of one position on the display relative to any other position within the operational display area. This may be accomplished, for example, using an electronic range and bearing line (ERBL), a combination of a VRM and an EBL, or the cursor.

If a separate tool is provided to measure the combination of range and bearing (for example, an ERBL):

- it shall have a numerical range and bearing readout. The resolution of the range readout shall be compatible with the range scale in use. The resolution of the bearing readout shall be $0,1^\circ$ adequate to maintain the system measurement accuracy requirements;
- it shall enable the user to measure the range of an object within the operational display area with a maximum system error of 1 % of the range scale in use or 30 m, whichever is the greater distance, and the bearing of any point object with a maximum system error of 1° based on a measurement uncertainty of $\pm 0,5^\circ$ at the periphery of the display;
- the user setting shall be retained while the tool is enabled (for example, after a change in range scale or after a change in display orientation);
- it shall enable the user to position its bearing component smoothly in either direction, with an incremental adjustment adequate to maintain the system measurement accuracy requirements.

It shall be possible to measure the range and bearing to any object in the operational display area within 5 s.

5.11.7.2 Methods of test and required results

Where a means or method is provided to measure the range and bearing from one position to another in the operational display area:

- a) confirm by observation that numerical readouts are available to display the range and bearing;
- b) confirm by analytical evaluation that the resolution of the range readout is compatible with each range scale;
- c) confirm by observation that the resolution of the bearing readout is $0,1^\circ$;

- d) confirm by measurement that the range from one position within the operational display area to any other position can be measured to an accuracy of ± 1 % of the range scale in use or 30 m, whichever is greater;
- e) confirm by measurement that the bearing from one position within the operational display area to any position can be measured to an accuracy of $0,5^\circ$ at the periphery of the display;
- f) confirm by observation that the bearing component can be rotated smoothly in either direction;
- g) confirm by measurement that the range and bearing to any object within the operational display area can be measured within 5 s;
- h) where a separate tool is provided to measure the combination of range and bearing, confirm by observation that a means or method is provided to enable and disable that tool;
- i) confirm by observation that the user settings are retained after the change of the range scale and a change of orientation mode while the tool is enabled.

5.11.8 User cursor

5.11.8.1 Requirement

A user cursor may be provided to enable a fast and concise means or method to designate any position on the operational display area. If a user cursor is provided:

- the cursor position shall have a continuous numerical readout to provide the range and bearing, measured from the CCRP, and the latitude and longitude of the cursor position presented either alternatively or simultaneously;
- a means or method shall be provided to easily locate the cursor position in the operational display area;
- the accuracy of the range and bearing measurements provided by the cursor shall meet the relevant requirements for VRM and EBL.

It shall be possible to measure the range and bearing to any object in the operational display area within 5 s.

5.11.8.2 Methods of test and required results

Where a user cursor is provided:

- a) confirm by observation that the cursor is presented in accordance with Annex A;
- b) confirm by observation that a numerical readout is available and that it continuously displays, either alternatively or simultaneously, the range and bearing of the cursor's position measured from own ship's CCRP, and the latitude and longitude of the cursor's position;
- c) confirm by observation that a means or method is provided to locate the cursor in the operational display area;
- d) confirm by analytical evaluation that the resolution of the range readout is compatible with each range scale;
- e) confirm by observation that the resolution of the bearing readout is $0,1^\circ$;
- f) confirm by analytical evaluation that the resolution of the latitude and longitude readout is compatible with each display scale;
- g) confirm by measurement that the range to an object within the operational display area can be measured to within an accuracy of ± 1 % of the range scale in use or 30 m, whichever is greater;
- h) confirm by measurement that the bearing to any point object within the operational display area can be measured to within an accuracy of $0,5^\circ$ at the periphery of the display;
- i) confirm by observation that the cursor can be moved smoothly to create rotation in either direction;

- j) confirm by measurement that the range and bearing to any object within the operational display area can be measured within 5 s.

5.12 AIS data link message processing capacity

5.12.1 General

Presentation of AIS related information may be provided. If provided, the following requirements and tests apply.

5.12.2 Requirements

The data link message processing capacity of the equipment shall provide the capability to process the number of VDM (VHF data link messages) corresponding to 90 % of fully loaded VDL (VHF data link). In that condition, continuous and smooth update of displayed AIS data shall be maintained.

NOTE IEC 61162-1 describes the AIS interface as having a maximum data rate of 4 500 messages per minute.

5.12.3 Methods of test and required results

Use the AIS simulator to generate a scenario of VDM sentences for 130 moving AIS targets updated every 2 s and for 10 other AIS objects supported by the equipment and updated every 3 min, corresponding to approximately 90 % of a fully loaded VDL. Confirm by observation that the displayed update of AIS objects supported by the equipment shows smooth and continuous updates.

If AIS targets are supported, use the AIS simulator to generate a scenario of VDM sentences for 6 000 AIS targets at anchor updated every 3 min with one or more moving AIS targets updated every 2 s. Confirm by observation that the displayed update of a sample set of 10 displayed AIS targets of both types selected at random shows smooth and continuous updates.

5.13 AIS data report

5.13.1 General

AIS data reports include AIS AtoNs, AIS SAR aircraft and AIS base stations.

Presentation of AIS data reports may be provided. If provided, then the following requirements and tests apply.

5.13.2 AIS data report capacity

5.13.2.1 Requirements

The equipment shall provide the capability to display a minimum number of AIS data reports according to Table 5 if no higher number is specified in individual equipment standards.

The user manual shall specify the processing and display capacity of AIS data reports. In addition, the user manual shall describe the operational consequences to the processing and display of current and new AIS data reports in the event that the capacity is at the maximum provided for each case when further AIS data reports are received.

There shall be an indication, or an alert (e.g. a caution) if specified by individual equipment standards, when the AIS data report processing or display capacity has been exceeded.

Table 5 – AIS data report capacity

Requirement	Capacity
Minimum display capacity for AIS data reports	20
Minimum processing capacity for AIS data reports	20

5.13.2.2 Methods of test and required results

The methods of test and the required results are as follows:

- confirm by inspection of the user manual that it specifies the processing and display capacity of AIS data reports and that at least the minimum capacities are provided;
- use the AIS simulator and confirm by observation that there is an indication, or an alert (e.g. a caution) if specified by individual equipment standards, when the capacity of processing or display of AIS data reports has been exceeded and that the EUT operates as described in the user manual;
- confirm by inspection of the user manual that it describes the operational consequences to the processing and display of current and new AIS data reports in the event that the processing or display capacity is at the maximum provided for each case when further AIS data reports are received.

5.13.3 AIS data report display**5.13.3.1 Requirement**

It shall be possible to add or remove AIS data reports from the display by layer, but not as individual objects. The following layers shall be provided:

- AIS AtoNs, physical (including unhealthy state);
- AIS AtoNs, virtual;
- AIS AtoNs, mobile physical;
- AIS AtoNs, mobile virtual;
- AIS AtoNs, synthetic;

NOTE 1 Synthetic AtoN is a physical AtoN structure, without an AIS transmitter, but for which AIS messages are broadcast from another (usually land-based) location. An AtoN is a physical AtoN when "virtual AtoN flag = 0" and "repeat indicator = 0". An AtoN is a synthetic AtoN when "virtual AtoN flag = 0" and "repeat indicator = 1, 2 or 3".

- AIS SAR aircraft;
- AIS base stations.

The "unhealthy" state provides an easy-to-use method to detect charted AtoNs which cause significant issues for navigation. The unhealthy AtoN includes symbol 2.10 a versions "Off Posn", "Unlit", "Racon err", "Error" and "Missing".

AIS data reports shall be presented by means of an appropriate symbol displayed using the reported/predicted position, see Annex A. Requirements related to the graphical presentation of AIS AtoN dimensions are in 5.13.4.

An AIS data report selected for display of its alphanumeric information shall be identified by the relevant symbol 2.12 given in Annex A.

For each selected AIS data report, the following information shall be presented in alphanumeric form:

a) Message 4, Base station report

- identification (Name, from AIS Message 24A, and/or MMSI. Both available at least on demand);
- reported position;
- if receiving of AIS safety related messages is supported, on user request, where available a link to or full content of the most recent received AIS safety related messages related to the same MMSI, see 5.19.

b) Message 9, SAR aircraft position report

- identification (Name from AIS Message 5 or 24A, Call sign from AIS Message 5 or 24B and MMSI. All available at least on demand);
- reported position and where available its quality (Position accuracy as " ≤ 10 m" or " > 10 m" and RAIM as "not in use" or "in use");
- reported altitude and where available its source;
- calculated range of target (2-dimensional calculation without altitude);
- calculated bearing of target;
- reported COG;
- reported SOG;
- if receiving of AIS safety related messages is supported, on user request, where available a link to or full content of the most recent received AIS safety related messages related to the same MMSI, see 5.19.

c) Message 21, AtoN report

- identification (Name, if not available then MMSI. MMSI at least available on demand);

NOTE 2 Name for an AtoN is a combination from "Name of Aid-to-Navigation" and "Name of Aid-to-Navigation Extension".
- reported position and where available its quality (Position accuracy as " ≤ 10 m" or " > 10 m" and RAIM as "not in use" or "in use") and source (Type of electronic position fixing device);
- indication of type (nature);
- AtoN status, see Annex L;
- dimensions, at least available on demand;
- if receiving of AIS safety related messages is supported, a link to a list or full content of all AIS safety related messages received from the AIS AtoN report (basis is MMSI). It shall at least be possible to present the most recent AIS safety related message for each AtoN. The AIS safety related messages received from the AIS AtoN shall be automatically removed after a timeout period of 18 min after reception or after removal of the related AtoN itself;
- optionally for Mobile AtoN, if derived from movement of position, calculated COG/SOG if ground stabilised (or calculated CTW/STW if sea stabilised).

If the received AIS data report information is incomplete, then the absent information shall be clearly indicated in the related data field as missing.

The information for a selected AIS data report shall be displayed and continually updated, until another target, AIS data report, AIS locating device or AIS synthetic target is selected for information display or, if applicable, until the user dialogue area is closed.

NOTE 3 Information can be displayed in a separate user dialogue area.

AIS data reports shall become lost after 6 times the nominal reporting interval for AtoNs, SAR aircraft and base stations from the last received report.

NOTE 4 Nominal reporting intervals are given in ITU R M.1371.

For lost AIS SAR aircraft and AIS base stations, there shall be no lost AIS data report symbol and the AIS data report symbol shall be removed automatically from the display.

The last reported/predicted position of an AIS AtoN shall be clearly marked by a lost AIS AtoN symbol on the display as set forth in Annex A, and the lost AIS AtoN warning shall be given if the lost AIS AtoN warning function is enabled. If the lost AIS AtoN warning function is disabled or if the AIS AtoN is beyond a user defined range, there shall be no lost AIS AtoN symbol and the AIS AtoN symbol shall be removed automatically from the display.

The lost AIS AtoN symbol shall disappear if the signal (or message) for the AIS AtoN is received again or after the warning has been acknowledged.

A means or method shall be provided for the user to enable/disable the lost AIS AtoN warning function. There shall be a clear indication of whether the lost AIS AtoN warning function is disabled. If an AIS AtoN is beyond a user defined range, then no warning shall be generated.

The lost AIS AtoN function enable/disable and the user defined range parameters may be shared with the lost target function, see 5.6.4, and/or the lost AIS locating device function, see 5.14.3.1.

5.13.3.2 Methods of test and required results

Use the AIS simulator and confirm by observation that the user can add and remove information from the presentation by layers, but not as individual objects.

Use the AIS simulator and confirm by observation that AIS data reports are displayed at the reported/predicted position and that the symbol is as defined in Annex A.

Use the AIS simulator and confirm by observation that an AIS data report selected for the display of its alphanumeric information is identified by the relevant symbol 2.12 given in Annex A.

Use the AIS simulator and confirm by observation that, for each selected AIS data report, the required information is presented in alphanumeric form or that there is a clear indication of absent information in the related data field.

Use the AIS simulator and confirm by observation that, for each AIS AtoN, the received AIS safety related messages are automatically removed after 18 min or after removal of the related AtoN itself.

Use the AIS simulator and confirm by observation that information displayed for a selected AIS data report is continually updated and that the information displayed for a selected target. AIS data report, AIS locating device or AIS synthetic target remains displayed until another AIS data report is selected or the user dialogue is closed.

For the following tests related to the lost AIS data reports, the timeout for the state of the lost AIS data report is 6 times the nominal reporting interval for AtoNs from the last received report.

Use the AIS simulator to simulate a lost AIS SAR aircraft and a lost AIS base station and confirm by observation that no lost AIS data report symbol is displayed and that the AIS data report symbol is removed automatically from the display.

Confirm by observation that a means or method is provided for the user to enable/disable the lost AIS AtoN warning function; and that there is a clear indication of whether the lost AIS AtoN warning function is disabled; and that a user defined range is available to control the functionality of the lost AIS AtoN.

Use the AIS simulator to simulate a lost AIS AtoN and confirm by observation that, when the lost AIS AtoN warning function is enabled, the last reported/predicted position of a AIS AtoN is clearly marked by a lost AIS AtoN symbol on the display and that the lost AIS AtoN warning is created.

Use the AIS simulator to simulate a lost AIS AtoN and confirm by observation that, when the lost AIS AtoN function is disabled or when the AIS AtoN is beyond a user defined range, no lost AIS AtoN symbol is displayed and that the AIS AtoN symbol is removed automatically from the display.

Use the AIS simulator and confirm by observation that, when signal (or message) for the AIS AtoN is received again or after the lost AIS AtoN warning has been acknowledged, the lost AIS AtoN symbol disappears.

5.13.4 Graphical presentation of AIS AtoN dimensions

5.13.4.1 Requirements

Graphical presentation of physical AIS AtoN dimensions may be provided. If provided, the following requirements and tests apply.

The user shall have means to select and deselect the graphical display of the true scaled dimensional outline of physical AIS AtoNs (symbol 2.10 d) in addition to the related physical AIS AtoN symbol as set forth in Annex A. The size of this outline shall be the true scale representation based on the reported dimensions. The true scaled outline shall only be presented when the largest of the ABCD values is at least 9 mm at a nominal viewing distance of 1 m.

Equipment may provide user selectable means to automatically select or deselect display of the AIS AtoN true scaled outline based on conditions provided by the manufacturer. The user shall be able to disable the functionality of the automatic selection.

5.13.4.2 Methods of test and required results

Use the AIS simulator to send the physical AIS AtoN objects including true scaled outline and:

- a) confirm by observation that the true scaled outline and the related symbol are as given in Annex A;
- b) confirm by observation that means are provided to select and deselect the graphical presentation of AIS AtoN dimensions;
- c) confirm by measurement that the dimension of the outline of the AIS AtoN is correct for the scale of the display;
- d) confirm by observation that the true-scaled outline of the AIS AtoN is not presented when none of the ABCD values is at least 9 mm at the nominal viewing distance of 1 m;
- e) if provided, confirm by observation that user selectable means to automatically select or deselect the display of the AIS AtoN true scaled outline are based on conditions described in the user manual.

5.14 AIS locating device

5.14.1 General

Presentation of AIS locating devices may be provided. If provided, then the following requirements and tests apply.

5.14.2 AIS locating device capacity

5.14.2.1 Requirements

The equipment shall provide the capability to display a minimum number of AIS locating devices nearest to the own ship according to Table 6 if no higher number is specified in individual equipment standard.

The user manual shall specify the processing and display capacity of AIS locating devices. In addition, the user manual shall describe the operational consequences to the processing and display of AIS locating devices in the event that the capacity is at the maximum provided for each case when further AIS locating devices are received.

There shall be an indication, or an alert (e.g. a caution) if specified by individual equipment standards, when the AIS locating devices processing or display capacity has been exceeded.

Table 6 – AIS locating devices capacity

Requirement	Capacity
Minimum display capacity for AIS locating devices	20
Minimum processing capacity for AIS locating devices	20

5.14.2.2 Methods of test and required results

The methods of test and the required results are as follows:

- confirm by inspection of user manual that it specifies the processing and display capacity of AIS locating devices; and that at least the minimum capacities are provided;
- use the AIS simulator and confirm by observation that there is an indication, or an alert (e.g. a caution) if specified by individual equipment standards, when the capacity of processing or display of AIS locating devices has been exceeded; that the displayed AIS locating devices are the nearest and that the EUT operates as described in the user manual;
- confirm by inspection of the user manual that it describes the operational consequences to the processing and display of AIS locating devices in the event that the processing or display capacity is at the maximum provided for each case when further AIS locating devices are received.

5.14.3 AIS locating device display

5.14.3.1 Requirement

It shall be possible to add or remove AIS locating devices from the display by a single layer (see Table 3) and it may be possible to add or remove AIS locating devices from the display by sub-layer (AIS-SART, EPIRB-AIS and AIS MOB), but not as individual objects.

AIS locating devices shall be presented by means of an appropriate symbol displayed using the predicted position, see Annex A.

An AIS locating device selected for display of its alphanumeric information shall be identified by the relevant symbol 2.12 given in Annex A;

For each selected AIS locating device, the following information shall be presented in alphanumeric form:

- Message 1 and 14, for AIS locating devices
 - identification (Name, from AIS Message 24A, 15-character HEX ID (applicable for EPIRB AIS), from Message 14, and/or MMSI. All available at least on demand);

- reported position, its age (based on current time and 'Time stamp' from AIS Message 1) and where available its quality (Position accuracy as " ≤ 10 m" or " > 10 m" and RAIM as "not in use" or "in use");
- calculated range of target;
- calculated bearing of target;
- reported COG (or calculated CTW if the display is sea stabilised). In sea stabilized display, the reported COG shall at least be available on demand;
- reported SOG (or calculated STW if the display is sea stabilised). In sea stabilized display, the reported SOG shall at least be available on demand;
- reported navigational status (active or under test);
- on user request, where available for AIS-SART and AIS MOB text from last received and for EPIRB-AIS text from the last two received unique AIS Message 14 related to the same MMSI. Received AIS Messages 14 having identical source and content shall replace existing messages that they duplicate. Received AIS Message 14 shall be automatically removed when the related AIS locating device is removed.

NOTE 1 Some examples of textual content of AIS Message 14 for AIS locating devices are: "SART ACTIVE", "SART TEST", "MOB ACTIVE", "MOB TEST", "EPIRB ACTIVE", "EPIRB TEST" and the 15-character HEX-ID of a Cospas-Sarsat beacon.

If the received AIS locating device information is incomplete, then the absent information shall be clearly indicated in the related data field as missing.

The information for a selected AIS locating device shall be displayed and continually updated, until another target, AIS data report, AIS locating device or AIS synthetic target is selected for information display or, if applicable, until the user dialogue area is closed.

NOTE 2 Information can be displayed in a separate user dialogue area.

AIS locating devices shall become lost after 6 min from the last received report.

NOTE 3 Nominal reporting intervals are given in ITU R M.1371.

The last predicted position of an AIS locating device shall be clearly marked by a lost AIS locating device symbol on the display as set forth in Annex A, and the lost AIS locating device warning shall be given if the lost AIS locating device warning function is enabled. If the lost AIS locating device warning function is disabled or if the AIS locating device is beyond a user defined range or if the AIS locating device is in testing, there shall be no lost AIS locating device symbol and the AIS locating device symbol shall be removed automatically from the display.

The lost AIS locating device symbol shall disappear if the signal (or message) for the AIS locating device is received again or after the warning has been acknowledged.

A means or method shall be provided for the user to enable/disable the lost AIS locating device warning function. There shall be a clear indication of whether the lost AIS locating device warning function is enabled or disabled. If an AIS locating device is beyond a user defined range, then no warning shall be generated.

The lost AIS locating device function enable/disable and the user defined range parameters may be shared with the lost target function, see 5.6.4, and/or the lost AIS data report device function, see 5.13.3.1.

5.14.3.2 Methods of test and required results

Use the AIS simulator and confirm by observation that the user can add and remove information from the presentation by layer and optionally sub-layers, but not as individual objects.

Use the AIS simulator and confirm by observation that AIS locating devices are displayed at the predicted position and that the symbol is as defined in Annex A.

Use the AIS simulator and confirm by observation that an AIS locating device selected for the display of its alphanumeric information is identified by the relevant symbol 2.12 given in Annex A.

Use the AIS simulator and confirm by observation that, for each selected AIS locating device, the required information is presented in alphanumeric form or that there is a clear indication of absent information in the related data field.

Use the AIS simulator and confirm by observation that information displayed for a selected AIS locating device is continually updated and that the information displayed for a selected AIS locating device remains displayed until another target, AIS data report, AIS locating device or AIS synthetic target is selected or the user dialogue is closed.

For the following tests related to the lost AIS reports, the timeout for the state of the lost AIS report is 6 min from the last received report.

Confirm by observation that a means or method is provided for the user to enable/disable the lost AIS locating device warning function; and that there is a clear indication of whether the lost AIS locating device warning function is disabled; and that a user defined range is available to control the functionality of the lost AIS locating device.

Use the AIS simulator to simulate a lost AIS locating device and confirm by observation that, when the lost AIS locating device warning function is enabled, the last predicted position of a AIS locating device is clearly marked by a lost AIS locating device symbol on the display and that the lost AIS locating device warning is created.

Use the AIS simulator to simulate a lost AIS locating device and confirm by observation that, when the lost AIS locating device function is disabled or when the AIS locating device is beyond a user defined range, no lost AIS locating device symbol is displayed and that the AIS locating device symbol is removed automatically from the display.

Use the AIS simulator and confirm by observation that, when signal (or message) for the AIS locating device is received again or after the lost AIS locating device warning has been acknowledged, the lost AIS locating device symbol disappears.

Use the AIS simulator to send an AIS locating device with associated AIS Message 14 and allow the AIS locating device to be lost and to be removed. Resend the AIS locating device after it has been removed and confirm by observation that no information remains available from the associated AIS Message 14.

5.15 AIS ASM

5.15.1 General

AIS ASMs used in this document are specified in IMO SN.1/Circ.289. An AIS ASM object represents information received from one or more AIS ASMs related to same uniquely identified AIS ASM object. See Annex J for the combinations of AIS ASMs to be combined as an AIS ASM object.

AIS ASMs are uniquely identified by their Application Identifier (AI), which is the combination of Designated Area Code (DAC) and Function Identifier (FI). All AIS ASMs described in this document have the DAC set as 1.

The AIS ASM objects used in this document are identified by the AI and one of the following:

- "Message linkage ID" and first six digits of source MMSI (FI = 18);
- "Message linkage ID" and first six digits of source MMSI (FI = 19);
- "Centre position of Berth, Latitude", "Centre position of Berth, Longitude" (FI = 20);
- "Position of observation, Latitude" and "Position of observation, Longitude" (FI = 21);
- "Message linkage ID" and first six digits of source MMSI (FI = 22);
- "Message linkage ID" and full source MMSI (FI = 23);
- "Latitude (from site location)" and "Longitude (from site location)" (FI = 26 and 31);
- "Message linkage ID" and first six digits of source MMSI (FI = 27 and 28);
- "Position #1 Latitude" and "Position #1 Longitude" (FI = 32).

NOTE 1 For the AIS base station as source, the first six digits of the source MMSI are $0_1 0_2 M_3 I_4 D_5 X_6$ of $0_1 0_2 M_3 I_4 D_5 X_6 X_7 X_8 X_9$. This leaves the last three digits $X_7 X_8 X_9$ available for possible repeated transmission of AIS ASMs by multiple sources coordinated by the shore operator.

NOTE 2 MMSI of the AIS ASM identifies the transmission source. For example, for redundancy purposes or expanded range, there cannot be multiple AIS Base or AIS AtoN stations with different MMSIs transmitting the same AIS ASM object.

Some AIS ASMs support a concept of "end of validity". This concept is based on the following combination of attributes related to AIS ASM validity, where provided and depending on the FI:

- End of "Duration" after "Start Date and Time" (FI=22 or 27);
- End of "Duration (forecast)" after "Valid time of forecast" (FI=26);
- End of "Data timeout (from site location)" (FI=26); or
- End of "Expected Next Signal" (FI=19).

NOTE 3 The validity period can include the current time or can start in the future.

Text description AIS ASMs (FI = 29 and 30) provide additional information related to an AIS ASM object (FI = 18, 19, 22, 23, 27 and 28). In the case that "Message linkage ID" and "MMSI of the source" from the text description AIS ASM matches an existing AIS ASM object, the text is combined into the AIS ASM object.

5.15.2 Categories

There are three categories of AIS ASM objects. For some categories of AIS ASM objects, the user can manage the storage by removing individual AIS ASM objects from the storage. The user may be able to remove and exclude AIS ASM objects from the storage by setting criteria. The user may also be able to control the display of AIS ASM objects in the storage by setting display criteria. The criteria can be for example, by layer, by range, by category.

For all categories of AIS ASM objects, only AIS ASM objects available from the storage can be displayed. Removing an AIS ASM object from the storage also causes it to be removed from the display.

NOTE Many AIS related objects, for example AIS targets, have one user functionality rule both for removal from storage and for add/remove from the display. AIS ASM does not apply one user functionality rule both for removal from storage and for add/remove from the display.

The three categories of AIS ASM objects are:

- 1) Addressed (FI = 18, 20, 23, 28, 30 and 32)
 - a) transmitted as addressed to a single vessel identified by the MMSI (AIS Message 6, Destination ID);
 - b) transmission is repeated until the source ends repetition or the destination has acknowledged received AIS ASM (AIS Message 7);
 - c) there is no timeout for automatic removal of the received AIS ASM;
 - d) automatic removal of AIS ASM object FI = 23 or FI = 28 happens after reception of a cancellation message as per IMO SN.1/Circ.289;
 - e) when the storage capacity limit is reached, the oldest AIS ASM object is replaced by the new AIS ASM object. The oldest AIS ASM object is the object for which the last reception of any related AIS ASM is the oldest;
 - f) an individual AIS ASM object can be removed from the storage by the user;
 - g) optionally received AIS ASM objects may be excluded and AIS ASM objects may be automatically removed from the storage by user selectable criteria. Examples of criteria are:
 - i) selected range: when outside, then excluded from reception and removed from the storage;
 - ii) selected by sub-layers (see Annex J): when de-selected, then excluded from reception and removed from the storage;
 - iii) selected by source (MMSI of source): when de-selected, then excluded from reception and removed from the storage;
 - iv) selected by FI: when de-selected, then excluded from reception and removed from the storage;
 - v) selected time since reception, when time passed, then excluded from reception and removed from the storage;
- 2) Broadcast – Date dependent (FI = 19, 22, 26, and 27; Include "end of validity")
 - a) transmitted as broadcast (AIS Message 8) with the combination of received AIS ASM information (i.e. AIS ASM object) and including "end of validity" concept related information;
 - b) transmission is repeated until end of validity;
 - c) optionally received AIS ASM may be excluded and AIS ASM objects may be automatically removed from the storage by user selectable criteria. Examples of criteria are:
 - i) selected range: when outside, then excluded from reception and removed from the storage;
 - ii) selected by sub-layers (see Annex J): when de-selected, then excluded from reception and removed from the storage;
 - iii) selected by source (MMSI of source): when de-selected, then excluded from reception and removed from the storage;
 - iv) selected by FI: when de-selected, then excluded from reception and removed from the storage;
 - v) selected time since reception, when time passed, then excluded from reception and removed from the storage;
 - d) automatic removal of AIS ASM object from the storage happens at the end of validity or after reception of a cancellation message as per IMO SN.1/Circ.289;
 - e) when the storage capacity limit is reached, the behaviour is as described by the manufacturer in the user manual;

- 3) Broadcast – Other (FI = 19, 21, 22, 26, 27, 29 and 31; Not including "end of validity")
- transmitted as broadcast (AIS Message 8) with the combination of received AIS ASM information (i.e. AIS ASM object) and does not include "end of validity" concept related information;
 - transmission is repeated as long as the information is valid;
 - timeout for automatic removal of AIS ASM objects from the storage is 18 min from the last AIS ASM reception for a single AIS ASM object;
 - when the storage capacity limit is reached, the oldest AIS ASM object is replaced by the new AIS ASM object;
 - optionally received AIS ASM may be excluded and AIS ASM objects may be automatically removed from the storage by user selectable criteria. Examples of criteria are:
 - selected range: when outside, then excluded from reception and removed from the storage;
 - selected by sub-layers (see Annex J): when de-selected, then excluded from reception and removed from the storage;
 - selected by source (MMSI of source): when de-selected, then excluded from reception and removed from the storage;
 - selected by FI: when de-selected, then excluded from reception and removed from the storage.

5.15.3 AIS ASM capacity

5.15.3.1 Requirements

If implementation of AIS ASM is provided, the equipment shall provide the capability to process and to display a minimum number of AIS ASM objects according to Table 7.

Table 7 – AIS ASM object capacity

AIS ASM object category	Minimum display capacity	Minimum processing capacity
Addressed and intended for own ship	10	10
Broadcast – Data dependent	20	20
Broadcast – Other	12	12
Storage capacities for each category should be bigger than or equal to display capacities for each category.		

The user manual shall specify the processing and display capacity of AIS ASM objects for each category. In addition, the user manual shall describe the operational consequences to the processing and display of current and new AIS ASM objects from the user point of view in the event that the capacity is at the maximum provided for each case specified in Table 7 when further AIS ASM objects are received.

For the AIS ASM categories "Addressed" and "Broadcast – Other" when reaching the capacity limit, on reception of AIS ASMs for a new AIS ASM object, the oldest AIS ASM object shall be replaced in the storage by the new AIS ASM object.

There shall be an indication, or an alert (e.g. a caution) if specified by individual equipment standards, when the AIS ASM processing or display capacity has been exceeded.

For AIS ASM objects of category "Addressed", the user shall be able to remove individual AIS ASM objects from the storage.

AIS ASM objects shall be automatically removed from the storage after reception of a cancellation message as per IMO SN.1/Circ.289.

Optionally, the functionality of the exclusion of received AIS ASMs and removal of AIS ASM objects from the storage may be provided by criteria. If provided, the user manual shall describe the functionality including details of the user selectable criteria. The functionality shall operate based on the criteria described in the user manual.

AIS ASM objects of category "Broadcast – Date dependent" shall be automatically removed from the storage after the end of validity (see 5.15.1).

AIS ASM objects of category "Broadcast – Other" shall be automatically removed from the storage after 18 min from the last received AIS ASM related to the AIS ASM object.

NOTE The nominal reporting interval is assumed to be 6 min.

EXAMPLE An area notice exists as long as reports for it are received at least once within the timeout period of 18 min and as long as it is within its specified validity period (i.e. until end of "duration" starting from "start date and time of area") and as long as it is not cancelled (i.e. "duration = 0").

5.15.3.2 Methods of test and required results

The methods of test and the required results are as follows:

- a) confirm by inspection of user manual that it specifies the processing and display capacity of AIS ASM objects and that at least the minimum capacities according to Table 7 are provided;
- b) confirm by inspection of the user manual that it describes the operational consequences to the processing and display of AIS ASM objects in the event that the capacity is at the maximum provided for each case when further AIS ASM objects are received;
- c) use the AIS simulator and confirm by observation that for AIS ASM categories "Addressed" and "Broadcast – Other" at reaching the capacity limit on reception of AIS ASMs for a new AIS ASM object the oldest AIS ASM object is replaced in the storage by the new AIS ASM object;
- d) use the AIS simulator and confirm by observation that there is an indication, or an alert (e.g. a caution) if specified by individual equipment standards, when the capacity of processing or display of AIS ASM objects has been exceeded and that the EUT operates as described in the user manual;
- e) use the AIS simulator and confirm by observation that AIS ASM objects of the AIS ASM category "Addressed" can be removed from the storage by user selection of individual AIS ASM object;
- f) use the AIS simulator and confirm by observation that AIS ASM objects are automatically removed from the storage after reception of a cancellation message as per IMO SN.1/Circ.289;
- g) if provided, confirm by inspection of the user manual that it describes the functionality of the exclusion of received AIS ASMs and removal of AIS ASM objects from the storage including details of the user selectable criteria;
- h) if provided, use the AIS simulator and confirm by observation that the functionality of exclusion of received AIS ASMs and removal of AIS ASM objects from the storage operate based on the user selectable criteria as described in the user manual and does not operate based on individual AIS ASM objects;
- i) use the AIS simulator and select display of all provided cases and confirm by observation that AIS ASM objects of the AIS ASM category "Broadcast – Date dependent" are removed after the end of validity;
- j) use the AIS simulator and select display of all provided cases and confirm by observation that AIS ASM objects of AIS ASM category "Broadcast – Other" are automatically removed after 18 min from the last received AIS ASM related to the AIS ASM object.

5.15.4 AIS ASM display

5.15.4.1 Requirement

Presentation on case-by-case basis for each AIS ASM Functional Identifier and display sub-layer (see Table J.1) may be provided.

If implementation of AIS ASM is provided, the user manual shall specify which AIS ASM Functional Identifiers and display sub-layers are supported (see Table J.1).

It shall be possible to add or remove AIS ASM objects from the display by layer or sublayer as defined in Table J.1, but not as individual objects.

Optionally, the equipment may allow the user to select by criteria which AIS ASM objects are displayed. Examples of criteria are:

- a) selected range: when outside, then not displayed;
- b) selected by source (MMSI of source): when de-selected, then not displayed;
- c) selected time since reception: when time passed, then not displayed.

AIS ASM objects shall be presented by means of an appropriate symbol or symbols displayed using the reported position. For selection of appropriate symbols, see Annex J. The shape of the symbol shall be as defined in Annex A.

NOTE Some AIS ASM objects require more than one symbol to present the information therein.

Where the user settings cause multiple different AIS ASM point symbols to be presented in the same position, a symbol shall be presented to represent all the AIS ASM point symbols at that position as follows:

- when the multiple different AIS ASM point symbols only include two or more of the symbols 5.6 (tidal and water level info), 5.7 (signal station) and/or 5.13 (environmental report) in Table A.5, the representing symbol shall be 5.13 (without optional addition of symbol 3.4 (tidal stream));
- when the multiple different AIS ASM point symbols include two or more different symbols including at least one symbol that is not symbol 5.6, 5.7 or 5.13, the representing symbol shall be symbol 5.18 (co-located AIS ASM objects).

Selection of an AIS ASM object for display of its alphanumeric information shall be possible from a list of available AIS ASM objects and by selecting the related symbol of the AIS ASM object.

When selecting the single symbol that represents multiple AIS ASM objects, the details of all the represented AIS ASM objects shall be provided to the user.

An AIS ASM object selected for display of its alphanumeric information shall be identified for point geometry objects by the symbol 2.12 given in Annex A and for line and area geometry objects the user manual shall describe the method used to identify the selection.

For each AIS ASM object selected for the display of its alphanumeric information, the values of the applicable and available fields contained in Table J.1 and Source ID (i.e. MMSI) shall be presented at least in alphanumeric form. The field of text description shall only be shown if content is available.

The alphanumeric presentation of the reason of an AIS ASM "Area Notice" (FI = 22 or 23) is based on "Notice Description". For values 0 to 125 of the "Notice Description", the alphanumeric presentation is the standardized text from the table in IMO SN.1/Circ.289. For value 127 of the "Notice Description", the alphanumeric presentation is the content of the "Associated Text".

The viewing date or viewing date range shall determine which date dependent objects are displayed. The viewing date or viewing date range shall be user selectable. When charted information is present, then the viewing date or viewing data range shall be common with charted information (for example S-57 ENC charts). If a date dependent AIS ASM object does not provide a start of validity information, it shall be considered valid up to the end of the validity.

There shall be a permanent indication when the viewing date or viewing date range does not include the current date. When an equivalent indication is required for charted information, a single, common, indication shall be presented.

AIS ASM objects that include the "end of validity" concept shall only be presented graphically when the viewing date or viewing date range overlaps the validity period.

AIS ASM objects shall not initiate any alerts.

5.15.4.2 Methods of test and required results

Confirm by inspection of user manual that it specifies which AIS ASM Functional Identifiers and display sub-layers are supported (see Table J.1).

If the equipment allows the user to select by criteria which AIS ASM objects are displayed, use the AIS simulator and confirm by observation that the selected criteria are used for the display of AIS ASM objects.

Use the AIS simulator and confirm by observation that the user can add and remove AIS ASM objects from the presentation by layers or sublayers as defined in Table J.1, but not as individual objects.

Use the AIS simulator and confirm by observation for each case supported and available in Table J.1 that AIS ASM objects are displayed at the reported position and that the symbol is as defined in Annex J and that the shape of the symbols is as defined in Annex A.

Use the AIS simulator to create cases of multiple point AIS ASM objects that are supported and that are in the same position (at least, where supported, the cases of: Air Gap + Berthing data; Wind + Weather; Wind + Water level; Tidal window + Water level) and confirm by observation for each case that symbol 5.13 or 5.18 is displayed as required in 5.15.4.1.

Use the AIS simulator and confirm by observation that it is possible to select an AIS ASM object for display of its alphanumeric information from the list of available AIS ASM objects and by selecting the related symbol of the AIS ASM object.

Use the AIS simulator and confirm by observation that, when selecting a single symbol that represent multiple AIS ASM objects, the details of all the represented AIS ASM objects are available to the user.

Use the AIS simulator and confirm by observation that an AIS ASM object selected for the display of its alphanumeric information is identified for point geometry objects by the symbol 2.12 given in Annex A and for line and area geometry objects by the method described in the user manual.

Use the AIS simulator and confirm by observation that, for each AIS ASM object selected for the display of its alphanumeric information, the values of the applicable and available fields contained in Table J.1 and Source ID (i.e. MMSI) are presented and that the field of text description is only shown if content is available.

Use the AIS simulator and confirm by observation that, for each AIS ASM "Area Notice" (FI = 22 or 23), the reason is based on "Notice Description" and that, for values 0 to 125 of the "Notice Description", the alphanumeric presentation is the standardized text from IMO SN.1/Circ.289 and that, for value 127 of the "Notice Description", the alphanumeric presentation is the content of the "Associated Text".

Confirm by observation that the viewing date and viewing date range are user selectable and that, when charted information is present, then the viewing date or viewing data range is common with charted information.

Confirm by observation that there is a permanent indication when viewing date or viewing date range does not include current date and that, when charted information is present, this indication is common with the indicator for the charted information.

Use the AIS simulator and confirm by observation that graphical presentation of AIS ASM objects which include the "end of validity" concept are only presented graphically when the viewing date or viewing date range overlaps the validity period.

Use the AIS simulator and confirm by observation that AIS ASM objects do not initiate any alerts.

5.16 Presentation of AIS synthetic target

5.16.1 Requirement

Presentation of AIS synthetic targets may be provided. If presentation of AIS synthetic targets is provided:

- a) the user manual shall specify the processing and display capacity of AIS synthetic targets. The processing capacity shall be at least 40 AIS synthetic targets and the display capacity shall be at least 20 AIS synthetic targets;
- b) it shall be possible to add or remove AIS synthetic targets from the display as a single layer, but not as individual objects;
- c) means may be provided to filter displayed AIS synthetic targets, for example based on range, speed, course if the information is available;
- d) AIS synthetic targets shall be displayed at the predicted position. The symbol shall be as defined in Annex A;

NOTE 1 FI = 17 VTS-generated/synthetic message includes velocity information. FI = 22 or FI = 23 Area Notices do not include velocity information.

- e) an AIS synthetic target selected for the display of its alphanumeric information shall be identified by the relevant symbol given in Annex A;
- f) for each AIS synthetic target selected for the display of its alphanumeric information, the following information shall be presented:
 - 1) when FI = 17, target identifier;
 - 2) reported position;
 - 3) calculated range from own ship to AIS synthetic target;
 - 4) calculated bearing from own ship to AIS synthetic target;
 - 5) when FI = 17, reported COG (or calculated CTW if the display is sea stabilised). In sea stabilized display, the reported COG shall at least be available on demand;
 - 6) when FI = 17, reported SOG (or calculated STW if the display is sea stabilised). In sea stabilized display, the reported SOG shall at least be available on demand;
 - 7) additional information, where available, shall be provided to the user on request;

If the received AIS synthetic target information is incomplete, then the absent information shall be clearly indicated in the related data field as missing.

The information for a selected AIS synthetic target shall be displayed and continually updated, until another target, AIS data report, AIS locating device or AIS synthetic target is selected for information display or, if applicable, until the user dialogue area is closed.

NOTE 2 Information can be displayed in a separate user dialogue area.

- g) AIS synthetic targets shall be automatically removed after 18 min from the last received report;

NOTE 3 Assumed nominal reporting interval is 6 min.

- h) if applicable, AIS synthetic targets shall be automatically removed after the end date and time specified or after receiving a cancellation message;
- i) AIS synthetic targets shall not initiate any alerts;
- j) there shall be an indication, or an alert (e.g. a caution) if specified by individual equipment standards, when the processing or display capacity for AIS synthetic targets has been exceeded.

5.16.2 Methods of test and required results

Where presentation of AIS synthetic targets is provided:

- a) confirm by observation that the user manual specifies the processing and display capacity of AIS synthetic targets and that at least the minimum capacities are provided;
- b) use the AIS simulator and confirm by observation that it is possible to add or remove AIS synthetic targets from the display as a single layer, but not as individual objects;
- c) if provided, use the AIS simulator and confirm by observation that means are provided to filter displayed AIS synthetic targets, for example based on range, speed, course;
- d) use the AIS simulator and confirm by observation that an AIS synthetic target is displayed at the predicted position and that the AIS synthetic target is not capable of being processed, for example updated by dead reckoning. Confirm by observation that the symbol is as defined in Annex A;
- e) use the AIS simulator and confirm by observation that an AIS synthetic target selected for the display of its alphanumeric information is identified by the relevant symbol given in Annex A;
- f) use the AIS simulator and confirm by observation that, for each selected AIS synthetic target, the following information is presented in alphanumeric form:
- 1) when FI = 17, target identifier;
 - 2) reported position;
 - 3) calculated range from own ship to AIS synthetic target;
 - 4) calculated bearing from own ship to AIS synthetic target;
 - 5) when FI = 17, reported COG (or calculated CTW if the display is sea stabilised). In sea stabilized display, the reported COG is at least be available on demand;
 - 6) when FI = 17, reported SOG (or calculated STW if the display is sea stabilised). In sea stabilized display, the reported SOG is at least be available on demand;
 - 7) additional information, where available on user's request;

Confirm by observation that there is a clear indication of absent information in the related data field.

Confirm by observation that information displayed for a selected AIS synthetic target is continually updated and that the information displayed for a selected AIS synthetic target remains displayed until another target, AIS data report, AIS locating device or AIS synthetic target is selected or the user dialogue is closed;

- g) use the AIS simulator and confirm by observation that an AIS synthetic target is automatically removed after 18 min from the last received report;

- h) use the AIS simulator and confirm by observation that, if applicable, an AIS synthetic target is automatically removed after the end date and time specified or after receiving a cancellation message;
- i) use the AIS simulator and confirm by observation that AIS synthetic targets do not initiate any alerts;
- j) use the AIS simulator and confirm by observation that there is an indication, or an alert (e.g. a caution) if specified by individual equipment standards, when the processing or display capacity for AIS synthetic targets has been exceeded.

5.17 Presentation of association of DSC received call with a displayed AIS object

5.17.1 Requirement

Presentation of DSC received call associations may be provided. If presentation of DSC received call associations is provided:

- a) DSC received calls shall be associated with an AIS object based on MMSI. If the equipment has no AIS object with the same MMSI, then the DSC received call shall not be presented graphically;

NOTE 1 Typical AIS objects for this association include AIS targets, AIS locating devices and AIS synthetic targets.

- b) the user manual shall specify the processing and display capacity of associations of DSC received calls. The processing capacity shall be at least 40 associations of DSC received calls and the display capacity shall be at least 20 associations of DSC received calls;
- c) it may be possible to add or remove DSC received calls from the display as a single layer, but not as individual objects;
- d) if an AIS object, for which an association of a DSC received call is available, is displayed and, where applicable, if the layer of association of DSC received calls is enabled, then the appropriate symbol 5.16 given in Annex A shall be displayed;
- e) if an AIS object, for which an association of a DSC received call is available, is selected for the display of its alphanumeric information, then the information received for the association of the DSC received call shall be readily available;

NOTE 2 The AIS object associated with the DSC received call contains itself a lot of up-to-date information which is available from the selected AIS object itself.

NOTE 3 Some examples of alphanumeric information available from DSC, DSE, ECI sentences include: type of DSC call, category of distress call, nature of distress, time of reception.

- f) it shall be possible for the user to remove an association of a DSC received call from the database;
- g) an association of a DSC received call shall be automatically removed from the database after 8 h from the last received report;

NOTE 4 The above requirement assumes reporting is just a single report.

- h) association of DSC received calls with an AIS object shall not initiate any alerts;
- i) there shall be an indication, or an alert without audible announcement (i.e. a caution) if specified by individual equipment standards, when the processing or display capacity for association of DSC received calls has been exceeded.

5.17.2 Methods of test and required results

Where presentation of association of DSC received calls is provided:

- a) use the DSC simulator and the AIS simulator to provide DSC received calls and confirm by observation that an association of DSC received call is connected to an AIS object based on MMSI. Use the simulator arrangement and confirm by observation that, if the equipment has no AIS object with same MMSI, then the association of DSC received call is ignored;
- b) confirm by observation that the user manual specifies the processing and display capacity of association of DSC received calls and that at least the minimum capacities are provided;

- c) use the DSC simulator and the AIS simulator to provide DSC received calls and confirm by observation that, if applicable, it is possible to add or remove association of DSC received calls from the display as a single layer, but not as individual objects;
- d) use the DSC simulator and the AIS simulator to provide a DSC received call and confirm by observation that if an AIS object, for which an association of DSC received call is available, is displayed and if the layer of association of DSC received call is enabled, then the symbol 5.16 given in Annex A is displayed;
- e) use the DSC simulator and the AIS simulator to provide a DSC received call and confirm by observation that, if a target for which the association of DSC received call is available, is selected for the display of its alphanumeric information, then the information received for the association of DSC received call is readily available;
- f) use the DSC simulator and the AIS simulator to provide a DSC received call and confirm by observation that user can remove the association of DSC received call from the database;
- g) use the DSC simulator and the AIS simulator to provide a DSC received call and confirm by observation that the association of DSC received call is automatically removed after 8 h from the last received report;
- h) use the DSC simulator and the AIS simulator to provide DSC received calls and confirm by observation that association of DSC received calls do not initiate any alerts;
- i) use the DSC simulator and the AIS simulator to provide DSC received calls and confirm by observation that there is an indication, or an alert without audible announcement (i.e. a caution) if specified by individual equipment standards, when the processing or display capacity for association of DSC received calls has been exceeded.

5.18 AIS ASM information extending reported AIS target information

5.18.1.1 Requirement

Presentation of AIS ASM information extending reported AIS target information may be provided. Table 8 specifies the reported AIS target information extended by AIS ASM messages and the function identifiers (FI) of AIS ASM messages which extends the reported AIS target information (see 5.5.11).

If presentation of AIS ASM information extending reported AIS target information is provided, the extended reported AIS target information of Table 8 shall be linked to the reported AIS target information (see 5.5.11) and shall be available on demand in alphanumeric form.

NOTE AIS ASM (DAC = 001, FI = 16 or FI = 24) are available to be sent by AIS equipment by internal decision or by external request. The assumed reporting rate is every 6 min.

Table 8 – Extended reported AIS target information from AIS ASM

Reported AIS target extended information (IMO SN.1/Circ.289)	AIS ASM source FI
Last Port of Call	24
Next Port of Call	24
Air Draught	24
Diesel	24
Gross tonnage	24
Heavy fuel oil	24
Ice class	24
Laden or Ballast	24
Light fuel oil	24
Lloyd's Ship type	24
Number of Persons	16,24

Reported AIS target extended information	AIS ASM
Second Port of call	24
Shaft Horse power	24
SOLAS Equipment status	24
Total amount of bunker oil in tonnes	24
VHF Working channel	24

5.18.1.2 Methods of test and required results

Where presentation of AIS ASM information extending reported AIS target information is provided, use the AIS simulation to provide each item of reported AIS target information in Table 8 and confirm by observation that the information is available on demand.

5.19 Received AIS safety related messages

5.19.1 Requirements

Presentation of received AIS safety related messages may be provided. If provided, these requirements apply unless otherwise specified by an individual equipment standard.

The received AIS safety related messages consist of AIS safety related messages sent by AIS targets, AIS base stations and AIS SAR aircraft. The presentation of AIS safety related messages is independent of the graphical presentation of the AIS target, AIS base station, or AIS SAR aircraft.

The user shall be able to tag individual safety related messages for permanent retention (retained). These messages shall not be overwritten by new messages. When no longer required, or when the storage capacity available for retained messages has been reached, the user shall be able to remove the tag on these messages which may then be overwritten in normal course.

The user manual shall specify the processing capacity of received AIS safety related messages. The processing capacity shall be at least 60 AIS safety related messages sub-divided as last 20 addressed, last 20 broadcast and 20 retained by user. AIS safety related messages sent by AIS locating devices and AIS AtoNs are processed and managed separately, see 5.14 and 5.13.

Received AIS safety related messages shall be linked to a source based on MMSI.

If an AIS target, AIS base station or AIS SAR aircraft for which an unread received AIS safety related message is available or if the content of a received AIS safety related message is selected for display is displayed, then the appropriate symbol given in Annex A (symbol 5.16) shall be displayed based on user selection. It shall not be possible to remove individual symbols associated with the received AIS safety related message sources from the presentation.

In this document, there are no requirements for synchronization of this functionality between individual equipment (e.g. between AIS and Radar).

Users shall have means (for example a list of received messages) to retrieve and individually view the field "safety related text" and the UTC time, if available, of receipt by the display equipment of at least the last 20 addressed and last 20 broadcast AIS safety related messages received and at least 20 received AIS safety related messages retained by the user. Using these means, the user shall be able to select the related AIS object based on MMSI for alphanumeric presentation of information.

Users shall have means to remove any individual or all received AIS safety related messages. After changing a single or all received AIS safety related messages in the storage to "retained" or "read" or after manual or automatic removal of a single or all unread received AIS safety related messages, the related symbol 5.16 given in Annex A shall no longer be displayed.

Received AIS safety related messages having identical source and content shall replace existing messages that they duplicate and shall maintain the status of the received AIS safety related message, retained, read or unread, as it was before. The time of receipt shall be set based on the newly received AIS safety related message.

The oldest not retained received AIS safety related message shall be automatically removed when the storage capacity for the last received messages is fully occupied and a new AIS safety related message is received.

An indication that there are unread received AIS safety related messages available shall be provided.

An indication of which received AIS safety related-messages are unread or retained shall be provided.

5.19.2 Methods of test and required results

If presentation of received AIS safety related messages from AIS targets, AIS base stations and AIS SAR aircraft is provided, apply the following tests, unless otherwise specified by an individual equipment standard:

- a) confirm by observation that the user manual specifies the processing capacity of received AIS safety related messages and that at least the minimum capacities are provided;
- b) use the AIS simulator to send the storage capacity of the equipment plus one received AIS safety related message and confirm by observation that:
 - the storage capacity for AIS safety related messages is at least the last 20 addressed and the last 20 broadcast received messages plus at least 20 retained messages;
 - the oldest received message has been automatically removed;
 - each received AIS safety related message is initially in the state of "unread";
 - there is an indication that there are "unread" received AIS safety related messages available;
 - received AIS safety related messages are linked to the sources based on MMSI;
 - duplicate received AIS safety related message having identical source and content replace existing message and maintain the status, retained, read or unread, as it was before;
 - when enabled by the user, AIS targets, AIS base stations and/or AIS SAR aircraft with linked and unread received AIS safety related messages are indicated by appropriate symbols in connection to the displayed AIS target, AIS base station and/or AIS SAR aircraft symbols;
 - when enabled by the user, an AIS target, AIS base station or AIS SAR aircraft for which the content of a received AIS safety related message is selected for display is indicated by an appropriate symbol in connection to the displayed symbol of AIS target, AIS base station or AIS SAR aircraft;
 - it is not possible to remove received AIS safety related message symbols from AIS targets, AIS base stations and AIS SAR aircraft based on individual received AIS safety related messages;
- c) confirm by observation that it is possible to remove any individual or all received AIS safety related messages;

- d) confirm by observation that a duplicate AIS safety related message replaces the existing message maintaining the status of the existing message retained, read or unread, as it was before and that the time of receipt is set based on the newly received AIS safety related message;
- e) confirm by observation that the alphanumeric content and the time of receipt of each received AIS safety related message is available for viewing together with the state (unread/read/retained) indication applicable for the individual received AIS safety related message;
- f) confirm by observation that, after changing all received AIS safety related messages in the storage to "read" or "retained", the indication of unread received AIS safety related messages available is no longer displayed;
- g) confirm by observation that, using the means provided, the user is able to select the related AIS object based on MMSI for alphanumeric presentation of information;
- h) confirm by observation that, after changing a single or all received AIS safety related messages in the storage to "retained" or "read" or after manual or automatic removal of a single or all unread received AIS safety related messages, the related symbols (5.16, see Annex A) are no longer displayed.

5.20 Sent AIS safety related messages

5.20.1 Requirements

Facilities to send AIS safety related messages may be provided. If provided, these requirements apply unless otherwise specified by an individual equipment standard.

It shall not be possible to send AIS addressed safety related messages to AIS targets which have reported the DTE indicator = 1 (not available).

NOTE The purpose of the data terminal equipment (DTE) indicator is to indicate to an application on the receiving side that, if set to available, the transmitting station conforms at least to the minimum keyboard and display requirements.

5.20.2 Methods of test and required results

If facilities to send AIS safety related messages are provided and unless otherwise specified by an individual equipment standard, confirm by observation that, when a safety related message is sent to an AIS target and the state of the addressed AIS target is DTE = 1, an indication is given that the sent AIS safety related message may not be displayed at the recipient.

6 INS, radar and chart displays

6.1 General

6.1.1 Application

NOTE See IEC 62388 for equivalent tests for Clause 6 for radar equipment.

The provisions of this Clause 6 are applicable to stand-alone displays, associated with radar systems or responsible for the presentation of electronic chart information (for example, ECDIS) and multifunction display equipment when providing a radar or chart display.

6.1.2 Multifunction displays

6.1.2.1 Requirement

(MSC191/7.1.1) *If the display equipment is capable of supporting the presentation of multiple functions or operational modes, then there shall be a clear indication of the primary function supported by the presentation (for example, radar, chart, etc.). It shall be possible to select the presentation associated with the primary function, for example, the radar presentation (see 6.2) or the chart presentation (for example, ECDIS) (see 6.3), by a simple operator action.*

6.1.2.2 Methods of test and required results

Where display equipment is capable of supporting the presentation of multiple functions:

- a) confirm by observation that the primary function of the display equipment is clearly indicated;
- b) confirm by observation that the presentation associated with the primary function can be selected by a simple operator action.

6.1.3 Simultaneous display of radar and chart data

6.1.3.1 Requirement

(MSC191/7.1.2) *If a radar video image and electronic chart information are displayed together, the chart and the radar video image shall use the same reference system and co-ordinate criteria, including, as applicable, datum, CCRP, and stabilisation mode, and shall match in scale, projection and orientation. Any user-entered offset, in addition to installation alignment (for example, to CCRP and/or heading reference), shall be indicated. The details of the offset shall be readily available to the user.*

NOTE The Performance Standards for individual navigational systems and equipment provide functional requirements for offsets.

6.1.3.2 Methods of test and required results

Where a radar video image and electronic chart information are displayed together:

- a) confirm by observation that they use the same reference system and co-ordinate criteria;
- b) confirm by observation that they use the same stabilisation mode;
- c) confirm by observation that they match in scale, projection and orientation;
- d) confirm by observation that an indication is provided for any user-entered offset to the presentation of either the radar video image or the electronic chart information;
- e) confirm by observation that the details of the user-entered offset are readily available.

6.1.4 Range scales

6.1.4.1 Requirement

(MSC191/7.1.3) *If a radar video image is displayed, range scales of 0,25, 0,5, 0,75, 1,5, 3, 6, 12 and 24 nautical miles shall be provided. Additional range scales are permitted below 0,25 NM and/or above 24 NM. The selected range scale shall be clearly and permanently or persistently indicated, as appropriate for the application.*

Metric units may also be provided. (See also 5.10.2.)

6.1.4.2 Methods of test and required results

Where a radar video image is displayed:

- a) confirm by observation that range scales of 0,25, 0,5, 0,75, 1,5, 3, 6, 12 and 24 NM are provided for user selection;
- b) where additional range scales are provided, confirm by observation that they are below 0,25 NM and/or above 24 NM;
- c) confirm by observation that the selected range scale is clearly indicated and remains visible while the radar video image is displayed.

6.1.5 Operational display area

6.1.5.1 Requirement

(MSC191/7.1.5) *No part of the operational display area shall be permanently used for the presentation of information that is not part of the navigational presentation (for example, pop up displays, drop down menus and information windows). Temporary, limited and relevant alphanumeric data, information and text may be displayed adjacent to a selected symbol, graphic or target within the operational display area.*

Any windows containing text, diagrams, etc. superimposed on the operational display area shall be temporary and movable (for example, to a less important part of the display, such as on land).

Note that display equipment should avoid the use of dialogue boxes using white backgrounds, or provide a means or method of automatically changing the background of dialogue boxes which appear on displays set for use in dusk or dark conditions.

6.1.5.2 Methods of test and required results

The methods of test and the required results are as follows:

- a) confirm by observation that any information that is not part of the navigational presentation but is superimposed on the operational display area is presented only in response to an explicit user action (for example, a menu selection, hyperlink, hot key, etc.);
- b) confirm by observation that any windows containing text, diagrams, etc. superimposed on the operational display area are movable within the operational display area or can be removed from the operational display area.

6.1.6 Motion display modes

6.1.6.1 Requirement

A clear indication of the motion mode in use shall be provided. (See also 4.10.1)

6.1.6.2 Methods of test and required results

Verify that a clear indication of the display mode in use is provided in accordance with 4.10.1.

6.1.7 Orientation modes

6.1.7.1 Requirement

A north up orientation mode shall be provided for radar and chart presentations.

A course up orientation mode shall be provided for radar presentations and may be provided for chart presentations.

A head up orientation mode may be provided for both radar and chart presentations.

A clear indication of the orientation mode in use shall be provided. (See also 4.10.1)

It shall always be possible to display the SENC information in a north-up orientation. Other orientations are permitted. When such orientations are displayed, the orientation shall be altered in steps large enough to avoid unstable display of the chart information.

6.1.7.2 Methods of test and required results

The methods of test and the required results are as follows:

- a) confirm by observation that a north up orientation mode is provided;
- b) for radar displays, confirm by observation that a course up orientation mode is provided;
- c) verify that a clear indication of the orientation mode in use is provided in accordance with 4.10.1;
- d) for each bearing stabilised orientation that may be provided, confirm by analytical evaluation that, for rates of turn between $0^{\circ}/s$ and $20^{\circ}/s$, the displayed chart symbols and text in the operational display area do not re-orient more often than twice per second and remain legible.

6.1.8 Off-centring

6.1.8.1 Requirement

If a radar video image is displayed, manual off-centring shall be provided to locate the selected antenna position (i.e. the centre of the radar video image) at any point within at least 50 % and not more than 75 % of the radius, measured from the centre of the operational display area. This limitation is only applicable for Radar or Radar-mode available in the equipment (for example, this limitation is not valid for radar overlay in an ECDIS).

If a radar video image is displayed, and an off-centred display is selected, the selected antenna position shall be capable of being located to any point on the display up to at least 50 %, and not more than 75 %, of the radius from the centre of the operational display area. A facility for automatically positioning own ship for the maximum view ahead may be provided. This limitation is only applicable for Radar or Radar-mode available in the equipment (for example, this limitation is not valid for radar overlay in an ECDIS).

If a radar video image is displayed, and an off-centred display and true motion display mode are selected, the selected antenna position shall automatically reset at least 50 %, and not more than 75 %, of the radius from the centre of the operational display area to a location giving the maximum view along own ship's course. Provision for an early reset of the selected antenna position shall be provided. This limitation is only applicable for Radar or Radar-mode available in the equipment (for example, this limitation is not valid for radar overlay in an ECDIS).

6.1.8.2 Methods of test and required results

Where a radar video image is displayed in a Radar or Radar-mode (not, for example, as a radar overlay on ECDIS):

- a) confirm by observation that manual off-centring is provided;
- b) confirm by observation that manual off-centring provides the capability to locate the selected radar antenna position at any point in the operational display area at least 50 % and not more than 75 % of the radius measured from the centre;
- c) where an off-centred display and true motion display mode is selected,
 - 1) confirm by observation that the selected radar antenna position is automatically reset at least 50 %, and not more than 75 %, of the radius from the centre of the operational display area,
 - 2) confirm by observation that the user may manually reset the selected radar antenna position.

6.1.9 Stabilisation modes

6.1.9.1 Requirement

If electronic chart information is displayed, then a ground stabilisation mode shall be provided.

Where radar information is displayed, both ground and sea stabilisation modes shall be provided.

The stabilisation mode and stabilisation source (i.e. velocity or speed source) shall be clearly indicated. (See also 4.10.1.)

NOTE Ground stabilisation requires a ground-referenced velocity (i.e. COG/SOG) from an external sensor capable of providing own ship speed measured over the ground (for example, an EPFS). Sea stabilisation requires a water-referenced velocity (i.e. CTW/STW or HDG/SPD) from an external sensor capable of providing own ship speed measured through the water (for example, an SDME).

6.1.9.2 Methods of test and required results

The methods of test and the required results are as follows:

- a) where electronic chart information is displayed, confirm by observation that a ground stabilisation mode is provided;
- b) where a radar information is displayed, confirm by observation that both ground and sea stabilisation modes are provided;
- c) confirm by observation that a clear indication of the stabilisation mode selected and its source are provided.

6.2 Radar displays

6.2.1 Application

The provisions of 6.2 are applicable to stand-alone displays associated with radar systems and multifunction displays when providing a radar display.

NOTE The functional requirements for radar are defined in the performance standards set forth in IMO Resolution MSC.192(79) and further specified in IEC 62388. The presentation requirements for radar information are defined in the performance standards for presentation set forth in IMO Resolution MSC.191(79) and further specified in this document.

6.2.2 Radar video image

6.2.2.1 Requirement

(MSC191/7.2.1.1) The *radar video image* (i.e. echoes), *tracked radar targets* and *reported AIS targets* shall *not be substantially degraded, masked or obscured by other presented information*. (See also 5.4.1.)

(MSC191/7.2.1.2) *It shall be possible to temporarily suppress all graphical information from the display, retaining only the radar video image and target trails.*

6.2.2.2 Methods of test and required results

The methods of test and the required results are as follows:

- a) confirm by analytical evaluation that the presentation of the radar video image, tracked radar targets and reported AIS targets is not degraded, masked or obscured by other presented information;
- b) confirm by observation that the user can suppress the presentation of all graphical information so that only the radar video image and target trails remain.

6.2.3 Brightness of radar information

6.2.3.1 Requirement

(MSC191/7.2.1.3) *The brightness of the radar video image (i.e. echoes) and associated graphic symbols for tracked radar targets shall be variable. It shall be possible to control the brightness of all displayed radar information. There shall be independent means to adjust the brightness of groups of displayed graphics and alphanumeric data, information and text (for example, tracked radar targets, navigation tools, etc.). The brilliance (i.e. brightness) of the heading line shall not be variable to extinction.*

6.2.3.2 Methods of test and required results

The methods of test and the required results are as follows:

- a) confirm by observation that a means or method to adjust the brightness of the radar video image is provided;
- b) confirm by observation that a separate independent means or method to adjust the brightness of tracked radar target symbols is provided;
- c) confirm by observation that a separate independent means or method to adjust the brightness of groups of other displayed graphics and alphanumeric data, information and text is also provided;
- d) confirm by observation that the brightness of the heading line cannot be adjusted to the point of extinction.

6.2.4 Display of chart information on radar

6.2.4.1 Requirement

(MSC191/7.2.2.1) *Vector format electronic chart information may be presented on a radar display. This shall be accomplished using layers (i.e. of charted objects or elements) selected from an electronic chart database. As a minimum, the elements of the ECDIS Standard Display (see IEC 61174) shall be available for individual selection by IMO display category or layer (for example, by IHO suggested viewing group, see IHO S-52), but not as individual objects. As far as practical, electronic chart information shall be presented in accordance with this document (see 4.5.1, 4.6.2 and 5.5.1) and with the ECDIS Performance Standards (IEC 61174). Raster navigational charts are not permitted for chart radar applications.*

NOTE IEC 62388 requires a subset of the ECDIS standard display, called the primary chart information set, to be made available by a primary control function.

(MSC191/7.2.2.3) *If electronic chart information is displayed on a radar presentation, then there shall be a permanent or persistent indication of its status (for example, on/off, official/unofficial data, overscale/underscale, etc.), as appropriate for the application. The source and update information shall also be available to the user on demand.*

Note that the overscale area pattern addressed in the relevant IHO standards, for example IHO S-52 and IHO ECDIS Presentation Library, may obscure or degrade the presentation of the radar video image. An alternative means or method of overscale indication (for example, the display of an overscale factor) is an acceptable alternative.

If electronic chart information is presented on a radar display, it shall be possible to temporarily remove it by a single operator action and also to switch charts on and off.

6.2.4.2 Methods of test and required results

When vector format electronic chart information is presented on a radar display:

- a) confirm by observation that the content of the electronic chart database includes all of the elements specified by the IMO for the ECDIS standard display (see IEC 61174);

- b) confirm by observation that elements of the standard display are available for selection (i.e. for display) by IMO display category and/or by layer, but not as individual chart objects;
- c) verify the presentation of vector format electronic chart information in accordance with 4.5.1, 4.6.2 and 5.5.1;
- d) confirm by observation that raster format electronic chart information cannot be presented when the radar is displayed;
- e) where electronic chart information is presented in shades of grey, confirm that they are distinguishable between respective chart features;
- f) confirm by observation that a permanent indication of the status (official/unofficial data and overscale/underscale) of the electronic chart information is provided;
- g) confirm by observation that the source of the electronic chart information and its update information are available to the user on demand;
- h) confirm by observation that the user may temporarily remove electronic chart information from the display by a single operator action and that there is a facility to switch charts on and off. The temporarily removed function may be combined with other functions;
- i) confirm by document inspection that the user manual describes all available chart functionalities;
- j) confirm by document inspection that the EUT has no functionality to use raster navigational charts;
- k) verify the testing of colours and intensity in accordance with the test methods and required results of the Annex G.

6.2.5 Priority of radar information

6.2.5.1 Requirement

(MSC191/7.2.2.2) *If electronic chart information is presented within the operational display area, the presentation of radar information (for example, the radar video image, target trails, etc.) shall have priority. The electronic chart information shall be clearly perceptible as such. The electronic chart information shall not substantially degrade, mask or obscure the radar video image, tracked radar targets or reported AIS targets.*

6.2.5.2 Methods of test and required results

When electronic chart information is presented on a radar display:

- a) confirm by observation that the radar video image and target trails have display priority over the electronic chart information;
- b) confirm by analytical evaluation that the presentation of electronic chart information cannot be confused with the display of any other information (for example radar information or AIS information);
- c) confirm by analytical evaluation that the presentation of the electronic chart information does not substantially degrade, mask or obscure the presentation of radar information in accordance with 6.2.2.

6.2.6 Display of map graphics

6.2.6.1 Requirement

(MSC191/7.2.3) User generated radar *map graphics* including monitored and/or additional planned routes *may be* presented on a radar display, *but shall not substantially degrade, mask or obscure the radar video image, target trails, tracked radar targets, reported AIS targets, or electronic chart information.*

Where a radar system provides map graphics for monitored and/or planned routes, it shall comply with the relevant clauses of IEC 61174.

Map graphics may be referenced to own ship or to a geographical position. It shall be possible to remove the display of map graphics by a simple operator action.

Map graphics may consist of lines, symbols and reference points.

The appearance and colours of map graphic lines and symbols are set forth in Annex A.

6.2.6.2 Methods of test and required results

When user generated map graphics are displayed on a radar presentation:

- a) confirm by analytical evaluation that map graphics do not substantially degrade, mask or obscure the radar video image, target trails, tracked radar targets, reported AIS targets or electronic chart information;
- b) confirm by observation that map graphics can be referenced to own ship or to a geographic position;
- c) confirm by observation that the user may remove the display of map graphics by a simple operator action;
- d) confirm by observation that the appearance and colour of the map graphics lines, symbols and reference points are in accordance with Annex A;
- e) where a radar system provides map graphics for monitored and/or planned routes, confirm by documented evidence that it complies with the relevant clauses of IEC 61174.

6.3 Chart displays

6.3.1 Application

The provisions of 6.3 are applicable to stand-alone displays responsible for the presentation of electronic chart information and multifunction displays when providing a chart display.

NOTE The functional requirements for ECDIS are defined in the performance standards set forth in IMO Resolution MSC.232(82) and further specified in IEC 61174. The presentation requirements for electronic chart information are defined in the performance standards for presentation, set forth in IMO Resolution MSC.191(79) and further specified in this document.

6.3.2 Display of chart information

6.3.2.1 Requirement

(MSC191/7.3.1.1) Electronic chart information *and all updates to it shall be presented without any degradation of information content.*

(MSC191/7.3.1.2) Electronic *chart information shall not be substantially degraded, masked or obscured by other presented information* (for example, a radar video image, tracked and/or reported targets, etc.).

6.3.2.2 Methods of test and required results

The methods of test and the required results are as follows:

- a) verify the presentation of electronic chart information in accordance with 4.5.1, 4.6.2 and 5.5.1;
- b) confirm by analytical evaluation that the electronic chart information is not substantially degraded, masked or obscured by other presented information.

6.3.3 IMO ECDIS display categories

6.3.3.1 Requirement

(MSC191/7.3.1.3) *It shall be possible to temporarily suppress all supplemental (e.g. radar, AIS and other overlays) information from the chart display, retaining only chart related information contained in the ECDIS Display Base.* This function is not required to be of single or simple operator action.

It shall be possible to remove radar information, AIS information and other navigational information including all non-charted information from the chart display by a single operator action. Chart display consists of chart itself and all automatic and manual updates for it. This removal may be permanent or momentary.

ENC and other vector format electronic chart information available for presentation on a chart display during route planning and route monitoring shall be subdivided into the following three IMO display categories:

- ECDIS display base;
- ECDIS standard display; and
- all other information.

It shall be possible to present the ECDIS standard display at any time by a single operator action. This single operator action shall not change any non-chart related user settings for the display.

When a chart display is switched on following a switch off or power failure, it shall return to the most recent settings for the display.

6.3.3.2 Methods of test and required results

The methods of test and the required results are as follows:

- a) confirm by observation that the user can suppress the presentation of all graphical information so that only the electronic chart information in the ECDIS Display Base remains;
- b) confirm by observation that, by a single operator action, the user can permanently or momentarily remove the presentation of all additional information so that only the chart display including automatic and manual updates remains;
- c) verify the subdivision of vector format electronic chart information into IMO display categories in accordance with IEC 61174;
- d) verify that the user can select the ECDIS standard display at any time by a single operator action. Confirm by observation that this single operator action does not change any other display setting than the displayed layers of the electronic charts;
- e) confirm by observation that, when the chart display is switched on, the electronic chart information is presented with the most recent display settings.

6.3.4 Adding or removing information from the display

6.3.4.1 Requirement

(MSC191/7.3.1.4) *It shall be possible to add or remove information from the chart display by layer (IHO viewing group, see for example IHO S-52), but not as individual objects. It shall not be possible to remove information contained in the ECDIS Display Base (see IEC 61174) from the display.* (See also 6.3.2.)

6.3.4.2 Methods of test and required results

The methods of test and the required results are as follows:

- a) confirm by observation that the user can add and remove information from the presentation by layer but not as individual objects;
- b) confirm by observation that the user cannot remove information contained in the ECDIS display base;
- c) confirm by observation that IHO viewing groups can be individually selected for display.

6.3.5 Safety contour

6.3.5.1 Requirement

(MSC191/7.3.1.5) *It shall be possible to select a safety contour from the depth contours provided by vector format electronic chart information. The safety contour shall be emphasized over other contours on the display in accordance with the relevant IHO standards, for example IHO S-52.*

6.3.5.2 Methods of test and required results

The methods of test and the required results are as follows:

- a) confirm by observation that the user can select a safety contour from the depth contours provided in vector format electronic chart information;
- b) confirm by observation that the presentation of the safety contour is emphasised over other depth contours.

6.3.6 Safety depth

6.3.6.1 Requirement

(MSC191/7.3.1.6) *It shall be possible to specify a safety depth. Soundings equal to or less than the safety depth shall be emphasized whenever spot soundings are selected for display.*

6.3.6.2 Methods of test and required results

The methods of test and the required results are as follows:

- a) confirm by observation that the user can specify a safety depth;
- b) confirm by observation that the presentation of spot soundings less than or equal to the safety depth are emphasized over other spot soundings.

6.3.7 Chart scale

6.3.7.1 Requirement

(MSC191/7.3.1.7) *An indication shall be provided if chart information is displayed at a larger scale than contained in the electronic chart database, or if own ship's position is covered by electronic chart information at a larger scale than the presentation.*

(MSC191/7.3.1.8) *Overscaled areas presented on the chart display shall be identified as defined in the relevant IHO standards, for example IHO ECDIS Presentation Library in IHO S-52 and its Appendices.*

6.3.7.2 Methods of test and required results

The methods of test and the required results are as follows:

- a) confirm by observation that an indication is provided when chart information is presented at a larger scale than in the electronic chart database;

- b) confirm by observation that an indication is provided when own ship's position is covered by electronic chart information at a larger scale than the presentation;
- c) confirm by observation that overscaled areas presented on the display are identified.

6.3.8 Display of radar and target information

6.3.8.1 Requirement

(MSC191/7.3.2.1) A radar video image, tracked radar and reported AIS target information may be presented on a chart display but shall not substantially degrade, mask or obscure the presentation of electronic chart information. As far as practical, the radar video image and target information shall be presented in accordance with the radar Performance Standards (see IEC 62388) and with the presentation standards set forth in this document.

(MSC191/7.3.2.2) A radar video image, tracked radar and reported AIS target information shall be clearly distinguishable from the electronic chart information. It shall be possible to remove radar and target information by a simple operator action.

6.3.8.2 Methods of test and required results

The methods of test and the required results are as follows:

- a) verify that the radar video image is presented in accordance with 5.4.1 and 5.4.2, as applicable;
- b) verify that targets are presented in accordance with 5.5.8;
- c) verify that radar and target information are clearly distinguishable from chart information in accordance with 6.3.2;
- d) confirm by observation that radar and target information can be removed from the presentation by a simple operator action.

6.3.9 Display of additional information

6.3.9.1 Requirement

(MSC191/7.3.3.1) Information from additional sources may be displayed on ECDIS but shall not substantially degrade, mask or obscure the chart information.

(MSC191/7.3.3.2) Additional information (including information for route planning, route monitoring, information overlays and supplementary navigation tasks) shall be clearly distinguishable from the electronic chart information. It shall be possible to remove additional information by a simple operator action.

6.3.9.2 Methods of test and required results

The methods of test and the required results are as follows:

- a) verify the presentation of additional information in accordance with 4.6.2;
- b) verify that the presentation of electronic chart information is not degraded, masked or obscured by the presentation of additional information in accordance with 6.3.2;
- c) verify that additional navigation-related information is clearly distinguishable from chart information in accordance with 6.3.3;
- d) confirm by observation that additional navigation-related information can be removed from the presentation by a simple operator action.

6.4 Composite task-oriented presentations

6.4.1 User-configured presentations

6.4.1.1 Requirement

(MSC191/7.4.1) *The user may configure a presentation for a specific task-at-hand. The presentation may include radar and/or electronic chart information, in combination with other navigation or ship related data or information. When not fully compliant with the relevant Performance Standards, such a presentation shall be identified as an auxiliary presentation.*

6.4.1.2 Methods of test and required results

The methods of test and the required results are as follows:

- a) if the user can configure presentations for the task-at-hand, confirm by inspection of documented evidence that all tasks configurable are noted in the manual;
- b) confirm by analytical evaluation that, for all tasks listed in the user documentation, the relevant related data and information are displayed;
- c) confirm that the display is fully compliant with the relevant performance standards either by analytical evaluation or inspection of the relevant test reports related to the task-at-hand for which test standards exists.

If the display is not fully compliant with the relevant performance standards, confirm by observation that a clear indication as an auxiliary presentation is provided.

6.4.2 Information associated with the task-at-hand

6.4.2.1 Requirement

(MSC191/7.4.2) *As far as practical, the presentation of any radar and/or chart related functions shall be compliant with the requirements of the relevant Performance Standards and of the presentation standards set forth in this document, with the exception of size requirements for the operational display area. Windows of chart or radar information may be presented along with other information associated with the task-at-hand.*

6.4.2.2 Methods of test and required results

The methods of test and the required results are as follows:

- a) confirm by inspection of test reports that the Radar and/or chart related functions are compliant with the relevant Performance Standards;
- b) confirm by analytical evaluation or inspection of the relevant test reports that the content and the physical display are compliant with the relevant parts of the presentation standards. Document the size of the operational display in use;
- c) confirm by analytical evaluation that the presentation of chart and radar information along with other information associated with the task-at-hand, if available, is in line with this document.

6.5 Single and simple operator actions

6.5.1 Applicability

The requirements of this Subclause 6.5 are from a recommendatory source for ECDIS, radar and INS. The implementation of this recommendation is optional. Manufacturers shall declare if these requirements have been implemented. The following requirements are applicable, if the manufacturer has declared implementation of Appendix 4 of MSC.1/Circ.1609.

6.5.2 Requirement

(MSC.1/Circ.1609/Appendix 4/3) *The inclusion of non-mandatory functions in the tables of Annex H does not make such functions 'mandatory' to provide. Where the functions in the tables of Annex H are included within navigation equipment, such functions shall comply with the criteria listed in the tables of Annex H.*

(MSC.1/Circ.1609/Appendix 4/1) *Where the equipment provides the functions listed in the tables of Annex H, access shall be as defined as in the tables of Annex H except where conformance is mandated by individual equipment standards. A requirement for information to be presented on single operator action may alternatively be met by a permanent indication.*

(MSC.1/Circ.1609/Appendix 4/2) *Care will need to be taken when adding single and simple operator action buttons to displays. The manufacturer/operator shall consider keeping the display area for the main function of the equipment as much as possible for user operability. It may be more useful to contain shortcut buttons under one setting menu rather than add many icons to the desktop.*

NOTE Single operator action functions available from physical controls outside of the display area are not part of the above requirements.

Manufacturers shall declare all functions available in the display area for single operator action and not listed as such in Annex H. The manufacturer's declaration shall include reasons why such functions are available as single operator action.

6.5.3 Methods of test and required results

The methods of test and the required results are as follows:

- a) confirm by observation that, if provided, functions listed in Annex H have been implemented as single or simple operator action according to Annex H;
- b) refer to manufacturer's declaration and confirm by analytical evaluation that any additional single operator action function, if available in the display area, is appropriate for being available in the highest level of the user interface.

6.6 User and default settings

6.6.1 General

The requirements of this Subclause 6.6 are from a recommendatory source for ECDIS, radar and INS. The implementation of these recommendations is optional. Manufacturers shall declare if these requirements have been implemented.

6.6.2 User-settings

6.6.2.1 Requirement

(MSC.1/Circ.1609/Appendix 5/1) *A facility shall be provided to store and recall user-specific settings to suit the conditions at hand. At least two such configurations shall be available to be stored for recall. Selection for recalling a stored configuration shall be followed by an action to confirm the selection.*

User specific settings shall include at least all settings specified for default settings, see Annex I. Manufacturers may include additional settings into the user specific settings. All settings shall be documented in the user manual.

6.6.2.2 Methods of test and required results

The methods of test and the required results are as follows:

- a) confirm by observation that user specific settings include at least all default settings, see Annex I;
- b) confirm by inspection of the user manual that all settings included into user specific settings are part of the documentation;
- c) confirm by observation that it is possible to store and recall at least two user specific settings;
- d) confirm by observation that the recall of user specific settings requires the user to confirm the selection before application of the settings.

6.6.3 Default settings

6.6.3.1 Requirement

(MSC.1/Circ.1609/Appendix 5/2) *A facility shall be provided to apply a set of default settings to return the equipment to a known default state, see Annex I. The default settings are intended to provide a basic and minimal mode of operation for the system or equipment that can be built upon by the user.*

(MSC.1/Circ.1609/Appendix 5/3) *Default settings are not intended to provide a redundant setting in the event of an equipment failure or loss of input.*

6.6.3.2 Methods of test and required results

Confirm by observation that the default settings include all settings specified in Annex I.

7 Physical requirements

7.1 General

The provisions of this Clause 7 are applicable to the physical displays associated with all navigational systems and equipment on the bridge of a ship. The equipment manufacturer may provide documented evidence to show compliance with the requirements specified in Clause 7.

Display equipment shall comply with the applicable requirements of IEC 60945. (See 4.2.2.1.)

7.2 Display adjustment

7.2.1 Contrast and brightness

7.2.1.1 Requirement

(MSC191/8.1.1) *It shall be possible to adjust the contrast and brightness of the display, as applicable to the display technology. It shall be possible to dim the display. The range of control shall permit the display to be legible under all ambient light conditions likely to be experienced on the bridge of a ship (for example, day, dusk and night). The range of adjustment shall be sufficient to maintain the user's dark adaptation at night. (See also 4.4.1.)*

(MSC191/8.1.2) *It shall be possible for the user to reset the values of contrast and/or brightness to a preset or default condition.* The manufacturer's documentation shall identify the default conditions.

If the brightness adjustment is set for night, then means shall be provided to return to such a brightness level that it is possible to continue control under daylight.

If display equipment is intended to present electronic chart information (see 4.6.2), then it shall

- provide the user with the capability to reset the values of brightness and/or contrast to a calibrated colour performance reference setting for each of the ambient light conditions defined in Table 1, and
- prevent inadvertent adjustments by the user by restricting access to controls that may cause degradation of colour performance, such as gamma and colour temperature adjustments.

7.2.1.2 Methods of test and required results

The setup for measurements of contrast, luminance and colour shall be conducted in accordance with the guidelines of IEC 61966-4 or the VESA Flat Panel Display Measurement (FPDM) standard (see VESA-2001-6). Before measurements are taken, display equipment shall be powered up and allowed to stabilize for a period identified by the manufacturer. (See also Annex G.)

The following verifications are required:

- a) confirm by observation that a manual contrast control is provided, if applicable (for example, for CRT technology);
- b) confirm by observation that a manual brightness control is provided;
- c) confirm by observation that, after dimming the equipment for use at night, when daylight ambient conditions are applied, there are means to readjust for operation under daylight;
- d) verify the adjustment of contrast and brightness in accordance with 4.4.1: (See 4.4.1.2)
 - 1) confirm by observation that the contrast and brightness controls can be reset to their default values;
 - 2) where display equipment is intended to display chart information, confirm by measurement of luminance that a means or method is provided to return the contrast and brightness controls to their calibrated setting for each ambient light condition in accordance with Table 1. (See 4.4.1)
- e) confirm by inspection of documented evidence that the default conditions for contrast and brightness controls are identified.

7.2.2 Magnetic interference

7.2.2.1 Requirement

(MSC191/8.1.3) *If magnetic fields degrade the presentation of navigation-related information, then a means or method to neutralise the effects of magnetic fields shall be provided.*

7.2.2.2 Methods of test and required results

Confirm by inspection of documented evidence that a means or method to neutralise the effects of magnetic fields is provided if magnetic fields degrade the presentation of navigation-related information.

7.2.3 Temporal stability

7.2.3.1 Requirement

Display equipment shall be perceptually "flicker" free in direct and peripheral vision at the nominal viewing distance identified in the manufacturer's documentation in accordance with the perception thresholds, as defined in Clause G.2.

NOTE The perception threshold of "flicker" is known to vary for observers, depending on such factors as age, fatigue, ambient lighting conditions, frequencies, the displayed image size, image brightness and image content.

7.2.3.2 Methods of test and required results

Establish by inspection of documented evidence whether the luminance persistence (response time) of the display equipment is less than or more than 1 ms. The test methods are then as follows:

- a) for display equipment with a luminance persistence of 1 ms or more (for example, CRT, LCDs, etc.), confirm by analytical evaluation or measurement that the display equipment emits less energy in the temporal frequencies than an observer will detect as "flicker" (i.e. the predicted "flicker" threshold) according to G.2.3.1 under each ambient light condition specified in Table 1;
- b) for display equipment based on technologies which have a luminance persistence much less than 1 ms (for example, EL (electro luminescent), plasma, light emitting diodes (LED), etc.), confirm by analytical evaluation or measurement that the display equipment emits less energy in the temporal frequencies than an observer will detect as "flicker" according to G.2.3.2 under each ambient light test condition specified in Table 1.

7.2.4 Physical controls and status indicators

7.2.4.1 General

Physical controls for display equipment shall be locatable by visual or tactile means. If the display equipment has more than three adjacent controls (for example, knobs or switches), then labels with adjustable illumination shall be provided for identification of these controls. Labels shall comply with the legibility/readability requirements contained in 4.4.2 and 4.4.3.

Any illuminated status indicators separate from the main display (for example, built-in to the front panel of the monitor) shall be locatable by visual means. Adjustable illumination provided for labels and status indicators shall be suitable for all ambient light conditions likely to be experienced on the bridge of a ship (day, dusk and night) and with due consideration to the night vision of the officer of the watch.

Illumination shall be dimmable to produce a maximum brightness of not more than 1 cd/m² and may be extinguishable below that point.

7.2.4.2 Method of test and required results

The methods of test and the required results are as follows:

- a) confirm by observation that physical controls for display equipment, if available, are locatable by visual or tactile means;
- b) where more than three adjacent control knobs or switches exist, confirm by observation that they have labels with adjustable illumination and that the illuminated labels comply with the legibility/readability requirements contained in 4.4.2 and 4.4.3;
- c) where illuminated status indicators exist separate from the main display, confirm by observation that they are locatable by visual means;
- d) where adjustable illumination is provided, confirm by observation that illumination is dimmable to not more than 1 cd/m² and may be extinguishable below that point;
- e) confirm by observation that a visual indication of the presence of power to the display equipment is provided;
- f) confirm by observation that a visual indication of the presence of video signals to the display equipment is provided.

7.3 Screen size

7.3.1 Requirement

(MSC191/8.2.1) *Display equipment shall be of sufficient size to support the requirements of the relevant IMO Performance Standards.*

(MSC191/8.2.2) For ECDIS, *the operational display area of the chart presentation for route monitoring shall be at least 270 mm × 270 mm.*

For ECDIS back-up arrangements, the effective size of the chart presentation shall be not less than 250 mm × 250 mm or 250 mm diameter.

(MSC191/8.2.3) For radar display equipment, *the operational display area of the radar presentation shall be at least a circle of diameter of:*

- 180 mm for ships smaller than 500 gross tonnage;
- 250 mm for ships larger than 500 gross tonnage and HSC less than 10 000 gross tonnage;
- 320 mm for ships larger than 10 000 gross tonnage.

The manufacturer's documentation shall identify the intended size of the operational display area.

7.3.2 Method of test and required results

The methods of test and the required results are as follows:

- a) for ECDIS, confirm by measurement that the dimensions of the operational display area are at least 270 mm × 270 mm;
- b) for ECDIS back-up arrangements, confirm by measurement that the dimensions of the operational display area are at least 250 mm × 250 mm, or 250 mm in diameter;
- c) for radar display equipment, confirm by measurement that the diameter of the operational display area is at least a circle of diameter of the intended size specified in the manufacturer's documentation.

7.4 Multicoloured display equipment

7.4.1 Requirement

(MSC191/8.3.1) *Multicoloured display equipment shall be used except where monochrome displays are permitted within individual IMO Performance Standards.*

(MSC191/8.3.2) *Multicoloured operational displays including multifunction displays (for example, conning displays) shall provide a minimum of 64 colours except where permitted or not required by the IMO, or when used for a single specific purpose (for example, speed log, echo-sounder).*

Monochrome displays may be provided when used for a single specific purpose (for example, speed log, echo-sounder) except where multicoloured displays are required by IMO performance standards or Code on Alerts and Indicators.

7.4.2 Method of test and required results

For multicoloured display, verify the result in accordance with Clause 4.

For monochrome display, verify the result in accordance with Clause 4 except the colour-related requirements specified in 4.5.1, 4.7.1, 4.7.2, 4.7.3 and 4.8.2.

For monochrome display, confirm by inspection of documented evidence that the manufacturer has noted the limitation of usage of the display to a single specific purpose or noted relevant IMO Performance Standard permitting use of monochrome display.

7.5 Screen resolution

7.5.1 Requirement

(MSC191/8.4) *Operational display equipment including multifunction displays* (for example, *conning displays*) shall provide a minimum screen resolution of 1 280 pixels × 1 024 pixels, or equivalent for a different aspect ratio, except where permitted or not required by the IMO, or when used for a single specific purpose (for example, speed log, echo-sounder) or 180 mm diameter radar. For 180 mm diameter radar, a minimum screen resolution of 1 024 pixels × 768 pixels, or equivalent for a different aspect ratio, shall be provided.

Display equipment intended to support the presentation of electronic chart information shall provide a maximum pixel pitch of 0,29 mm/m of nominal viewing distance (1 min of arc), for example, 0,36 mm at 1 237 mm viewing distance.

The manufacturer's documentation shall describe the screen resolution, pixel format and viewing distance (i.e. for measurement of pixel pitch).

7.5.2 Method of test and required results

The methods of test and the required results are as follows:

- a) confirm by inspection of documented evidence that for radar displays larger than 180 mm diameter the display equipment supports a screen resolution of at least 1 280 × 1 024 or equivalent resolution if the equipment uses a different aspect ratio. For radar displays of 180 mm or smaller diameter the requirement is at least 1 024 × 768 or equivalent resolution if the equipment uses a different aspect ratio;
alternatively, confirm by inspection of documented evidence that the display equipment supports the minimum screen resolution permitted by the applicable Performance Standards;
alternatively, if the display equipment is used for a single specific purpose (for example, speed log, echo-sounder, etc.), confirm by inspection of documented evidence that it is not required to support a minimum screen resolution;
- b) confirm by inspection of documented evidence that the display equipment provides a maximum pixel pitch of not more than 1 min of arc;
alternatively, if the display equipment is used for a single specific purpose (for example, speed log, echo-sounder, etc.), confirm by inspection of documented evidence that it is not required to support a maximum pixel pitch;
- c) confirm by inspection of documented evidence that the screen resolution, pixel format and the viewing distance used for the measurement of pixel pitch are identified.

7.6 Screen viewing angle

7.6.1 Requirement

(MSC191/8.5) *The display equipment shall support the reading of information under all ambient light conditions, simultaneously, by at least two users, from standing and sitting user positions likely to be found on the bridge of a ship.*

7.6.2 Methods of test and required results

Verify in accordance with 4.4.1.2 a) that readability requirements are satisfied from a position at the side of the operator.

Annex A (normative)

Presentation colours and symbols

A.1 Overview

Annex A specifies the harmonised symbols to be used for the presentation of navigation related information on all shipborne navigational systems and equipment in conformance with guidelines published by the IMO and provided in SN/Circ.243.

All text in Annex A whose wording is identical to text contained in IMO SN/Circ.243 is printed in *italics*. The IMO reference is made up of two parts; a prefix representing the IMO instrument, followed by the paragraph number, displayed as, for example: (SN243/1).

A.2 Purpose

(SN243/1/1) *The purpose of Annex A is to provide guidance on the appropriate use of navigation-related symbols and the use of colour to achieve a harmonized and consistent presentation on all shipborne navigational systems and equipment.*

A.3 Use

(SN243/1/2) *The use of these guidelines will ensure that the symbols used for the display of navigation-related information on all shipborne navigational systems and equipment are presented in a consistent and uniform manner.*

A.4 Application

(SN243/1/3) *The symbols listed in Table A.1 through Table A.5 shall replace symbols which are currently in existing Performance Standards for navigational systems and equipment. Where a standard symbol is not available, another symbol may be used, but this symbol shall not conflict with the symbols listed in Annex A.*

A.5 Navigation-related symbols

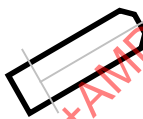
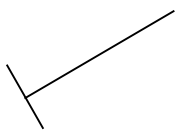
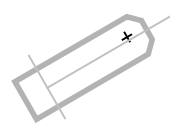
For the application of the symbols in Table A.1 through Table A.5, the following shall be considered:

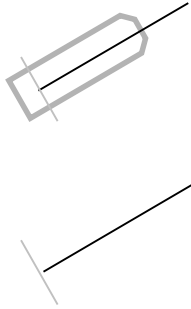
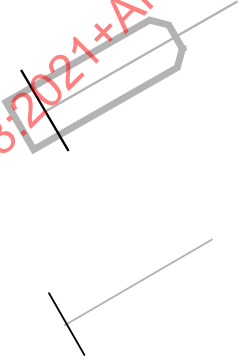
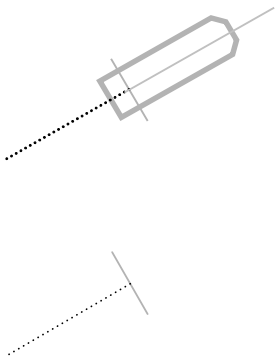
- colours are not standardised except where explicitly stated;
- colours used for the presentation of tracked radar targets and reported AIS targets (symbols from 2.1 a to symbol 2.9) shall be the same;
- colours used for the presentation of own ship symbols shall be identifiable from colours used for the presentation of targets;
- colours used for the presentation of operational information shall be discriminated from the colours used for the presentation of the radar image, target trails, additional processed radar information and electronic chart information;
- colours recommended for symbols assume that the presentation provides for lighter foreground information against a dark background;
- sizes specified for symbols assume a nominal viewing distance of 1 m (see 4.6.1.1 for requirements with viewing distances other than 1 m);

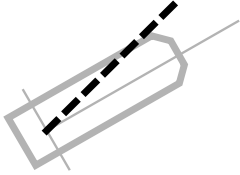
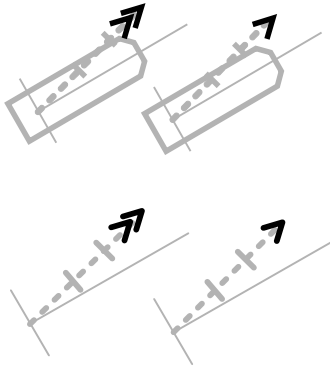
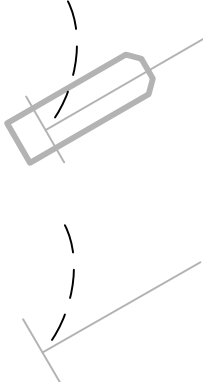
- weights specified for line styles assume that the "thick" line style is at least twice the thickness of the "thin" line style.

An example of a possible colour scheme that may be used is given in Table A.6.

Table A.1 – Own ship symbols

	Symbol name and description	Symbol graphic(s)
1.1 a	Own ship – True scaled outline The user may select to present own ship as a true scaled outline oriented in the direction of heading relative to CCRP and drawn using a thick solid line style with the same basic colour used for own ship symbols. A more detailed true scaled outline symbol, representing the physical shape of the own ship, is permitted as an alternative to the standardized symbol specified in this document. Automatic selection of the true scaled outline is permitted (see 5.2.1). The true scaled outline shall not be used when heading is unknown in a gyro/THD-stabilised mode, or when the beam of the outline is less than 3 mm. Note that a loss of heading will force the radar into head-up mode (see IEC 62388); in this case, the true scaled outline is still permitted.	 (SN243)
1.1 b	Own ship – Simplified symbol If a navigation display presents the chart mode (with or without the radar image), a simplified symbol may be used for own ship. The simplified symbol may be combined with the minimised symbol (see symbol 1.1 c). A simplified symbol shall be used when a chart is displayed in north-up presentation, without a radar image and in the absence of heading information. The outer circle shall be 6 mm in diameter. The inner circle shall be 3 mm in diameter. The circles shall be drawn using a thick solid line style, with the same basic colour used for own ship symbols. Note that for a radar mode, the simplified symbol should not be used as the symbol does not permit the minimum range requirements in IEC 62388.	 (SN243)
1.1 c	Own ship – Minimised symbol If a navigation display presents the radar mode, own ship shall be presented as a minimised symbol. The minimised symbol is comprised of the heading line (see symbol 1.3) and the beam line (see symbol 1.4). Where appropriate, the minimised symbol shall be combined with the true scaled outline of own ship. Note that a loss of heading will force the radar into head-up mode (see IEC 62388) whereby the minimised symbol should be used.	 (SN243)
1.2	Radar antenna position If a radar image is displayed and own ship is displayed as a true scaled outline, the user may select to present the radar antenna position as crossed lines centred at the physical location of the radar antenna (the source of the displayed radar image). The total extent of the crossed lines shall be at least 1 mm but not more than 2 mm in length. They shall be drawn using a thin solid line style with the same basic colour used for own ship symbols.	 (SN243)

	Symbol name and description	Symbol graphic(s)
1.3	Own ship heading line The heading line shall always be indicated (except when temporarily suppressed by the user), originating at CCRP and extending in the direction of own ship heading to the bearing scale. The line shall be drawn using a thin solid line style with the same basic colour used for own ship symbols. The heading line shall always be shown together with the beam line (see symbol 1.4).	 (SN243)
1.4	Beam line The beam line forms part of the own ship minimised symbol. Own ship beam line shall be presented as a single line, perpendicular to the heading line, passing through the CCRP and extending a minimum of 5 mm each side of the CCRP. The line shall be drawn as a thin solid line style with the same basic colour used for own ship symbols.	 (SN243)
1.5	Stern line Optionally, the user may select a stern line that shall originate at CCRP and shall extend, in the direction 180° from the heading, to the bearing scale. The line shall be drawn using a thin dotted line style with the same basic colour used for own ship symbols.	

	Symbol name and description	Symbol graphic(s)
1.6 a	Velocity vector Optionally, the user may also select to present a velocity vector originating at CCRP and extending in the direction of COG or CTW, as appropriate, for a length representing the distance own ship will travel in a user-selected time interval. The vector shall be drawn using a thick short-dashed line style with the same basic colour as used for own ship symbols. An option to select other colours may be provided, but these colours shall conform to the rules given in Clause A.5.	 (SN243)
1.6 b	Velocity vector – Time increments Optionally, the user may also select to present time increments along the velocity vector perpendicular to the vector with their midpoint on it and extending not more than 1,5 mm on either side. They shall be spaced along the vector to represent the distance own ship will travel in a user-selected increment of the time interval used for the velocity vector. The increments shall be drawn using a thick solid line style with the same basic colour used for own ship velocity vector.	 (SN243)
1.6 c	Velocity vector – Stabilisation indicator Optionally, the user may select to present a stabilisation indicator, positioned at the end of the velocity vector. The ground stabilisation indicator shall be presented as a double arrowhead. The water stabilisation indicator shall be presented as a single arrowhead. The arrowheads shall extend at least 1 mm but not more than 1,5 mm on either side of the vector (i.e. measured perpendicular to it). The arrowhead(s) shall be drawn using a thick solid line style with the same basic colour used for own ship velocity vector.	 (SN243)
1.6 d	Path predictor Optionally, the user may select to present a path predictor, either in place of a velocity vector or independently, as a curved line originating at CCRP and extending along the predicted path over ground that own ship will travel in the time interval used for the velocity vector. The path shall be drawn using a thin long-dashed line style with the same basic colour as used for own ship symbols. An option to select other colours may be provided, but these colours shall conform to the rules given in Clause A.5.	 (SN243)

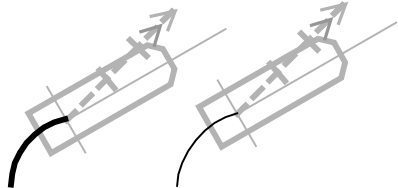
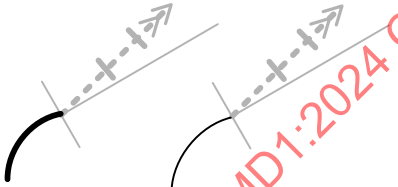
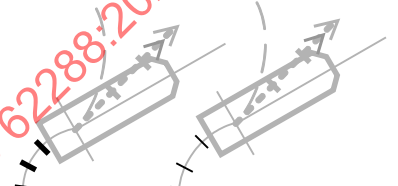
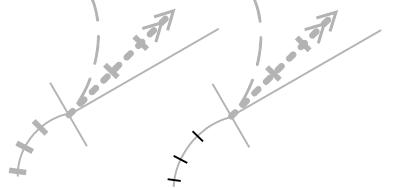
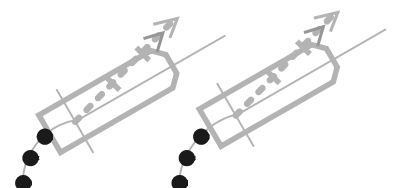
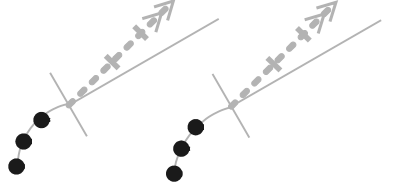
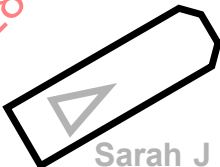
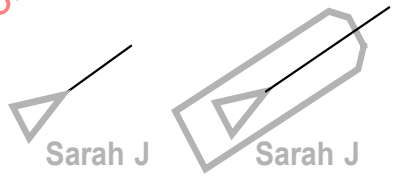
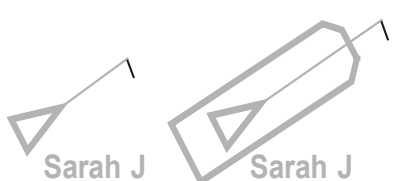
	Symbol name and description	Symbol graphic(s)
1.7 a	Past track The user may select to present a past track for the primary and/or secondary positioning sources. The past track shall be presented as line connecting own ship current and past positions. The primary past track shall be drawn using a thick solid line style with the same basic colour used for own ship symbol. The secondary past track shall be drawn using a thin solid line style with the same basic colour used for own ship symbols.	  (SN243)
1.7 b	Past track – Time increments Optionally, time increments along the past track may be shown. The time increments shall be presented as single lines perpendicular to the past track with their midpoint on it and extending at least 1 mm but not more than 1,5 mm on either side. They shall be spaced along the past track to represent the distance own ship travelled in the user-selected increment of the time interval used for the velocity vector. The time increments for the primary past track shall be drawn using a solid line style.	  (SN243)
1.7 c	Past track – Past positions Alternatively, the user may select to present past positions along the past track in place of time increments. Past positions shall be drawn as small filled circular symbols with a diameter of not more than 1,5 mm, with the same basic colour used for own ship symbols.	 
The simplified symbol (1.1 b) may be used with all examples showing the minimised symbol (1.1 c) in this table.		

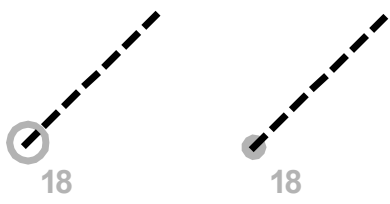
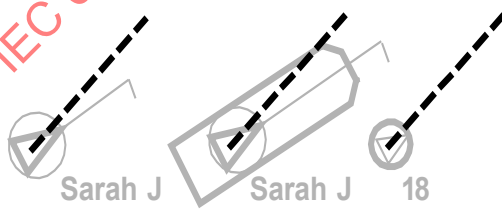
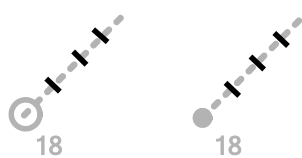
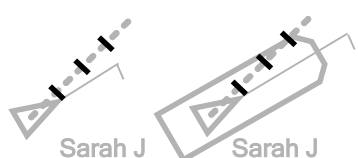
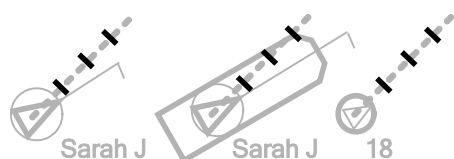
Table A.2 – Radar and AIS symbols

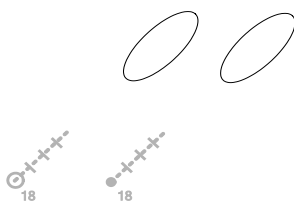
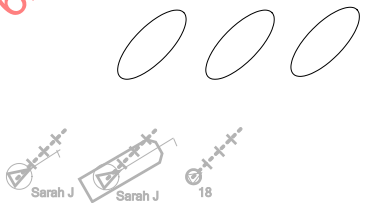
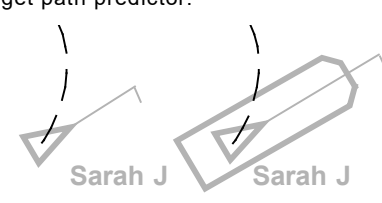
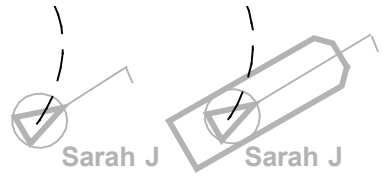
	Symbol name and description	Symbol graphic(s)
2.1 a	Radar targets in acquisition state A symbol drawn around radar targets in acquisition state shall be presented as a broken circle centred at the position of target acquisition. The circles shall be a 5 mm in diameter and shall be drawn using a thin dashed line style with the same basic colour used for target symbols.	 (SN243)
2.1 b	Radar targets in acquisition state – Automatically detected A symbol drawn around radar targets in acquisition state that are automatically detected inside an acquisition area, shall be a 5 mm in diameter and using a thick dashed line style, with the required colour red. The symbols shall flash until acknowledged by the user. Once acknowledged, the symbols shall cease flashing (even when they remain inside the acquisition area) and unless considered as dangerous, shall be drawn as a normal radar target in an acquisition state (i.e. detected outside an acquisition area) with the basic colour of other non-dangerous target symbols.	 (SN243)
2.2 a	Tracked radar targets Tracked radar targets shall be presented as circles centred at the targets' tracked position. The circles shall be 3 mm in diameter and shall be drawn using a thick solid line style. Tracked radar targets generated from a target automatically detected in an acquisition area that have not been acknowledged shall be the required red basic colour and shall continue to flash until acknowledged by the user (even when they move outside the acquisition area). Once acknowledged, the symbols shall cease flashing and unless considered as dangerous, shall be drawn as a normal radar target in an acquisition state (i.e. detected outside an acquisition area) with the basic colour of other non-dangerous target symbols. Tracked radar targets may be labelled. Alphanumeric text used to label radar targets shall be drawn with the same basic colour used for target symbols.	 18 (SN243)
2.2 b	Tracked radar targets – Alternative Alternatively, tracked radar targets may be presented as filled circles of not more than 2 mm in diameter.	 18 (SN243)

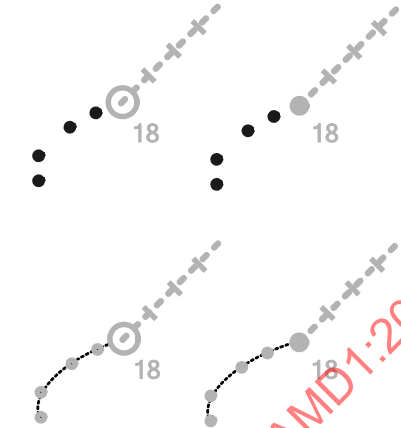
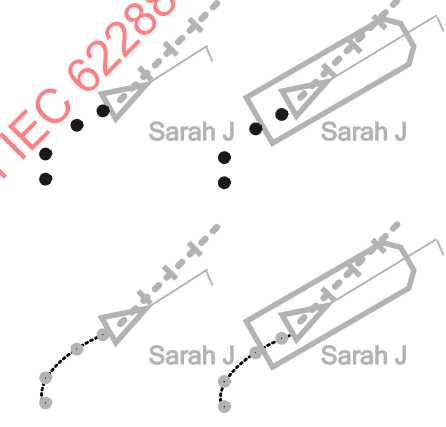
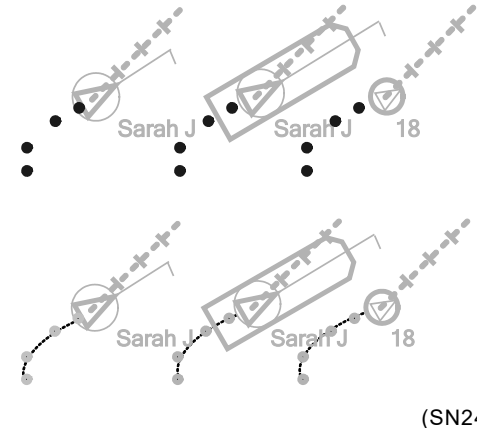
	Symbol name and description	Symbol graphic(s)
2.2 c	Tracked radar targets – Dangerous targets Tracked radar targets designated as dangerous targets may be presented using 5 mm diameter circles, and shall flash until acknowledged by the user. The required colour shall be red. Once acknowledged, the symbols shall cease flashing, but shall still be drawn with the required colour red until the target(s) cease to be a danger.	 (SN243)
2.3	Reference targets Tracked radar targets designated as reference targets shall be labelled with the letter "R" adjacent to the symbol. <i>Multiple reference targets shall be numbered as "R1", "R2", "R3", etc.</i> The reference target labels shall be drawn with the same basic colour used for target symbols.	 (SN243)
2.4	Sleeping AIS targets Sleeping AIS targets shall be presented as acute isosceles triangles oriented to the targets' reported heading (or COG if heading is not reported) and centred at the targets' predicted position. The base of the triangles shall be 3 mm and the height shall be 4,5 mm. The triangles shall be drawn using a thick solid line style with the same basic colour used for target symbols.	 (SN243)
	A sleeping AIS target with <i>neither a reported heading nor COG</i> shall be <i>oriented toward the top of the operational display area</i> and shall include <i>one diagonal line crossed through the symbol</i>. The line shall be drawn using a thick solid line style with the basic colour used for target symbols.	Sleeping AIS target with neither reported heading nor COG:  (SN243)

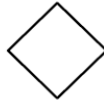
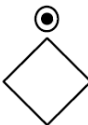
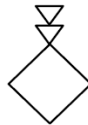
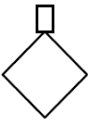
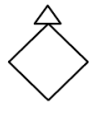
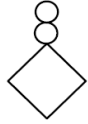
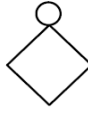
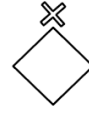
	Symbol name and description	Symbol graphic(s)
2.5 a	Activated AIS targets Activated AIS targets shall be presented as acute isosceles triangles oriented to the targets' reported heading (or COG if heading is not reported) and centred at the targets' predicted position. The base of the triangles shall be 4 mm and the height shall be 6 mm. The triangles shall be drawn using a thick solid line style with the basic colour used for target symbols. <i>An activated AIS target with neither a reported heading nor COG shall be oriented toward the top of the operational display area and shall include one diagonal line crossed through the symbol. The line shall be drawn using a thick solid line style with the basic colour used for target symbols.</i> Activated AIS targets may be labelled. Alphanumeric text used to label AIS targets shall be drawn with the same basic colour as used for target symbols.	 (SN243)
		Activated AIS target with neither reported heading nor COG:  (SN243)
2.5 b	Activated AIS targets – True scaled outlines Alternatively, when own ship is presented as a true scaled outline, the user may select to add true scaled outlines to activated AIS target symbols. True scaled outlines for activated AIS targets shall be drawn around the AIS target symbol triangles relative to the targets' predicted position according to the offsets, beam and length. The outline shall be drawn using a thick solid line style. True scaled outlines for activated AIS targets shall be drawn with the same basic colour used for target symbols. True scaled outlines for individual activated AIS targets shall not be used when a target's heading is not reported, or when the beam of the outline is less than 3 mm.	 (SN243)
2.5 c	Activated AIS targets – Dangerous targets Activated AIS targets designated as dangerous targets may be presented with larger triangles, with a base of 5 mm and a height of 7,5 mm, shall be the required colour red, drawn with a thick solid line and shall flash until acknowledged by the user. Activated AIS targets designated as dangerous targets with neither a reported heading nor COG shall be oriented toward the top of the operational display area and shall include one diagonal line crossed through the symbol. The line shall be drawn using a thick solid line style with the colour red. Once acknowledged, the symbols shall cease flashing but shall still be presented using the required colour red until no longer considered to be a dangerous target. Activated AIS targets designated as dangerous targets may be labelled. Alphanumeric text used to label AIS targets shall be drawn with the colour red, as used for target symbols. The label shall not flash – see IEC 60945:2002, 6.1.5 t).	  (SN243)
		Activated dangerous AIS target with neither a reported heading nor COG: 

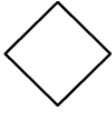
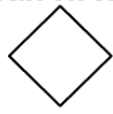
	Symbol name and description	Symbol graphic(s)
2.6	Associated targets – Alternative The user may select to present associated targets (i.e. activated AIS targets associated with tracked radar targets) as either activated AIS target symbols (see symbol 2.5) or tracked radar target symbols (see symbol 2.2). Alternatively, activated AIS target symbols representing associated targets may be modified by circumscribing a circle around the symbols' isosceles triangle. Tracked radar target symbols representing associated targets may be presented with larger diameter circles (up to 5 mm), modified by inscribing an isosceles triangle inside the symbols' circle. The circumscribed circle and inscribed triangle shall be drawn using a thin solid line style with the same basic colour used for target symbols. Associated targets may be labelled. Alphanumeric text used to label associated targets shall be drawn with the same basic colour as used for target symbols.	Associated targets represented by AIS target symbols:  (SN243) Associated targets represented by radar target symbols:  (SN243)
2.7 a	Heading lines Heading lines shall be selected for display for activated AIS targets and associated targets, represented by AIS target symbols. Heading lines shall originate at the apex of the AIS triangle and shall extend not less than 4 mm and at least 4 mm beyond the bow of the true scaled outline when it is used. They shall be drawn using a thin solid line style with the same basic colour as used for target symbols. Heading lines for dangerous AIS targets shall flash with their base symbol until acknowledged by the user. An activated target without a reported heading shall be orientated to the top of the operational display area (see 2.5 a) and when AIS heading is enabled shall not include a heading line.	 (SN243)
2.7 b	Heading lines – Turn indicators The user shall select to display turn indicators for activated AIS targets and associated targets represented by AIS target symbols. Turn indicators shall be presented as a single line extending at least 1 mm but not more than 2 mm perpendicular to the heading line in the direction of turn. The indicator shall be drawn using a thin solid line style with the same basic colour as used for their target symbols. Turn indicators for dangerous targets shall be the required colour red (until no longer dangerous) and shall flash with their symbol until acknowledged by the user.	 (SN243)

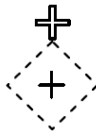
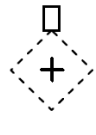
	Symbol name and description	Symbol graphic(s)
2.8 a	Velocity vectors Velocity vectors for targets shall be selected for display. Velocity vectors shall be presented as single lines originating at the targets' tracked/predicted position and extending in the direction of course CTW or COG, as appropriate, for a length representing the distance the target will travel in the time interval used for own ship's velocity vector. Vectors shall be drawn using a thick short-dashed line style with the same basic colour used for target symbols. Velocity vectors for dangerous targets shall be the required red colour and shall flash with their base target symbols until acknowledged by the user. Once acknowledged, the symbols shall cease flashing and unless considered as dangerous, shall assume the basic colour of other non-dangerous target symbols.	Radar target velocity vectors:  (SN243)
		AIS target velocity vectors:  (SN243)
		Associated target velocity vectors:  (SN243)
2.8 b	Velocity vectors – Time increments Time increments may be shown drawn across target velocity vectors. Time increments shall be presented as single lines perpendicular to the vectors with their midpoint on them and extending not more than 1,5 mm on either side. They shall be spaced along the vectors to represent the distance the target will travel in the time increment of the time interval used for own ship's velocity vector. The increments shall be drawn using a thick solid line style with the same basic colour as for target symbols. Time increments for dangerous targets shall be the required red colour and shall flash with their base target symbols until acknowledged by the user. Once acknowledged, the symbols shall cease flashing and unless considered as dangerous, shall use the basic colour of other non-dangerous target symbols.	Radar target time increments: 
		AIS target time increments: 
		Associated target time increments: 

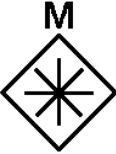
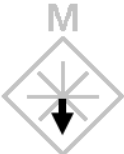
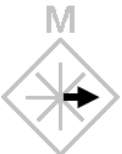
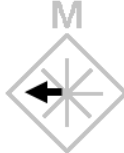
	Symbol name and description	Symbol graphic(s)
2.8 c	Predicted area of dangers Optionally, predicted area of dangers (PADs) may be shown along the path of target velocity vectors. PADs shall be presented as an outline area geographically representing a target's predicted CPA/TCPA violations. (The PAD's shape may be modified by knowledge of own ship manoeuvring characteristics, safety contour limits, etc). PADs shall be oriented in the direction of their velocity vectors. The PADs shall be drawn using a thick solid line style with the same-basic colour as their target symbols. PADs for dangerous targets shall flash with their base symbols until acknowledged by the user. When a target is selected, the associated PAD may be highlighted for identification. Note that PADs are shown as an elliptical area which is typical. Presentation of more accurate shapes is not excluded.	Radar target PADs:  Not to scale AIS target PADs:  Not to scale Associated target PADs:  Not to scale
2.8 d	Path predictor Optionally, the user may select to display a path predictor in place of a velocity vector. The <i>path predictor</i> shall be represented as a <i>curved vector</i> originating at the targets' tracked/predicted position and extending along the predicted path over the ground that the target will travel, in the time interval used for the target vector. The path shall be drawn using a thin long-dashed line style with the same basic colour used for target symbols.	AIS target path predictor:  Associated target path predictor: 

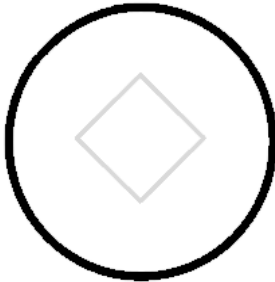
	Symbol name and description	Symbol graphic(s)
2.9	Target past positions Optionally, target past positions may be shown. Past positions shall be presented as a series of small circular symbols of 1 mm diameter. They may be connected by a line drawn from the current tracked or predicted position of the target. The line shall be drawn using a thin short-dashed line style with the same basic colour as their target symbols.	Radar target past positions:  (SN243)
		AIS target past positions:  (SN243)
		Associated target past positions:  (SN243)

	Symbol name and description	Symbol graphic(s)
2.10 a	AIS aids to navigation – Physical Source of physical AIS AtoN is: AIS Message 21, Virtual AtoN Flag = 0, except for case "Missing" MMSI identity range: 99 MID 0000 to 99 MID 9999 Physical AIS aids to navigation (AtoN) shall be presented as an open diamond centred at reported position. The sides of the diamond shall be not more than 6 mm in length. The diamond shall be drawn using a thin solid line style. The basic colour for an "on position" AIS AtoN shall not be yellow or red but may be same as for reported targets. The colour for the diamond of an "off position" AIS AtoN shall be yellow, it shall be drawn using thick solid line style and when used against light background it shall include a black one-pixel outline to improve readability. If available, on radar displays the AIS AtoN shall be drawn indicating the purpose of the AIS AtoN using the "type of aids-to navigation" from AIS Message 21. On displays containing an underlying chart, AIS AtoNs shall be drawn without indication of purpose unless the object is selected in which case, if available, the symbol shall be drawn indicating the purpose of the AIS AtoN. The purpose symbol shall be drawn using same line style and colour as the basic shape of AIS AtoN symbol. The height of the purpose symbol shall be not more than 5 mm in length. When a floating AIS AtoN is off position, this shall be indicated with the yellow text "Off Posn" (AIS AtoN Off-Position Indicator = 1) and the lights off – racon error and light error indications shall not be presented. AIS AtoNs shall indicate an extinguished light with yellow text "Unlit". AIS AtoNs shall indicate failure of Racon with yellow text "Racon err". AIS AtoNs shall indicate light error or combination of light error/off with racon error with yellow text "Error". When used against light background, the yellow text shall include a black one-pixel outline to improve readability. In case there is an indication of purpose, the error text shall be above the indication of purpose. A Synthetic AtoN physically exists, but AIS data information for it is provided remotely. An AtoN is a Synthetic AtoN when "virtual AtoN flag = 0" and "repeat indicator > 0". The absence of a physical AtoN, a state known as "Missing", may be communicated as a combined state of "virtual AtoN flag = 1" and "off position indicator = 1". This shall be indicated with yellow text "Missing" above the diamond using colour yellow. This symbol shall have no crosshair at the position centre. When used against light background the yellow text shall include a black one-pixel outline to improve readability. AIS AtoNs may be labelled with the AtoN name. Alphanumeric text used to label an AIS AtoN shall be the same basic colour as the AIS AtoN symbol. It may be user selectable for the label to include full textual content of the AtoN name or truncated version of the AtoN name, for example only last 3 characters of the AtoN name.	Physical AIS AtoN and related AIS Type of aids-to navigation code and AIS Status bits in parenthesis, where applicable:  Basic shape Default, type not specified (0); Reference point (1); Fixed structure offshore/obstruction (3); Light, without sectors (5); Light, with sectors (6); Leading light front (7); Leading light rear (8); Light vessel/LANBY/Rigs (31)    Racon (2) Emergency wreck mark (4) Beacon, Cardinal N (9); Floating, Cardinal Mark N (20)    Beacon, Cardinal E (10); Floating, Cardinal Mark E (21) Beacon, Cardinal S (11); Floating, Cardinal Mark S (22) Beacon, Cardinal W (12); Floating, Cardinal Mark W (23)   Beacon, Port hand (13); Beacon, Preferred Channel Port hand (15); Port hand mark (24); Preferred channel port hand (26) Beacon, Starboard hand (14); Beacon, Preferred Channel Starboard hand (16); Starboard hand mark (25); Preferred channel Starboard hand (27)    Beacon, Isolated danger (17); Isolated danger (28) Beacon, Safe water (18); Safe water (29) Beacon, Special mark (19); Special mark (30)

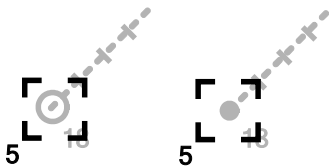
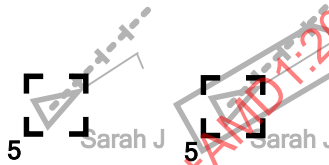
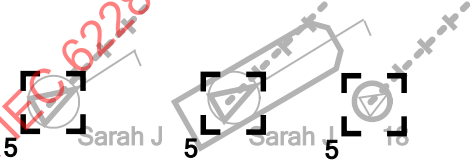
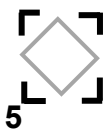
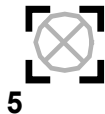
	Symbol name and description	Symbol graphic(s)		
		Off Posn  Off position including any combinations with Lights off/error and/or Racon error	Unlit  Light off (bits 11100101 or 11101101 or 11110101)	Racon err  Racon error (bits 11111001 or 11111011 or ~~11111111~~) (SN243) Error  Light error or combination of light error/off with racon error (bits ~~11100110~~ ~~or 11101110~~ ~~or 11110110~~ ~~or 11111101~~ 11100111 or 11101111 or 11110111 or 11111101 or 11111111) Missing  Charted AtoN is missing (off position indicator = 1) (SN243)

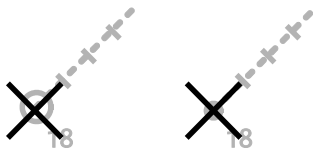
	Symbol name and description	Symbol graphic(s)
2.10 b	AIS aids to navigation – Virtual Source of virtual AIS AtoN is: AIS Message 21, Virtual AtoN Flag = 1, except for case "Missing" MMSI identity range: 99 MID 0000 to 99 MID 9999 Virtual AIS aids to navigation (AtoN) shall be presented as an open diamond with crosshair centred at reported position. The sides of the diamond shall be not more than 6 mm in length. The diamond shall be drawn using a thin dashed line style. The basic colour for a Virtual AIS AtoN is as used for the physical AIS AtoN symbols. If available, the AIS AtoN shall be drawn indicating the purpose of the AtoN using the "type of aids-to navigation" from the AIS Message 21. The purpose symbol shall be drawn using same line style and colour as the basic shape of the AIS AtoN symbol. The height of the purpose symbol shall be not more than 5 mm. AIS AtoN may be labelled with the AtoN name. Alphanumeric text used to label an AIS AtoN shall be the same basic colour as the AIS AtoN symbol. It may be user selectable for the label to include full textual content of the AtoN name or truncated version of the AtoN name, for example only last 3 characters of the AtoN name.	Virtual AIS AtoN and related AIS Type of aids-to navigation code in parenthesis:  Basic shape Default, type not specified (0); Reference point (1); Light, without sectors (5); Light, with sectors (6); Leading light front (7); Leading light rear (8)           Emergency wreck mark (4) Beacon, Cardinal N (9); Floating, Cardinal Mark N (20) Beacon, Cardinal E (10); Floating, Cardinal Mark E (21) Beacon, Cardinal S (11); Floating, Cardinal Mark S (22) Beacon, Cardinal W (12); Floating, Cardinal Mark W (23) Beacon, Port hand (13); Beacon, Preferred Channel Port hand (15); Port hand mark (24); Preferred channel port hand (26) Beacon, Starboard hand (14); Beacon, Preferred Channel Starboard hand (16); Starboard hand mark (25); Preferred channel Starboard hand (27)) Beacon, Isolated danger (17); Isolated danger (28) Beacon, Safe water (18); Safe water (29) Beacon, Special mark (19); Special mark (30)

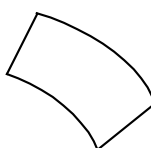
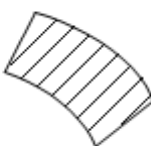
	Symbol name and description	Symbol graphic(s)
2.10 c	AIS aids to navigation – Mobile Source of mobile AIS AtoN is: AIS Message 21 AtoN Status = Page ID = 101 MMSI identity range: 99 MID 8000 to 99 MID 9999 Mobile AIS aids to navigation (AtoN) shall be presented as an open diamond topped by letter "M" of not more than 2 mm in length or height and a compass rose inside centred at reported/predicted position. The sides of the diamond shall be not more than 6 mm in length. The diamond and the compass rose shall be drawn using a thin solid line style (Virtual AtoN Flag = 0) or a thin dashed line (Virtual AtoN flag = 1). The basic colour for a mobile AIS AtoN is as used for the physical AIS AtoN symbols. Mobile AIS AtoN with known direction of movement shall include an arrow originating from the compass rose centre oriented towards to the reported COG of the mobile AIS AtoN (see AIS AtoN Status bits when Page ID bits = 101 in Table L.1) adjusted to the orientation mode in use. The result from "adjusted to the orientation mode" shall be presented aligned with the closest line of the compass rose. Mobile AIS AtoNs may be labelled with the AtoN name. Alphanumeric text used to label a mobile AIS AtoN shall be the same basic colour as the mobile AIS AtoN symbol. It may be user selectable for the label to include full textual content of the AtoN name or truncated version of the AtoN name, for example only last 3 characters of the AtoN name.	Basic shapes:  Default  Virtual Virtual AtoN Flag = 0 Virtual AtoN Flag = 1 Basic shapes shall use the additional qualifiers below to denote how the AtoN as propelled. Self-propelled, but direction not reported or unavailable (AtoN Status bits 1010111x):   Tethered (AtoN Status bits 1010101x):  If COG information is provided, it shall be presented with an arrow pointed in coarse direction of COG within $\pm 22,5^\circ$ sectors as defined by AtoN Status bits (see Table L.1):   

	Symbol name and description	Symbol graphic(s)
2.10 d	AIS AtoN dimensions – True scaled outline The user may select to present dimensions of physical AIS AtoN type = 3 (Fixed structure offshore/obstruction) and type = 31 (Light vessel/LANBY/Rigs) as a true scaled outline drawn using a thick solid line style with the same basic colour used for AtoN symbols, with the A axis of the ABCD values of the AIS AtoN oriented to True North. Automatic selection of the true scaled outline is permitted (see 5.13.4). The true scaled outline shall only be presented when the largest of the ABCD values is at least 9 mm.	 Outline drawn as a circle when $A = B = C = D > 1$  Outline drawn as a rectangle when $A \neq B$ and $C \neq D$  Outline drawn as a rectangle when $A \neq B$, $C \neq 0$ and $D = 0$

	Symbol name and description	Symbol graphic(s)
2.11	AIS search and rescue transmitter and other devices using AIS burst transmission technology NOTE Also known collectively as "AIS locating devices". Sources of AIS locating devices are: • AIS-SART use MMSI identity range 970 00 0000 to 970 99 9999, • AIS MOB use MMSI identity range 972 00 0000 to 972 99 9999, • EPIRB-AIS use MMSI identity range 974 00 0000 to 974 99 9999. Valid MMSI for AIS locating devices are defined in ITU-R 585. Care should be taken to ensure that possible future expansions of the MMSI identity ranges do not affect the correct presentation, if such decision is taken by ITU. Such MMSI identity range expansion might be AIS-SART up to 971 99 9999, AIS MOB up to 973 99 9999, EPIRB-AIS up to 975 99 9999. Active AIS locating devices shall be presented as a 8 mm diameter circle with a cross inside drawn with a solid line. The symbol shall use the same basic colour as the AIS AtoN symbols. Test versions of AIS locating devices shall include label "TEST" in lower right-hand side of the symbol. The symbol and labels shall be drawn using a solid line style and shall use the same basic colour as the AIS AtoN symbols. AIS locating device symbol has no associated speed or course vector.	Active AIS locating device  (SN243) AIS locating device under test 

	Symbol name and description	Symbol graphic(s)
2.12	Selected object <i>Selected object symbols shall be presented as broken squares indicated by their corners, centred on the selected object symbol by the user and clearly extending beyond it. The squares shall be drawn using a dashed line.</i> If the selected symbol is presented with the addition of symbol 5.16, symbol 2.12 shall be sized to encompass both the selected symbol and symbol 5.16. Alphanumeric text used to label a selected object shall be the same basic colour as the selected object symbol. The selected object symbol can be used, for example, for selected radar targets, selected AIS targets, selected associated targets, selected AIS ATON, selected AIS locating device, selected AIS SAR aircraft, selected AIS SAR vessel, selected waypoint, etc. This selected object symbol can be used for objects based on point geometry.	Selected radar targets:  (SN243) Selected AIS targets:  (SN243) Selected associated targets:  (SN243) Selected AIS ATON:  (SN243) Selected AIS locating device:  (SN243)

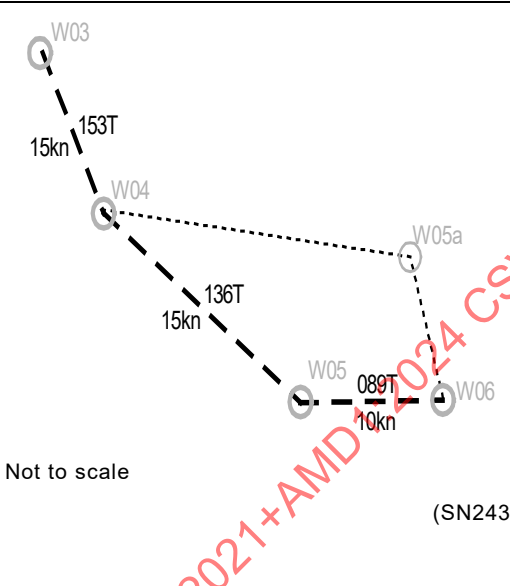
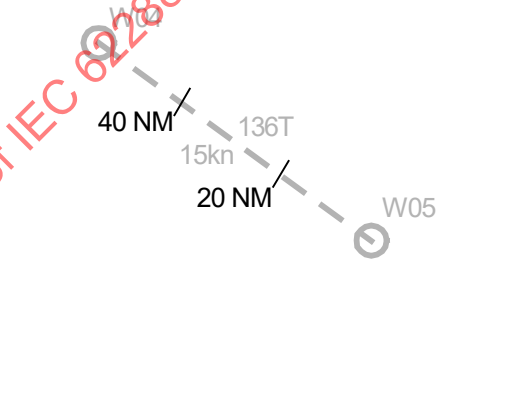
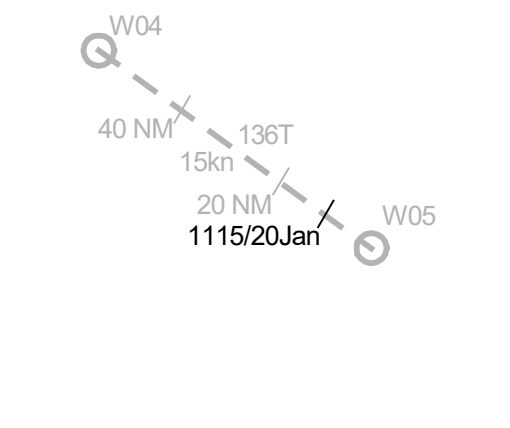
	Symbol name and description	Symbol graphic(s)
2.13	Lost targets, AIS SAR vessels, AIS ATONs and AIS locating devices <i>Lost target, AIS SAR vessel, AIS ATON and AIS locating device symbols shall be presented as crossed lines centred on the target symbol and extending at least 2 mm but not more than 3 mm beyond the symbol. The cross shall have a fixed orientation. The lines shall be drawn using a thick solid line style and shall flash with the required colour red until acknowledged by the user. The triangle of AIS target symbol shall be oriented per last known value. The lost target shall be displayed without vector, heading and rate of turn indication.</i> Once acknowledged, the lost target, AIS SAR vessel, AIS AtoN or AIS locating device symbol and its target, AIS SAR vessel, AIS AtoN or AIS locating device symbol shall be removed from the display.	Lost radar targets:  (SN243)
		Lost AIS targets:  (SN243)
		Lost associated targets:  (SN243)
		Lost AIS ATON:  (SN243)
		Lost AIS locating device:  (SN243)

	Symbol name and description	Symbol graphic(s)
2.14	Target acquisition area/zone The user may select to display radar target acquisition areas and/or AIS target activation areas. Target acquisition areas shall be presented as a series of lines bounding a geographic area designated for radar target acquisition and/or AIS target activation. The lines shall be drawn using a thin solid line style with the same basic colour used for target symbols. Another colour may be used when in edit mode. The area may be filled providing the colour of the fill does not degrade the visibility of the radar image and target symbols. Area fill shall be transparent and shall be the same basic colour as the area boundary.	 (SN243)
2.15 a	AIS SAR aircraft – fixed wing Source of AIS SAR aircraft – fixed wing is: AIS Message 9 MMSI identity range: 111 MID 100 to 111 MID 499 <i>An AIS SAR aircraft – fixed wing shall be drawn with a thin solid outline with the same basic colour as used for target symbols. The symbol shall be oriented in the direction of the COG. The length of the symbol shall be 6 mm.</i>	 (SN243)
2.15 b	AIS SAR aircraft – helicopter Source of AIS SAR aircraft – helicopter is: AIS Message 9 MMSI identity range: 111 MID 500 to 111 MID 999 <i>An AIS SAR aircraft – helicopter shall be drawn with a thin solid outline with the same basic colour as used for target symbols. The symbol shall be oriented in the direction of the COG. The length of the symbol shall be 6 mm.</i>	
2.16	AIS SAR vessel Source of AIS SAR vessel is: Message 5 and Message 24B contains ship type 51 is SAR. <i>If provided, a search and rescue vessel shall be presented by having a circle with cross drawn with a solid line inside the standard activated AIS vessel symbol (see 2.5 a and 2.5 b)</i>	 (SN243)
2.17	Target exclusion zone The user may select to display radar target acquisition exclusion zone and/or AIS target exclusion zone. Target exclusion zones shall be presented as a series of lines bounding a geographic area designated for radar target acquisition exclusion and/or AIS target activation exclusion. The lines shall be drawn using a solid line style with the same basic colour used for target symbols. The area shall include solid thin diagonal lines. Another colour may be used when in edit mode.	

	Symbol name and description	Symbol graphic(s)
2.18	Autonomous Marine Radio (Group B) Device (AMRD B) Source of AMRD B device is: AIS message as specified in ITU-R M.2135 on Ch. 2006. NOTE Details of AIS messages related to AMRD B and MMSI Identity range for AMRD B are under discussion in ITU (see newest edition of ITU-R M.2135). An AMRD B shall be drawn as hexagon with a thin solid outline with the same basic colour as used for target symbols. The height of the symbol shall be 4 mm.	

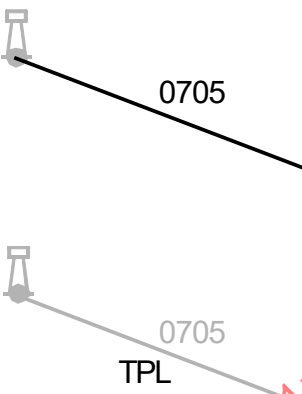
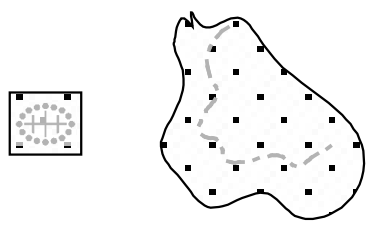
Table A.3 – Navigation symbols

	Description	Symbol
3.1 a	Waypoint Waypoints shall be presented as circles centred at the position of the waypoint. The circles shall be at least 4 mm but not more than 6 mm in diameter. Circles representing waypoints on the monitored route shall be drawn using a thick solid line style with the same basic colour used for the route. Alternatively, the next waypoint on the monitored route may be presented as a set of two concentric circles. The outer circle shall be 6 mm in diameter. The inner circle shall be 4 mm in diameter. Circles representing waypoints on the alternate planned route shall be drawn using a thin solid line style. Optionally, waypoints may be labelled adjacent to their symbol. The label shall be offset by at least 2 mm from the symbol and shall not interfere with text used to label the track leg. Alphanumeric text used to label a waypoint shall be the same basic colour as the waypoint symbol.	 (SN243)

	Description	Symbol
3.1 b	Routes A route is as a series of waypoints connected by one or more legs. Leg lines on the monitored route shall be drawn using a bold long-dashed line style. Leg lines on an alternate or a planned route shall be drawn using a thin dotted line style. The IHO's specified colour for leg lines on the monitored route is red. Leg lines on the monitored route may be labelled adjacent to their line with their course and planned speed, ideally on opposite sides. The label shall be offset by at least 2 mm from the line and shall not interfere with text used to label the waypoint. Note that the IHO recommends drawing a box around the planned speed. Alphanumeric text used to label a leg line shall be the same colour as the leg line. The alternate planned route shall be presented as a series of track legs connecting a series of waypoints.	 Not to scale (SN243)
3.1 c	Distance to run Leg lines on the monitored route may be marked with distance to run. These marks shall be presented as single lines perpendicular to the leg line with their midpoint on it and extending at least 2 mm but not more than 3 mm on either side. They shall be located along the leg line to represent the distance to the next waypoint. The marks shall be drawn using a thin solid line style with the same colour as the leg line. Distance to run may be labelled adjacent to the marks. The label shall be offset by at least 2 mm from the mark and shall not interfere with other text used to label the leg line or waypoints. Alphanumeric text used to label distance to run shall be the same colour as the mark.	
3.1 d	Planned position Optionally, track legs may be marked with a planned position. These marks shall be presented as single lines perpendicular to the track leg with their midpoint on the line and extending at least 2 mm but not more than 3 mm on either side. They shall be located along the track leg to represent the distance from the previous waypoint. The marks shall be drawn using a thin solid line style. Planned position may be labelled adjacent to the mark with the date and time of planned arrival. The label shall be offset by at least 2 mm from the mark and shall not interfere with other labels. Alphanumeric text used to label planned position shall be the same basic colour as the mark.	

	Description	Symbol
3.1 e	Visual limit of lights Leg lines on the monitored route may be marked with the visual limits of lights (i.e. rising/dipping range). The visual limit shall be presented as an arc centred on the light and extending across the track leg at least 10 mm on either side. The arc shall be drawn using a thin solid line with the same basic colour as the leg line. The visual limit may be labelled adjacent to the arc with the rising/dipping range and information about the light. Alphanumeric text used to label visual limits shall be the same basic colour as the arc.	
3.1 f	Wheel-over line Track leg lines on the monitored route may be marked with a wheel-over line. The wheel-over line shall be presented as single line centred on the current leg line, parallel to the next leg line and extending at least 5 mm on either side of the current leg line. The line shall be drawn using a thin solid line with the same colour as the leg line. A second perpendicular line to the current leg line may be presented. This second line shall not extend more than 5 mm on either side of the current leg line. The second line shall be drawn using a thin solid line with the same colour as the leg line. The wheel-over line may be labelled adjacent to the line with the planned rudder angle and time of wheel-over. Alphanumeric text used to label wheel-over position shall be the same basic colour as the wheel-over line.	
3.2	Plotted position A plotted position (Fix, EP, and DR) shall be presented as a circle with crossed lines centred at the position. The circle shall be 5 mm in diameter. The length of the crossed lines shall be the diameter of the circle. The circle and crossed lines shall be drawn using a thin solid line style. The position shall be labelled with time and an indication of its source for example GNSS, L (Loran), R (Radar range), V (Visual bearing), VR (Visual bearing and Radar range). If the position is an estimated position, it shall also be labelled with the letters "EP". If the position is a dead reckoned position, it shall also be labelled with the letters "DR". Alphanumeric text used to label the position shall be the same basic colour as the symbol.	

(SN243)

	Description	Symbol
3.3	Line of position <i>A line of position (LOP) shall be presented as a single line originating from a charted object and extending towards own ship. The bearing of the LOP shall be referenced to the CCRP.</i> <i>The LOP shall be drawn using a thin solid line style.</i> <i>The LOP shall be labelled with time. If the LOP is transferred, it may also be labelled with the letters "TPL" for transferred position line.</i> <i>Alphanumeric text used to label LOP shall be the same basic colour as the line.</i> <i>A LOP range observation will be an arc.</i>	 Examples show the default symbol for a water tower. (SN243)
3.4	Tidal stream <i>A tidal stream shall be presented as a single line with three arrowheads. The line shall originate from the charted position for which a tidal stream table (or tidal stream data) is available and shall extend no more than 15 mm in length. The triple arrowhead shall extend no more than 2 mm on either side (perpendicular to the line).</i> <i>The line for an actual tidal stream shall be drawn using a thin solid line style.</i> <i>The line for a predicted tidal stream shall be drawn using a thin long dashed line style.</i> <i>The arrowheads for a tidal stream shall be drawn using a thin solid line style.</i> <i>The tidal stream shall be labelled adjacent to the line with the effective strength and time, ideally on opposite sides. The label shall be offset by at least 2 mm from the line.</i> <i>Alphanumeric text used to label the tidal stream shall be the same basic colour as the line.</i>	 Examples show the default symbol for a point or area for which a tidal stream table is available. (SN243)
3.5 a	Mariner entered danger <i>A danger highlighted by a mariner shall be presented as a polygon bounding a geographic area designated as dangerous to navigation, or as a poly-line creating a boundary around such an area. The boundary of the polygon, or poly-line, shall be drawn using a thick solid line style. Recommended colour: red.</i> <i>The polygon, or bounded area shall be filled with a transparent fill using the same colour as the polygon or poly-line.</i>	 Examples show the default symbol for a mariner entered danger highlight of a dangerous wreck at an unknown depth bounded by a rectangular danger highlight and an outcropping of land bounded by a user-entered danger highlight. (SN243)

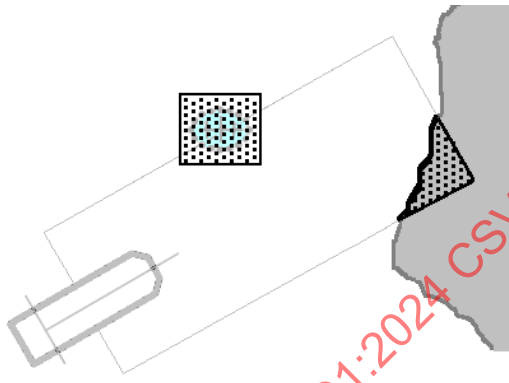
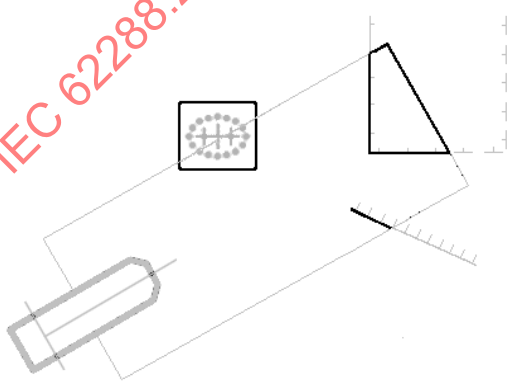
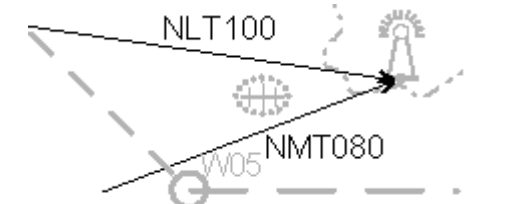
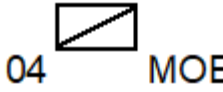
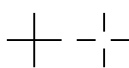
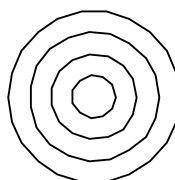
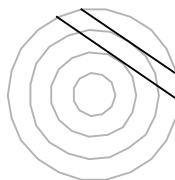
	Description	Symbol
3.5 b	Look-ahead alarm highlight <i>The graphical indication in the chart area of an alarm condition (see MSC.232(82)/A 11.4.4 and 11.4.6) shall be presented as a polygon or poly-line on the boundary of the area or point object causing the condition. The polygon or poly-line shall be drawn using a thick solid line style with recommended colour red. The bounded area shall have a transparent fill of the same colour.</i>	 The example shows a depth area shallower than safety contour and a dangerous wreck within the look-ahead safety check area. (SN243)
3.5 c	Look-ahead indication highlight <i>The graphical indication in the chart area of warning or caution conditions (see MSC.232(82)/A 11.4.4 and 11.4.6) shall be presented as a polygon or poly-line on the boundary of the area or point object causing the condition. The polygon or poly-line shall be drawn using a thick solid line style with recommended colour yellow and adjacent thin lines of black on either side for visibility against a white (Day) background. The bounded area shall not be filled.</i>	 Examples show point (wreck), restricted area and line (fish stakes). (SN243)
3.6	Danger bearing <i>A danger bearing or clearing line shall be presented as a single line with an arrowhead directed at the base of a charted object. The line shall extend at least 20 mm in length and ideally through or across the monitored route.</i> <i>The line shall be drawn using a thin solid line style with the required colour red.</i> <i>A danger bearing shall be labelled with its bearing. The letters "NMT" shall be used to indicate "not more than". The letters "NLT" to indicate "not less than".</i> <i>Alphanumeric text used to label the danger bearing shall be the same basic colour as the line.</i>	 The drawing is not to scale. The example shows the default symbols for a light and a dangerous wreck at an unknown depth. (SN243)
3.7	Event marker An event marker shall be presented as a 5 mm x 8 mm rectangle with a diagonal line inscribed. The symbol shall be drawn using a solid line style. An event marker shall be labelled. Multiple event markers may be numbered. Alphanumeric text used to label an event marker shall be the same basic colour as the symbol.	 (SN243)

Table A.4 – Navigation tools

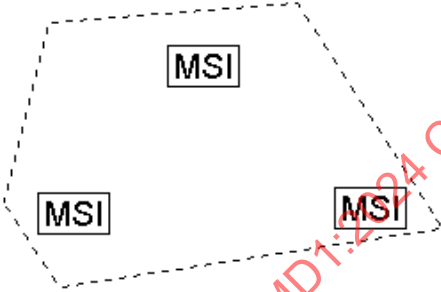
	Description	Symbol(s)
4.1	User cursor The user cursor shall be presented as crossed lines perpendicular to each other extending at least 3 mm from the centre on all sides. The cursor shall be drawn in a thick solid line style. Optionally, the centre of the cursor may be open. Either symbol may be used.	 (SN243)
4.2	Electronic bearing line (EBL) Electronic bearing lines (EBL) shall be presented as a single line originating from CCRP, from a position offset from CCRP, or from a geographically fixed position. An EBL shall be drawn as a <i>dashed line</i> style. Each <i>additional EBL</i> shall be distinguished by different styles of dashed lines and/or colours. If an EBL is offset, the EBL may be combined with a VRM to form an ERBL (electronic range and bearing line). The range shall be presented as a small arc across the EBL and referenced from the origin of the EBL. The arc shall use the same colour as the EBL.	 (SN243)
4.3	Variable range marker (VRM) Variable range markers (VRM) shall be presented as a <i>circle</i>. The VRM shall be drawn as a dashed line style. Each <i>additional VRM</i> shall be distinguished by different styles of dashed lines and/or colours.	 (SN243)
4.4	Range rings If selected, a set of fixed range rings shall be presented as an appropriate number of equally spaced concentric circles centred at the CCRP. Spacing between range rings is dependent on the range scale (i.e. range rings represent logical subdivisions of the range scale). The circles shall be drawn as a thin solid line style.	 (SN243)
4.5	(parallel) Index lines Parallel index lines shall be presented as a series of lines aligned to a set bearing, and spaced at a series of beam ranges (for example at the range ring spacing). No line style is specified for (parallel) index lines, however, they shall be distinguishable from each other and from EBLs. Index lines set at other bearings may be used. A series of index lines at other positions may be used.	

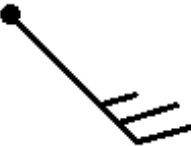
For the application of the symbols in Table A.5, the following shall be considered:

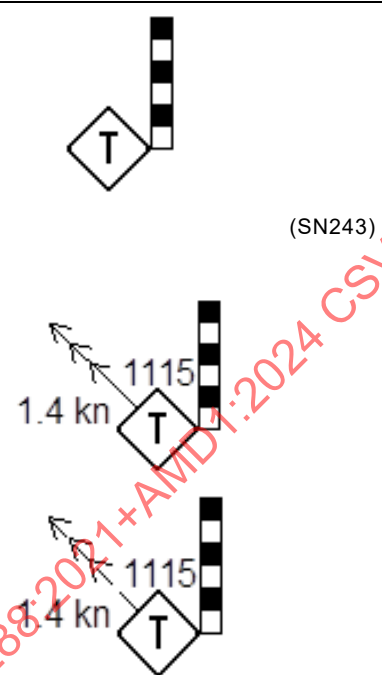
- multiple symbols may be co-located;
- a minimum means shall be provided to prevent co-located symbols from obscuring each other, for example by user selection, by type of information.

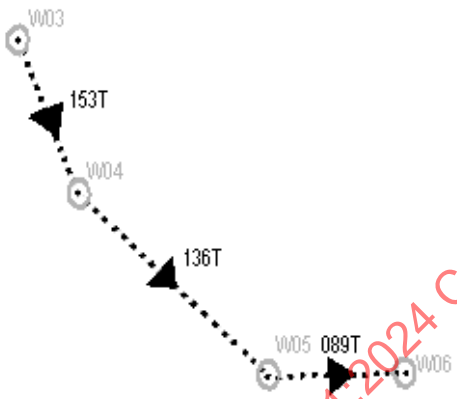
Table A.5 – Other symbols

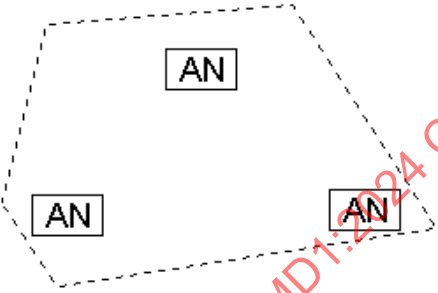
	Description	Symbol(s)
5.1	Trial manoeuvre When a trial manoeuvre function is enabled, it shall be indicated by the presentation of a large letter "T" in a conspicuous location in the operational display area.	T (SN243)
5.2	Simulation mode When a simulation mode is enabled, it shall be indicated by the presentation of a large letter "S" in a conspicuous location in the operational display area.	S (SN243)
5.3	Radar test target When an internally generated test target is enabled, it shall be indicated by the presentation of the large letter "X" adjacent to the target with the basic colour used for the target symbol. In addition, a bold "X" shall be shown in a conspicuous location in the operational display area.	X (SN243)

	Description	Symbol(s)
5.4	Maritime Safety Information, MSI <i>MSI point symbol shall be presented as box with the "MSI" inscribed inside it. The box shall be centred at the position derived from MSI message. The box shall not be more than 6 mm in height, drawn using a thick solid line style.</i> <i>MSI area symbol shall be presented as a series of lines bounding a geographic area designated as "caution" to navigation. Connecting lines shall be drawn using thin dashed line style and using same basic colour as the symbol itself. The area shall be filled with a sparse pattern of MSI point symbols separated by 50 mm.</i> MSI symbols shall be in a separate user selectable layer or group, removable by single operator action. The removal may be connected to generic removal functionality of non-chart object layers. The user dialog area shall have an indication if MSI notices are available in the area currently displayed, but the MSI layer is not automatically selected for display. MSI symbols may be connected to a date range and in such case each MSI notice symbol shall be displayed only when user selected date is within data range. It shall be possible to cursor pick an MSI symbol for further details. When presentation of MSI point and area symbols are provided as overlay on chart or radar, then means shall be provided for cursor pick of the symbol to provide further information in the user dialog area of the display. <i>Note that the source of MSI may be NAVTEX, EGC, AIS ASM function identifier 22 or 23 (SN.1/Circ.289), etc.</i> Note that sub-components of MSI, for example Navigational Warnings (S-124) may have their own symbology.	Example of point symbol  Example of area symbol 

	Description	Symbol(s)
5.5	Meteorological information <i>Meteorological information symbols consist of two parts:</i> – the weather station symbol or reference point; and – the wind shaft. <i>The weather station symbol shall be presented as a circle with "W" inscribed inside it. The circle shall be centred at the position derived from the site location report binary message. The circle shall not be more than 6 mm in diameter, drawn using a thin solid line style and using the same basic colour as AIS AtoN.</i> <i>The reference point symbol shall be presented as a dot. The dot shall not be more than 1 mm in diameter, drawn using solid fill and using the same basic colour as AIS AtoN.</i> <i>Alphanumeric text may be used to label the weather station.</i> <i>The optional wind shaft shall be used to represent actual wind (i.e. not forecast) force and direction as defined by WMO No.485, Appendix II-4, the surface plotting model. If actual wind force and direction is not available then there shall be no wind shaft. The wind shaft shall be not more than 3 times the diameter of the weather station symbol. The length of barbs and pennants shall not exceed the diameter of the weather station symbol. The wind shaft shall be drawn using a thick solid line style and using the same basic colour as AIS AtoN.</i> <i>The wind shaft is directed along the axis of the wind towards the centre of the station circle and stops at its circumference. Wind is represented by barbs and solid pennants. The full barbs representing 5 m s⁻¹ or 10 kn, the half barbs representing 2,5 m s⁻¹ or 5 kn and the solid pennant representing 25 m s⁻¹ or 50 kn. All pennants and barbs lie to the left (clockwise) of the wind shaft in the northern hemisphere and to the right (counter clockwise) of the wind shaft in the southern hemisphere. Barbs are at an angle of 110° to 130° from the wind shaft. Pennants are triangles with their bases on the wind shaft. A calm shall be indicated by a circle drawn around the weather station circle: Missing wind speed shall be indicated by placing an "x" at the end of the wind shaft in lieu of the wind barbs.</i> <i>Other meteorological or hydrographic information such as visibility, temperature, salinity, etc., if available, shall be available on demand.</i> <i>Note that the source of meteorological information may be AIS ASM function identifier 26 or 31 (SN.1/Circ.289), etc.</i>	Dover  (WMO) (SN243) Example of weather station Dover  (WMO) (SN243) Example of weather station with optional wind shaft in southern hemisphere  (SN243) Example of reference point with optional wind shaft in southern hemisphere

	Description	Symbol(s)
5.6	Tidal and water level information <i>Tidal and water level information symbol consist of two parts: the tidal symbol and the tidal gauge symbol.</i> <i>The tidal symbol shall be presented as a diamond with "T" inscribed inside it. The diamond shall be centred at the position derived from the site location report binary message. The sides of the diamond shall not be more than 6 mm in length, drawn using a thin solid line style and using the same basic colour as AIS AtoN.</i> <i>The optional tidal flow part of the symbol shall be used to represent tidal speed and direction. If tidal speed and direction is not available then there shall be no tidal flow symbol. The tidal flow symbol (see symbol 3.4) shall be drawn to the direction of the tidal current and using the same basic colour as AIS AtoN.</i> <i>The optional tidal gauge part of the symbol shall be used to represent availability of water level information. If water level is not available then there shall be no tidal gauge symbol. The tidal gauge symbol shall not be more than 10 mm in length, drawn using a thick solid line style, transparent fill and using the same basic colour as AIS AtoN.</i> If selected, the details of water level shall be presented in the associated AIS object dialog. If both the tidal gauge and the tidal flow symbol are presented, the tidal gauge symbol shall be presented to the right-hand or left-hand side of the tidal symbol such that overlapping of the tidal flow vector and the tidal gauge symbols does not occur. <i>Note that the source of tidal information may be AIS ASM function identifier 31 (SN.1/Circ.289), etc.</i>	 (SN243) Examples of combinations of symbols 5.6 and 3.4
5.7	Signal station <i>Signal station shall be presented as a diamond centred at the reported position of the signal station. The sides of the diamond shall be not more than 6 mm in length, drawn using a thin solid line style and shall be the same basic colour as the AIS AtoN symbol.</i> <i>The symbol shall be labelled with text "SS" centred in the diamond and the colour of the label shall be the same colour as the symbol.</i> Other information from signal station, if available, shall be available on demand. <i>Note that a signal station is a station capable of transmitting marine traffic signals. The source of signal station may be AIS ASM function identifier 19 (SN.1/Circ.289), etc.</i>	 (SN243)

	Description	Symbol(s)
5.8	Route information received <i>Route information is as a series of waypoints connected by one or more legs.</i> <i>Leg lines on the route information shall be drawn using a thin dotted line style. They shall have a centred solid triangle with equal length of each side of not more than 4 mm and shall be the same basic colour as the AIS AtoN symbol. Solid triangle is centred on visible part of each leg.</i> <i>Leg lines on the route information may be labelled adjacent to their line with their course. The label shall be offset by at least 2 mm from the line and shall not interfere with text used to label the waypoint.</i> <i>Alphanumeric text used to label a leg line shall be the same colour as the leg line.</i> <i>The colour of route type "mandatory route" shall be different from other route types and symbol 3.1 b. Note that the source of route information may be AIS ASM function identifier 27 or 28 (SN.1/Circ.289), etc.</i>	 NOTE Not to scale (SN243)
5.9	Berthing data <i>Berthing assignment shall be presented as a box with the "BERTH" inscribed inside it. The box shall be centred at the position derived from the berthing data message. The box shall not be more than 6 mm in height, drawn using a thick solid line style and shall be the same basic colour as the AIS AtoN symbol.</i> <i>Other information from berthing data, if available, shall be available on demand.</i> <i>Note that the source of berthing data may be AIS ASM function identifier 20 (SN.1/Circ.289), etc.</i>	 (SN243)
5.10	Clearance time to enter port <i>Clearance time to enter port shall be presented as a box with the "CTE" inscribed inside it. The box shall be centred at the position derived from clearance time to enter port data message. The box shall not be more than 6 mm in height, drawn using a thick solid line style and shall be the same basic colour as the AIS AtoN symbol.</i> <i>Other information from clearance time to enter, if available, shall be available on demand.</i> <i>Note that the source of clearance to enter port may be AIS ASM function identifier 18, 22 or 23 (SN.1/Circ.289), etc.</i>	 (SN243)

	Description	Symbol(s)
5.11	Area notice <i>Area notice point symbol shall be presented as box with the "AN" inscribed inside it. The box shall be centred at the position derived from Area notice message. The box shall not be more than 6 mm in height, drawn using a thick solid line style and shall be the same basic colour as the AIS AtoN symbol.</i> <i>Area notice area symbol shall be presented as a series of lines bounding a geographic area. Connecting lines shall be drawn using the thin dashed line style and using the same basic colour as the symbol itself. The area shall be filled with a sparse pattern of Area notice point symbols separated by 50 mm.</i> <i>Drawing priority of Area notice symbol is below Maritime Safety Information MSI, see symbol 5.4.</i> Area notice symbols shall be in a separate user selectable layer, which is removable by single operator action. The removal may be connected to generic removal functionality of non-chart object layers. The user dialog area shall have an indication if area notices are available in the area currently displayed, but the area notice layer is not selected for display. Area notice symbols may be connected to a date range and in such case each area notice symbol shall be displayed only when user selected date is within data range. It shall be possible to cursor pick an Area notice symbol for further details. <i>Note that the source of the area notice may be AIS ASM function identifier 22 or 23 (SN.1/Circ.289), etc.</i>	Example of point symbol  Example of area symbol  (SN243)
5.12	Air gap <i>Air gap symbols consist of two parts: the air gap symbol and the air gap gauge symbol.</i> <i>The air gap symbol shall be presented as a diamond with "A" inscribed inside it. The diamond shall be centred at the position derived from the site location report binary message. The sides of the diamond shall not be more than 6 mm, drawn using a thin solid line style and using the same basic colour as AIS AtoN.</i> <i>The air gap gauge part of the symbol shall be used to represent availability of air gap information. If air gap is not available then there shall be no air gap gauge symbol. The air gap gauge symbol shall not be more than 10 mm in length, drawn using a thick solid line style, transparent fill and using the same basic colour as AIS AtoN.</i> Air gap relative to the water surface in metres with one decimal and other air gap information, if available, shall be available on demand. <i>Note that the source of the air gap/air draught information may be AIS ASM function identifier 26 (SN.1/Circ.289), etc.</i>	 (SN243)

	Description	Symbol(s)
5.13	Environmental report <i>The environmental report symbol shall be presented as a diamond with "ENV" inscribed inside it. The diamond shall be centred at the position derived from the site location report binary message. The sides of the diamond shall not be more than 6 mm, drawn using a thin solid line style and using the same basic colour as AIS AtoN.</i> All available details of environmental information shall be displayable on demand. The tidal flow/current may optionally be represented by symbol 3.4 (tidal stream). If tidal/current speed and direction is not available then there shall be no tidal flow symbol. The tidal flow symbol shall use the same basic colour as AIS AtoN. If selected, the details of tidal flow/current shall be presented in the associated AIS object dialog using one decimal. <i>Note that the source of environmental information may be AIS ASM function identifier 26 or 31 (SN.1/Circ.289), etc.</i>	 (SN243)
5.14	Fairway closure The fairway closure symbol shall be presented as crossed lines centred on a fairway symbol (two converging dashed lines) plus a box around the symbol, drawn using a thin solid line style and using the same basic colour as AIS AtoN. All available details of fairway closure shall be displayable on demand.	
5.15 a	AIS synthetic target – Distress AIS synthetic targets for which the source is AIS ASM when FI = 22 or FI = 23 Area Notice with "Sub-areas" set to "0" circle or point and "Area shape" set to "0" and "Radius" set to "0" and "Notice Description" set to a value range from 64 to 74 shall be presented as a quadrilateral and centred at the predicted position and oriented to the top of the operational display area and shall include a diagonal line across the quadrilateral. The shorter sides of the quadrilateral shall be 4 mm and the longer sides shall be 6 mm. The symbol shall be drawn using a thick solid line style with yellow colour and when used against a light background it shall include a black one-pixel outline to improve readability. Quadrilaterals may be labelled. Alphanumeric text used to label quadrilaterals shall be drawn with the same basic colour as used for AIS AtoN.	 Sarah J
5.15 b	AIS synthetic target AIS synthetic targets for which the source is AIS ASM when FI = 17 VTS generated/synthetic target shall be presented as quadrilaterals oriented to the reported COG and centred at the targets' predicted position. The shorter sides of the quadrilateral shall be 4 mm and the longer sides shall be 6 mm. The quadrilaterals shall be drawn using a thick solid line style and using the same basic colour as AIS AtoN. An AIS synthetic target without a reported COG shall be oriented toward the top of the operational display area and shall include a diagonal line across the quadrilateral. Quadrilaterals may be labelled. Alphanumeric text used to label quadrilaterals shall be drawn with the same basic colour as used for AIS AtoN	 Sarah J AIS synthetic target without COG  Sarah J

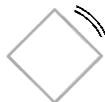
	Description	Symbol(s)
5.16	Source of a received call or unread message Received call or unread message shall be presented by having two increasing centred 1/8 arcs drawn using a thin solid line at upper right-hand side of the AIS target symbol. The received call or unread message symbol may be presented to the upper left-hand side of the AIS symbol, centred on the symbol position, if required to avoid overlapping.	Some examples of the use of symbol 5.16 together with other symbols With AIS target  With AIS AtoN physical  With Base station 
5.17	AIS base station AIS base station shall be presented as a diamond at the reported position of the base station. The sides of the diamond shall be not more than 6 mm in length, drawn using a thin solid line style and shall be the same basic colour as the AIS AtoN symbol. The symbol shall be labelled with text "BS" centred in the diamond and the colour of the label shall be the same colour as the symbol The AIS base station has no associated velocity vector.	 Basic shape
5.18	Co-located AIS ASM objects Co-located AIS ASM objects shall be presented as a diamond at the reported position of the AIS ASM objects. The sides of the diamond shall be not more than 6 mm in length, drawn using a thin solid line style and shall be the same basic colour as the AIS AtoN symbol. The symbol shall be labelled with text "INFO" centred in the diamond and the colour of the label shall be the same colour as the symbol.	
5.19	Weather observation report from ship The weather observation report from ship symbol shall be presented as a diamond with "WX" inscribed inside it. The diamond shall be centred at the position derived from the reported position of observation. The sides of the diamond shall not be more than 6 mm, drawn using a thin solid line style and using the same basic colour as AIS AtoN. Note that the source of ship weather information may be AIS ASM function identifier 21 when type of weather report = 0 (SN.1/Circ.289).	

Table A.6 – Example of possible colour scheme

Symbol	Colour white background/ dark background	Colour token (IHO S-52)
1.1 a, 1.1 b	Black/White	SHIPS
1.7 a	Black/White	PSTRK
2.1 a, 2.4, 2.5 a, 2.15, 2.16	Blue-green	ARPAT
2.10, 2.11, 5.5, 5.6, 5.7	Blue	RESBL
2.12, 4.1, 4.2, 4.3, 4.4, 4.5	Orange	CURSR
2.14, 3.7, 5.4	Orange	NINFO
3.1 a	Red	PLRTE
3.1 a	Orange	APLRT

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Annex B (normative)

Guidelines for the presentation of navigation-related terminology and abbreviations

B.1 Overview

Annex B specifies the terminology and abbreviations to be used for the presentation of navigation related information in conformance with guidelines published by IMO and provided in SN/Circ.243. All text in this document whose wording is identical to that in the IMO guidelines is printed in *italics*, and the referenced paragraph number is indicated in brackets with the abbreviated prefix, for example (SN243/2).

B.2 Purpose

(SN243/2/1) *The purpose of Annex B is to provide guidelines on the use of appropriate navigation-related terminology and abbreviations intended for presentation on all shipborne navigational systems and equipment. These are based on terminology and abbreviations used in existing navigation references.*

B.3 Use of these guidelines

(SN243/2/2) *These guidelines will ensure that the terminology and abbreviations used for the presentation of navigation-related information on all shipborne navigational systems and equipment are presented in a consistent and uniform manner.*

B.4 Application

(SN243/2/3) *These guidelines apply to all shipborne navigational systems and equipment when navigation-related information is presented as text, the standard terminology or abbreviations listed in Table B.1 and Table B.2 shall be used in place of terminology and abbreviations which are currently contained in existing Performance Standards for navigational systems and equipment. Where standard terminology or a standard abbreviation is not available, another may be used. This shall provide a clear meaning and shall not conflict with the standard terminology or abbreviations listed in Table B.1 and Table B.2. Standard marine terminology shall be used for this purpose. When the meaning is not clear from its context, it shall not be abbreviated. When another terminology or abbreviation is used, it shall be explained in the operating manual.*

(SN243/2/3) *Unless otherwise specified, standard terms shall be presented in lower case while abbreviations shall be presented in upper case.*

B.5 Navigation related terminology and abbreviations

For the application of the standard terminology and abbreviations listed in Table B.1 and the standard units of measurement and abbreviations listed in Table B.2, the following shall be considered:

- *terms and abbreviations used in nautical charts are published in relevant IHO publications and are not listed here;*
- *in general, terms should be presented using lower case text with upper case first character for each separate word and abbreviations should be presented using upper case text. Those abbreviations that may be presented using lower case text are identified in Table B.2;*

- *abbreviations may be combined, for example, "CPA LIM" or "T CRS". When the abbreviation for the standard terminology "Relative" is combined with another abbreviation, the abbreviation "R" should be used instead of "REL", for example, "R CRS" (see footnote b to Table B.1);*
- *the use of the abbreviations "SIM" and "TRIAL" are not intended to replace the appropriate symbols listed in Table A.5 (see footnote c to Table B.1);*
- *The term "Course Made Good" has been used in the past to describe "Track Made Good". This is a misnomer in that "courses" are directions steered or intended to be steered with respect to a reference meridian. "Track Made Good" is preferred over the use of "Course Made Good", where applicable (see footnote d to Table B.1);*
- *Where other information is presented using SI units, the respective abbreviations shall be used (see Table B.2).*

Table B.1 – List of standard terms and abbreviations

Term	Abbreviation	Term	Abbreviation
Acknowledge	ACK	Bearing Waypoint To Waypoint	BWW
Acquire, Acquisition	ACQ	Bow Crossing Range	BCR
Acquisition Zone	AZ	Bow Crossing Time	BCT
Additional Military Layer	AML	Built in Test Equipment	BITE
Adjust, Adjustment	ADJ	Calibrate	CAL
Aft	AFT	Cancel	CNCL
Alarm	ALARM	Cancel All	CNCL ALL
Alert Setting	ALERT SET	Carried (for example, carried EBL origin)	C
Altitude	ALT	Central Processing Unit	CPU
Amplitude Modulation	AM	Centre	CENT
Anchor Watch	ANCH	Change	CHG
Antenna	ANT	Chart Display Settings	CHT DISP SET
Anti Clutter Rain	RAIN	Chart Management	CHT MGMT
Anti Clutter Sea	SEA	Chart Safety Settings	CHT SF SET
April	APR	Circularly Polarised	CP
Audible	AUD	Clear	CLR
August	AUG	Closest Point of Approach	CPA
Automatic	AUTO	Compact Disk Read Only Memory	CDROM
Automatic Frequency Control	AFC	Conning	CONN
Automatic Gain Control	AGC	Consistent Common Reference Point	CCRP
Automatic Identification System	AIS	Consistent Common Reference System	CCRS
Automatic Identification System – Search and Rescue Transmitter	AIS-SART	Contrast	CONT
Automatic Radar Plotting Aid	ARPA	Coordinated Universal Time	UTC
Autopilot	AP	Correction	CORR
Auxiliary System/Function	AUX	Course	CRS
Available	AVAIL	Course Over the Ground	COG
Azimuth Indicator	AZI	Course Through the Water	CTW
Background	BKGND	Course To Steer	CTS
BeiDou Navigation Satellite System	BDS	Course Up	C UP ^a
Bearing	BRG		

Term	Abbreviation
Cross Track Distance	XTD
Cross Track Limit	XTL
Cursor	CURS
Dangerous Goods	DG
Date	DATE
Dated Objects	Dated Objects
Day	DAY
Day/Night	DAY/NT
Dead Reckoning, Dead Reckoned Position	DR
December	DEC
Decrease	DECR
Default Settings	DFLT SET
Delay	DELAY
Delete	DEL
Departure	DEP
Depth	DPTH
Destination	DEST
Deviation	DEV
Differential BDS	DBDS
Differential Galileo	DGAL ^a
Differential GLONASS	DGLONASS ^a
Differential GNSS	DGNSS ^a
Differential GPS	DGPS ^a
Digital Selective Calling	DSC
Display	DISP
Display Brilliance	BRILL
Distance	DIST
Distance Root Mean Square	DRMS ^a
Distance To Go	DTG
Down	DN
Drift	DRIFT
Dropped (for example, dropped EBL origin)	D
East	E
Echo Reference	REF
Electronic Bearing Line	EBL
Electronic Chart Display and Information System	ECDIS
Electronic Chart System	ECS
Electronic Navigational Chart	ENC
Electronic Position Fixing System	EPFS
Electronic Range and Bearing Line	ERBL

Term	Abbreviation
Emergency Position Indicating Radio Beacon	EPIRB
Emergency Position Indicating Radio Beacon – AIS	EPIRB-AIS
ENC Management Report	ENC MGMT REP
ENC Update Status Report	ENC UPD STATUS
Enhance	ENH
Enter	ENT
Equipment	EQUIP
Error	ERR
Estimated Position	EP
Estimated Time of Arrival	ETA
Estimated Time of Departure	ETD
European Geo-Stationary Navigational Overlay System	EGNOS
Event	EVENT
Exclusion Zone	EZ
Export Route	ROUTE EXP
External	EXT
F-Band (applies to radar)	F-Band
February	FEB
Foreword	FWD
Fishing Vessel	FISH
Fix	FIX
Forward	FWD
Frequency	FREQ
Frequency Modulation	FM
Full	FULL
Gain	GAIN
Geographics	GEOG
Geometric Dilution Of Precision	GDOP
Global Maritime Distress and Safety System	GMDSS
Global Navigation Satellite System	GNSS
Global Orbiting Navigation Satellite System	GLONASS
Global Positioning System	GPS
Great Circle	GC
Grid	GRID
Ground	GND
Grounding Avoidance System	GAS
Group Repetition Interval	GRI
Guard Zone	GZ
Gyro	GYRO

Term	Abbreviation	Term	Abbreviation
Harmful Substances (applies to AIS)	HS	Magnetic	MAG
Head Up	H UP ^a	Man Overboard	MOB
Heading	HDG	Manoeuvre	MVR
Heading Control System	HCS	Manual	MAN
Heading Line	HL	Manual Update	MAN UPD
Heading Line Off	HL OFF	Map(s)	MAP
High Frequency	HF	March	MAR
High Speed Craft	HSC	Maritime Mobile Services Identity number	MMSI
Horizontal Dilution Of Precision	HDOP	Maritime Polluant (applies to AIS)	MP
Identification	ID	Maritime Safety Information	MSI
Import Chart	IMPORT CHT	Marker	MKR
Import Route	ROUTE IMP	Master	MSTR
In	IN	Maximum	MAX
Increase	INCR	May	MAY
Indication	IND	Medium Frequency	MF
Information	INFO	Medium Pulse	MP
Information Report	INFO REPORT	Menu	MENU
Infrared	INF RED	Minimum	MIN
Initialisation	INIT	Missing	MISSING
Input	INP	Mute	MUTE
Input/Output	I/O	Navigation	NAV
Integrated Navigation System	INS	Night	NT
Integrated Radio Communication System	IRCS	Normal	NORM
Interference Rejection	IR	North	N
Interswitch	ISW	North Up	N UP ^a
Interval	INT	Not Less Than	NLT
January	JAN	Not More Than	NMT
July	JUL	Not Under Command	NUC
June	JUN	November	NOV
Label	LBL	October	OCT
Latitude	LAT	Off	OFF
Latitude/Longitude	L/L	Off centred	OFF CENT
Leeway	LWY	Officer of the Watch	OOW
Limit	LIM	Offset	OFFSET
Line Of Position	LOP	On	ON
Log	LOG	Out/Output	OUT
Long Pulse	LP	Own Ship	OS
Long Range	LR	Own Ship Look-Ahead	LOOK AHEAD
Longitude	LON	Panel Illumination	PANEL
Loran	LORAN	Parallel Index Line	PI
Lost Target	LOST TGT	Past Positions	PAST POSN
Low Frequency	LF	Passenger Vessel (applies to AIS)	PASSV

Term	Abbreviation	Term	Abbreviation
Performance Monitor	MON	Route Monitoring	ROUTE MON
Permanent	PERM	Route Plan	ROUTE PLAN
Person Overboard	POB	Safety Contour	SF CNT
Personal Identification Number	PIN	Sailing Vessel	SAIL
Pilot Vessel	PILOT	Satellite	SAT
Port/Portside	PORT	Satellite Based Augmentation System	SBAS
Position	POSN	Save User Settings	SAVE USR
Positional Dilution Of Precision	PDOP	S-Band (applies to Radar)	S-BAND
Power	PWR	Scan to Scan	SC/SC
Predicted	PRED	Search And Rescue	SAR
Predicted Area of Danger	PAD	Search And Rescue Transponder	SART
Predicted Point of Collision	PPC	Search And Rescue Vessel	SARV
Pulse Length	PL	Select	SEL
Pulse Modulation	PM	Select User Settings	USR SEL
Pulse Repetition Frequency	PRF	September	SEP
Pulse Repetition Rate	PRR	Sequence	SEQ
Pulses Per Revolution	PPR	Set (i.e., set and drift, or setting a value)	SET
Racon	RACON	Ship's Time	TIME
Radar	RADAR	Short Pulse	SP
Radar Overlay	RADAR OVR	Signal to Noise Ratio	SNR
Radar Settings	RADAR SET	Silence	SLNC
Radar Plotting	RP	Simulation	SIM ^c
Radar Transponder	TPR	Slave	SLAVE
Radius	RAD	South	S
Rain	RAIN	Speed	SPD
Range	RNG	Speed and Distance Measuring Equipment	SDME
Range Rings	RR	Speed Over the Ground	SOG
Raster Chart Display System	RCDS	Speed Through the Water	STW
Raster Navigational Chart	RNC	Stabilized	STAB
Rate Of Turn	ROT	Standard Display	STND DISP
Real-time Kinematic	RTK	Standby	STBY
Receiver	RX ^a	Starboard/Starboard Side	STBD
Receiver Autonomous Integrity Monitoring	RAIM	Station	STN
Reference	REF	Status and Data	STAT DISP
Relative	REL ^b	Symbol(s)	SYM
Relative Motion	RM	Synchronization	SYNC
Revolutions per Minute	RPM	System Electronic Navigational Chart	SENC
Rhumb Line	RL	Target	TGT
Roll On/Roll Off Vessel (applies to AIS)	RoRo	Target Tracking	TT
Root Mean Square	RMS	Test	TEST
Route	ROUTE	Time	TIME

Term	Abbreviation	Term	Abbreviation
Time Difference	TD	Vector	VECT
Time Dilution Of Precision	TDOP	Very High Frequency	VHF
Time Of Arrival	TOA	Very Low Frequency	VLF
Time Of Departure	TOD	Vessel Aground (applies to AIS)	GRND
Time to CPA	TCPA	Vessel at Anchor (applies to AIS)	ANCH
Time To Go	TTG	Vessel Constrained by Draught (applies to AIS)	VCD
Time to Wheel Over Line	TWOL	Vessel Engaged in Diving Operations	DIVE
Track	TRK	Vessel Engaged in Dredging or Underwater Operations (applies to AIS)	DRG
Track Control System	TCS	Vessel Engaged in Towing Operations (applies to AIS)	TOW
Tracking	TRKG	Vessel Not Under Command (applies to AIS)	NUC
Track Made Good	TMG ^d	Vessel Restricted in Manoeuvrability (applies to AIS)	RIM
Trail(s)	TRAIL	Vessel Traffic Service	VTs
Transceiver	TXRX ^a	Vessel Underway Using Engine (applies to AIS)	UWE
Transferred Line Of Position	TPL	Video	VID
Transmitter	TX ^a	Visual Display Unit	VDU
Transmitting Heading Device	THD	Voyage	VOY
Trial	TRIAL ^c	Voyage Data Recorder	VDR
Trial Settings	TRIAL SET	Warning	WARNING
Trigger Pulse	TRIG	Water	WAT
True	T	Waypoint	WPT
True Motion	TM	Waypoint Closure Velocity	WCV
Tune	TUNE	West	W
Ultrahigh Frequency	UHF	Wheel Over Line	WOL
Uninterruptible Power Supply	UPS	Wheel Over Point	WOP
Universal Time, Coordinated	UTC	Wheel Over Time	WOT
Universal Transverse Mercator	UTM	World Geodetic System	WGS
Unstabilised	UNSTAB	X-Band (applies to Radar)	X-BAND
Update Log	UPD LOG		
Update Review	UPD REV		
User Chart	USR CHT		
Variable Range Marker	VRM		
Variation	VAR		

- ^a In general, terms should be presented using lower case text and abbreviations should be presented using upper case text. Those abbreviations that may be presented using lower case text are identified in the table, for example, "dGNSS", "Rx".
- ^b Abbreviations may be combined, e.g. "CPA LIM" or "T CRS". When the abbreviation for "Relative" is combined with another abbreviation, the abbreviation "R" should be used instead of "REL", for example "R CRS".
- ^c The use of abbreviations "SIM" and "TRIAL" are not intended to replace the appropriate symbols listed in Table A.5.
- ^d The term "Course Made Good" has been used in the past to describe "Track Made Good". This is a misnomer in that "courses" are directions steered or intended to be steered with respect to a reference meridian. "Track Made Good" is preferred over the use of "Course Made Good", where applicable.

Table B.2 – List of standard units of measurement and abbreviations

Unit	Abbreviation
<i>cable length</i>	<i>cbl</i>
centimetre	cm
<i>cycles per second</i>	<i>cps</i>
<i>degree(s)</i>	<i>deg or °</i>
<i>fathom(s)</i>	<i>fm</i>
<i>feet/foot</i>	<i>ft</i>
<i>gigahertz</i>	<i>GHz</i>
<i>hectopascal</i>	<i>hPa</i>
<i>hertz</i>	<i>Hz</i>
<i>hour(s)</i>	<i>hr(s)</i>
inch	in
<i>kilohertz</i>	<i>kHz</i>
<i>kilometre</i>	<i>km</i>
<i>kilopascal</i>	<i>kPa</i>
<i>knot(s)</i>	<i>kn</i>
<i>megahertz</i>	<i>MHz</i>
<i>metre</i>	<i>m</i>
<i>minute(s)</i>	<i>min or '</i>
<i>Nautical Mile(s)</i>	<i>NM</i>
<i>second(s)</i>	<i>s or "</i>

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Annex C (informative)

Guidance on display and dialogue design in IMO MSC/Circ.982

C.1 Overview

Annex C lists the guidelines in IMO MSC/Circ.982 that are related to presentation, and their association with the presentation-related requirements provided in IEC 60945 and this document.

C.2 General

IMO MSC/Circ.982 provides guidelines on ergonomic criteria for bridge equipment and layout with the objective of improving the reliability and efficiency of navigation. These guidelines contain additional, relevant and useful information that may be applied to the design of computer-based displays for navigational systems and equipment.

C.3 Requirements in IMO MSC/Circ.982 related to the display design

Some of the paragraphs in IMO MSC/Circ.982 can be associated with the general requirements for shipborne navigational systems and equipment in IEC 60945:2002, particularly those related to display equipment or displays. Others are wholly or partially related to display design. Table C.1 through Table C.3 list those paragraphs.

Table C.1 – Paragraphs in MSC/Circ.982 associated with IEC 60945 requirements

IEC 60945:2002 Subclause		MSC/Circ.982 Paragraph	
4.2.1	Ergonomics and HMI		
4.2.1.3	Operation	5.3.2.6	Control/indicator discernability
		5.5	Input devices
		5.7	General user input guidelines
4.2.1.4	Identification	5.3.2.4	Control and display location
		5.2.2.5	Simultaneous use
4.2.1.5	Screen displays and indications	5.3.5.1	Function labelling
		5.3.5.2	Label terminology
		5.6.3.3	Background colour (Conflicts with Paragraph 7)
		5.7	General user input guidelines (Paragraph g))
4.2.2	Hardware		
4.2.2.2	Alarms and indicators	5.4.1.1	Alarm acknowledgement

Table C.2 – Other paragraphs in MSC/Circ.982 related to display design

MSC/Circ.982 Paragraph	
5.3.2.7	High priority displays
5.3.3.5	Spacing between controls
5.4.1.4	Sensor input failure
5.4.1.8	Alarm Minimization
5.4.1.12	Presentation of Alarms
5.4.2	Visual Alarms (all 6 sub-criteria)
5.6.1.1	Lack of ambiguity
5.6.1.2	Use of digital displays
5.6.1.3	Digital readout
5.6.1.10	Display fields for the display of important information
5.6.2.3	Demarcation of Groups
5.6.3.8	Flicker
5.6.3.9	Image continuity
5.6.3.10	CRT image linearity
5.6.5.2	Meaningful abbreviations
5.6.5.3	Units of measurement
5.6.5.7	Highlighting
5.6.5.8	Scaling in standards intervals
5.6.5.10	Unobtrusive grids

Table C.3 – Other paragraphs in MSC/Circ.982 partially related to display design

MSC/Circ.982 Paragraph	
5.3.2.4	Control and display location
5.3.2.5	Simultaneous use
5.3.3.4	Consistent arrangement
5.3.3.5	Simultaneous use
5.4.1.3	Failure or reduction of power supply
5.4.1.13	Modes of alarms
5.4.3	Audible alarms (all 6 sub-criteria)

Annex D **(informative)**

Guidance on testing

D.1 Methods of test

D.1.1 General

The methods of test in this document do not identify specific processes, approaches or facilities. Rather, they are intended to provide guidance to accredited testing laboratories for the development of test plans and test procedures that evaluate compliance with the requirements specified.

D.1.2 Observation

The test method "observation" refers to simple examination of the presentation of information to confirm that a particular observable condition has been met. The phrase "confirm by observation" is used.

Observations may be made by any person with the necessary skill to understand the presentation of information to determine if a statement concerning an observable property has been correctly applied. It is used when suitably trained individuals with a broad range of education and/or experience can be confidently expected to reach the same conclusion about a property of presented information or the performance of display equipment.

Compliance is determined by comparing the observed property to the requirement. Some observations may be made directly from the presentation. Other observations may require simulation of input from sensors or other sources. Typical confirmations by observation include:

- existence of functions or features;
- use of symbols or a defined range of words;
- a system output in response to a defined input.

D.1.3 Inspection of documented evidence

The test method "inspection of documented evidence" refers to examination of relevant documents to confirm that a particular presentation or display requirement has been met. The phrase "confirm by inspection of documented evidence" is used.

Documented evidence may include manuals, system requirements, design justification, industry conventions, etc. Inspections may be made by a suitably qualified person who has the necessary education, skill and/or experience to apply the documentation to the system's presentation or display equipment. It is used when performance of a system's presentation or display equipment is not directly observable or measurable. It may also be used when observation would be excessively repetitious, time consuming, or expensive.

Compliance is determined by comparing the documented property to the requirement. Typical confirmations by inspection of documented evidence include:

- conformance to a standard or other documented evidence;
- existence of optional features or functions;
- design and/or operation of algorithms.

D.1.4 Measurement

The test method "measurement" refers to measuring or calculating a value or variable for comparison to a specified value to determine that a particular presentation or display requirement has been met. The phrase "confirm by measurement" is used.

Measurements may require the use of test facilities and equipment. Measurements may be made by any person with the necessary skill to measure and/or calculate the value and compare it against a requirement, standard or other documented evidence.

Compliance is determined by comparing the measured or calculated value or variable to the requirement. Typical confirmations by measurement include:

- assessing whether the end users of a display will be able to read characters from the intended viewing distance;
- differences between displayed colours or absolute levels of display brightness;
- achievement of a level of availability or dependability.

D.1.5 Analytical evaluation

The test method "analytical evaluation" refers to detailed examination of the presentation of information to confirm that a particular condition has been met. The phrase "confirm by analytical evaluation" is used.

Analytical evaluations may be made by a relevant expert with the necessary education, skills and/or experience to make an informed and reliable judgement concerning the presentation of information, its appropriateness and usability. It is used for the evaluation of properties which can be judged only in the context of other information or knowledge which requires the tester to make an informed assessment of the likely performance of a typical user of the presentation.

Compliance is determined by comparing the observed property to the requirement. Typical confirmations by analytical evaluation include:

- the largest amount of information that can be presented to a user on a single display;
- the smallest difference in size, colour or line thickness that will be distinguished by a user on a particular display;
- consistency and clarity in presentation of information.

D.2 Application of IEC 60945

D.2.1 Display equipment category

The manufacturer should categorize their display equipment according to IEC 60945:2002, 4.4.

D.2.2 Technical performance

A performance test should be used to confirm compliance with the requirements specifying parameters.

A performance check should be used to confirm that the equipment operates.

The testing laboratory should use the appropriate measure of technical performance (i.e. performance test or performance check) for each test in the test plan.

The equipment should operate in accordance with this document during each performance test or performance check.

D.2.3 Pre-conditioning for environmental tests

The manufacturer should specify any mechanical or electrical preconditioning required for environmental tests. The testing laboratory should inspect the display equipment and perform any preconditioning specified by the manufacturer.

The testing laboratory should carry out environmental tests with display equipment in its normal operational configuration, including mounting and supports, and with all mechanical arrangements secure.

D.2.4 Methods of test applied for IEC 60945

Many requirements for the presentation of information are of a nature that may be tested by simple observation. Other requirements are, however, of a more complex nature and may require informed judgement in the context of other information or knowledge by an expert with the necessary education, skills and/or experience. This is particularly the case in assessing conditions of appropriateness, usability or the likely performance of a typical user.

These considerations are reflected in the guidance on test methods provided by Clause D.1, and in the structure of this document in general, where the test method to be applied is specified test by test.

IEC 60945:2002 simply specifies that each requirement should be "checked", without further guidance. Table D.1 gives appropriate test methods.

Table D.1 – Methods of test applied for IEC 60945

IEC 60945:2002 subclause	Original test method	Appropriate test method
6.1.2 a)	Check	Analytical evaluation
6.1.2 b)	Check	Analytical evaluation
6.1.2 c)	Check	Measurement
6.1.2 d)	Check	Analytical evaluation
6.1.2 e)	Check	Observation
6.1.2 f)	Check	Observation
6.1.2 g)	Check	Observation
6.1.2 h)	Check	Analytical evaluation
6.1.3 a)	Check	Analytical evaluation
6.1.3 b)	Check	Analytical evaluation
6.1.3 c)	Check	Observation
6.1.3 d)	Check	Analytical evaluation
6.1.4 a)	Check	Observation
6.1.4 b)	Check	Observation
6.1.4 c)	Check	Observation
6.1.4 d)	Check	Analytical evaluation
6.1.5 a)	Check	Analytical evaluation
6.1.5 b)	Check	Observation
6.1.5 c)	Check	Analytical evaluation
6.1.5 d)	Check	Observation
6.1.5 e)	Check	Analytical evaluation
6.1.5 f)	Check	Analytical evaluation
6.1.5 g)	Check	Inspection of documented evidence
6.1.5 h)	Check	Analytical evaluation
6.1.5 i)	Check	Analytical evaluation
6.1.5 j)	Check	Analytical evaluation

IEC 60945:2002 subclause	Original test method	Appropriate test method
6.1.5 k)	Check	Analytical evaluation
6.1.5 l)	Check	Analytical evaluation
6.1.5 m)	Check	Observation
6.1.5 n)	Check	Observation
6.1.5 o)	Check	Analytical evaluation
6.1.5 p)	Check	Observation
6.1.5 q)	Check	Observation
6.1.5 r)	Check	Observation
6.1.5 s)	Check	Observation
6.1.5 t)	Check	Observation
6.1.6 a)	Check	Analytical evaluation
6.1.6 b)	Check	Observation
6.1.6 c)	Check	Observation
6.1.6 d)	Check	Observation
6.1.7 a)	Check	Analytical evaluation
6.1.7 b)	Check	Analytical evaluation
6.1.7 c)	Check	Analytical evaluation
6.1.7 d)	Check	Analytical evaluation
6.1.7 e)	Check	Analytical evaluation
6.1.8 a)	Check	Analytical evaluation
6.1.8 b)	Check	Observation
6.1.8 c)	Check	Observation
6.1.8 d)	Check	Observation
6.1.8 e)	Check	Observation
6.1.8 f)	Check	Analytical evaluation
6.2.1 a)	Check	Observation
6.2.1 b)	Check	Analytical evaluation
6.2.1 c)	Check	Analytical evaluation
6.2.1 d)	Check	Observation
6.2.2 a)	Check	Observation
6.2.2 b)	Check	Observation
6.2.2 c)	Check	Observation
6.2.3 a)	Check	Observation
6.2.3 b)	Check	Observation
6.2.3 c)	Check	Inspection of documented evidence
6.2.3 d)	Check	Observation
6.2.3 e)	Check	Observation
6.2.3 f)	Check	Analytical evaluation
6.2.3 g)	Check	Observation
6.2.3 h)	Check	Observation
6.2.3 i)	Check	Observation

D.3 Compliance with requirements

Compliance with a requirement can be established by verifying that it is implemented in accordance with another standard or with another clause or subclause within this document; or by confirming that it is implemented in accordance with the requirement(s) specified in the requirement clause/subclause.

D.4 Simulation

Some test methods require simulation. A simulator arrangement should provide the capabilities to replicate own ship navigational sensors, radar video images including individual radar echoes for the tracking of targets, reported radar targets (for example, in accordance with the IEC 61162 series), AIS data reports, AIS locating devices, AIS synthetic targets, AIS safety related messages and AIS ASMs.

IEC 62388 describes a Target Scenario Simulator (TSS), a Reported Target Simulator (RTS) and a combined TSS/RTS.

D.5 Electronic chart data

Some test methods require electronic chart data or an electronic chart test data set.

IEC 61174 describes the use of a test data set for ENC. For example, IHO S-64 contains the IHO test data sets for ECDIS using IHO S-57 ENC. The ECDIS test data sets are comprised of an ENC test data set and an RNC test data set.

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Annex E (normative)

Operational controls and logical grouping

E.1 Overview

Operational controls for navigational systems and equipment shall be easy to identify and simple to use. Controls may be implemented through dedicated hardware, screen-accessed soft keys, or a combination of both. The primary controls for each navigational system or equipment shall be identified and provided with an associated status indication in accordance with the function it is serving.

E.2 Logical grouping of data and control functions

Data and control functions shall be divided into logical groups for the function or the task-at-hand, in accordance with 4.3.1.

Table E.1 provides logical grouping that shall be applied to radar, ECDIS and INS; and may be applied to other electronic navigation equipment and navigation sensors, where applicable.

Table E.2 provides examples of voluntary to implement top-level logical groupings of data and controls for radar and charting functionality. Specific requirements for logical grouping of data and control functions, when contained in the individual standards for navigational systems and equipment, shall also be followed. Examples of major groups:

- alerts and indications;
- own ship information;
- track monitoring data (as specified in IEC 62065);
- trial manoeuvre;
- navigational tools and readouts;
- target information;
- range/scale and mode readout;
- radar system information;
- radar signal information;
- chart database information;
- system settings.

**Table E.1 – Logical grouping for radar, ECDIS and INS applications
(based on MSC.1/Circ.1609)**

Own ship information
HDG: <value> <unit> <sensor source/ status>
COG: <value> <unit> <sensor source/ status>
SOG: <value> <unit> <sensor source/ status>
STW: <value> <unit> <sensor source/ status>
Position (Optional) <LAT value> <LON value> <Sensor source and status>
Date and Time
<Date> <Time> <time reference>
<Date> <Time> <UTC>
Target information
Target Number/ Identifier <1234>
Target Name <Alphanumeric>
COG: <value> <unit>
SOG: <value> <unit>
STW: <value> <unit> >
Closest Point of Approach (CPA): <value> <unit>
Time to Closest Point of Approach (TCPA): <value> <unit>
Bearing from Ownship: <value> <unit>
Range from Ownship: <value> <unit>
Measurement info
EBL bearing: <value><unit>
VRM range: <value><unit> >
Cursor location
Position <LAT value> <LON value>
Bearing from Ownship: <value> <unit>
Range from Ownship: <value> <unit>
Route
Route Name: <RTE Name>
Next Waypoint Number/ Name: <WPT name>
Distance to "TO-WPT": <value> <unit>
Bearing to "TO-WPT": <value> <unit>
Time to go to "TO-WPT": <value> <unit>
Estimate time of arrival: <value> <unit> <time reference>
Next course: <value> <unit>
Current Cross Track Distance: PORT <value> <unit> Or STBD <value> <unit>
Cross track Limit Current Leg: PORT <value> <unit> STBD <value> <unit>

Table E.2 – Examples of logical grouping for voluntary implementation

Scale and mode information	Chart database information
Chart scale Chart datum Orientation mode Motion mode Symbol set	ENC cell Cell edition/date Corrected through date
Radar signal information	Radar system information
Gain Rain Sea Processing (for example, target enhancement or correlation)	Standby/run Pulse length Frequency band Master/slave designation Tune
Range and mode information	
Range scale Orientation mode Stabilization mode Motion mode	

E.3 Navigation related terminology and icons for common function controls (hot keys and shortcuts)

When any of the following controls listed in Clause E.3 are used, they shall be identified in English by the relevant name or abbreviation as listed by the appropriate table. In addition, they may be identified by standard icons, described below.

General equipment controls apply to all equipment and are defined in Table E.3. Navigation controls are defined in Table E.4. Radar specific controls are defined in Table E.5. Chart display controls are defined in Table E.6. Some chart related functions are in Table E.7. Chart database controls are defined in Table E.8. Route plan and monitoring controls are defined in Table E.9. Miscellaneous controls are defined in Table E.10.

Icons in Table E.6 shall be implemented using the specified colours based on IHO colour scheme or similar. For all other icons, the manufacturer shall select appropriate colours within the requirements of this document.

All icons in the tables are examples of the shape and to be adjusted for space available for an icon in the target equipment.

The following code of practice shall be used when marking equipment controls with optional icons:

- the minimum dimension of a symbol shall be not less than 9 mm;
- the distance between the centres of two adjacent symbols shall be not less than 1,1 times the size of the larger symbol;
- switch function symbols shall be linked by a line. A linked line infers controlled action;
- variable control function symbols shall be linked by a line, preferably an arc. The direction of increase shall be indicated;
- icons shall be presented with a high contrast against their background;
- the various elements of a symbol shall have a fixed ratio one to another;
- multiple functions of controls and switch positions may be indicated by a combined symbol;
- where concentric controls or switches are fitted, the outer of the symbols should refer to the larger diameter control.

Table E.3 – General controls

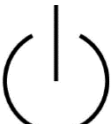
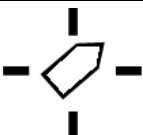
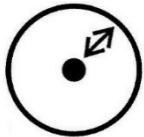
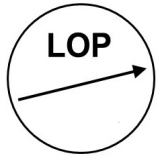
Explanation	Term	Abbreviation	Icon (hot key)
To identify the "off" position of the control or switch	OFF	OFF	
To identify the "Radar on" position of the switch or alternatively To identify the "on" position of the control or switch The relative size of the dot with respect to the circle may vary as long as it is easily distinguishable.	ON	ON	 or 
To identify the "on/off" alternate control or switch	ON/OFF	ON/OFF	
To identify the standby alternate control or switch and To identify the combined "on/off" plus standby alternate control or switch Table E.5 specifies this symbol for Radar. A radar may use this symbol or the symbol specified in Table E.5.	STANDBY	STBY	
To activate system menu	Menu	MENU	
To perform Undo	Undo	UNDO	
To perform Redo	Redo	REDO	
To return to Colour calibrated display	Colour calibrated	COLCAL	
To perform Print screen	Print screen	PRT SC	

Table E.4 – General navigation functions (based on MSC.1/Circ.1609)

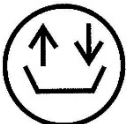
Explanation	Term	Abbreviation	Icon (hot key)
To set panel illumination	Panel illumination	PANEL	
To set display brilliance	Display brilliance	BRILL	
To select ECDIS mode (for multifunction displays)	ECDIS	ECDIS	
To select Radar mode (for multifunction displays)	Radar	RADAR	
To select Conning display or to select 'navigation control data' task of the INS (for multifunction displays)	Conning	CONN NAV CTRL	
To select CAM-HMI as defined in Bridge Alert Management (BAM) (for example as required by INS)	CAM-HMI	CAM	
To select North Up display	North Up	N UP	N UP
To select Head Up display	Head Up	H UP	H UP
To select Course Up display	Course Up	C UP	C UP
To select True Motion mode	True Motion	TM	TM
To select Relative Motion mode	Relative Motion	RM	RM
To select ship centred Mode	Centred	CENT	
To select ship off centred Mode	Off centred	OFF CENT	
To perform True Motion reset	TM reset	TM RESET	TM RESET

Explanation	Term	Abbreviation	Icon (hot key)
To select range	Range	RANGE	
To perform Range up (for example, from 3 nm to 6 nm)	Up	+	
To perform Range down (for example, from 6 nm to 3 nm)	Down	-	
To identify the "heading line" off position	Heading Line Off	HL OFF	
To toggle Range Rings on and off	Range Rings	RR	
To set Variable Range Marker	Variable Range Marker	VRM	VRM
To set Electronic Bearing Line	Electronic Bearing Line	EBL	EBL
To control simultaneous measurement of range and bearing	Electronic Range and Bearing Line	ERBL	ERBL
To perform Target Acquire	Acquire	ACQ	ACQ
To perform selection (for example, target or chart object)	Select	SEL	
To call up the information associated with an object by cursor selection on its symbol	Info report	INFO REPORT	
To perform target cancellation	Cancel	CNCL	
To perform cancellation of all targets	Cancel all	CNCL ALL	
To acknowledge an alert	Acknowledge	ACK	ACK

Explanation	Term	Abbreviation	Icon (hot key)
To temporarily silence alerts	Silence	SLNC	
To record or log an event or occurrence	Record Event	REC EVENT	
To select default settings	Default settings	DFLT SET	
To select user settings	Select user settings	USR SET	
To save user settings	Save user settings	SAVE USR	
To select standard display for chart symbol	Standard display	STND DISP	STND DISP
To execute Trial Manoeuvre	Trial manoeuvre	TRIAL	TRIAL
To toggle Day/Night/Dusk mode	Day / Night	DAY / NT	
To plot own ship position manually	Line of Position	LOP	
To toggle True/Relative Vector mode	True/Relative Vector	T/R VECT	
To toggle On/Off AIS	Automatic Identification System contacts on/off	AIS	AIS
To toggle On/Off Automatic Identification System Application Specific Messages	AIS ASM on/off	AIS ASM	AIS ASM

Explanation	Term	Abbreviation	Icon (hot key)
To "status and data display" tasks of the INS	Status and Data	STAT DISP	STAT DISP
To activate anchor watch	Anchor watch	ANCHOR	

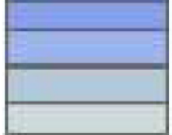
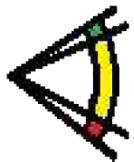
Table E.5 – Radar specific controls

Explanation	Term	Abbreviations	Symbol
To identify the "Radar stand-by" position of the switch Table E.3 specifies this case for general use. A radar may use this symbol or the symbol specified in Table E.3.	STANDBY	STBY	
To identify the "short" pulse position of the pulse length selection control	SHORT PULSE	SP	
To identify the "long" pulse position of the pulse length selection control	LONG PULSE	LP	
To identify the "tuning control"	TUNE	TUNE	
To identify the "gain" control	GAIN	GAIN	
To identify the minimum position of the "rain" control or switch	RAIN	RAIN	
To identify the minimum position of the "anti-clutter sea" control	SEA	SEA	
To identify the position of the performance monitor switch	PERFORMANCE MONITOR	PM	

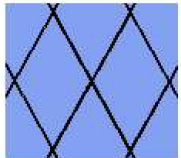
Explanation	Term	Abbreviations	Symbol
To select target association priority for radar target The circle is drawn using a thick line and triangle is drawn using a thin line			
To select target association priority for AIS target The circle is drawn using a thin line and triangle is drawn using a thick line			
NOTE The circles around the SHORT PULSE, LONG PULSE, and PERFORMANCE MONITOR icons are optional.			

Table E.6 – Control of chart display functions (based on MSC.1/Circ.1609)

Explanation	Term	Abbreviation	Icon (hot key)
To show accuracy related symbols	Accuracy	CATZOC	
Selector for viewing group layer	All isolated dangers	ISODNG	
	Archipelagic sea lanes	ALS	
	Boundaries and limits	BNDLIM	
	Buoys, beacons, aids to navigation	ATON	
	Cautionary notes	CNTNTE	
Chart boundary shown	Chart boundary	CHTBND	

Explanation	Term	Abbreviation	Icon (hot key)
Selector for viewing group layer	Chart scale boundaries	CHTSCA	
To show contour labels	Contour label	CNTLBL	
Deep contour	Deep contour	DEEPCNT	
Selector for viewing group layer	Display base	DISPBASE	
Use four shades	Four shades	4SHADES	
Selector for full light sector lines	Full light lines	FULLSEC	
Show date dependent object	Highlight date dependent	DATEDEP	
Show symbol for INFORM and NINFOM	Highlight info	INFHLT	
Show symbol for TXTDSC, NTXDS and PICREP	Highlight document	DOCHLT	

Explanation	Term	Abbreviation	Icon (hot key)
Selector for viewing group layer	Important text	IMPTXT	IMP TXT
	Other text	OTHTXT	OTH TXT
	Magnetic variation	MAGVAR	
	Miscellaneous	MISC	MISC
Show national language NOBJNM, text group 2	National language	NATLANG	
Selection for point object style	Paper chart symbols	PAPERSYM	
	Simplified symbols	SIMPSYM	
Selection for line style	Plain boundaries	PLNBND	
	Symbolized boundaries	SYMBND	

Explanation	Term	Abbreviation	Icon (hot key)
Selector for viewing group layer	Prohibited and restricted areas	PRBAREA	
	Drying line	DRYLNE	DRY LNE
To select safety contour	Safety contour	SF CNT	SAFE CNT
Shallow contour	Shallow contour	SHAL CNT	SHAL CNT
Depths in safety area shown, soundings in safe area shown	Safe depths shown	SF DPTH SHOW	DPTH SHWN
To select safety depth	Safety depth	SF DPTH	SAFE DPTH
To turn SCAMIN off	Scale min	SCAMIN	SCA MIN
Selector for viewing group layer	Seabed	SEABED	SEA BED
To show shallow pattern	Shallow pattern	SHALPAT	
To show isolated dangers in shallow waters	Shallow water dangers	SHALDNG	

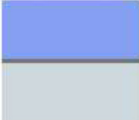
Explanation	Term	Abbreviation	Icon (hot key)
<i>Selector for viewing group layer</i>	<i>Ships' routeing systems and ferry routes</i>	ROUTEING	
	<i>Spot soundings</i>	SPOTSND	
	<i>Submarine cables and pipelines</i>	SUBCAB	
	<i>Tidal</i>	TIDAL	
	<i>Two shades</i>	2SHADE	
<i>Selector for displaying unknown objects</i>	<i>Unknown</i>	UNKNOWN	
<i>To highlight objects which have undergone modification</i>	<i>Update review</i>	UPD REV	
NOTE The icons can be modified in a consistent manner to provide an indication of current state (i.e. on or off).			

Table E.7 – Control of chart functionality (based on MSC.1/Circ.1609)

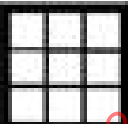
Explanation	Term	Abbreviation	Icon (hot key)
To select a date or date range for displaying all chart objects active at that date and time	Dated objects	DATE OBJ	
To toggle latitude/longitude grid	Grid	GRID	
To perform manual update	Manual update	MAN UPD	
To toggle radar overlay	Radar overlay	RADAR OVR	
To select original compilation scale of the chart or To select 1:1 chart pixel to display pixel in RCDS mode	Original scale	ORIG SCALE	1:1

Table E.8 – Database functions (based on MSC.1/Circ.1609)

Explanation	Term	Abbreviation	Icon (hot key)
To import ENC	Import Chart	IMPORT CHT	Not applicable
To review ENC updates	Update review	UPD REV	Not applicable
To view ENC update summary report	Update summary	UPD SUM	Not applicable
To view graphical index of ENC charts	Graphical index	GRAPH INDX	Not applicable
To view ENC update log	Update log	UPD LOG	Not applicable
To view ENC Update Status Report	ENC Update Status Report	ENC UPD STATUS	Not applicable
To view ENC Management Report	ENC Management Report	ENC MGMT REP	Not applicable
NOTE Some of these functions may also apply to RNC.			

Table E.9 – Route plan and monitoring functions (based on MSC.1/Circ.1609)

Explanation	Term	Abbreviation	Icon (hot key)
To export route plan	Export Route	RTE EXPORT	
To import route plan	Import Route	RTE IMPORT	
To set own-ship look ahead	Own ship look-ahead	LOOK AHEAD	Not applicable
To add WPT	Add waypoint	ADD WPT	
To edit WPT	Edit waypoint	EDIT WPT	
To delete WPT	Delete waypoint	DEL WPT	

Table E.10 – Groups of functions (based on MSC.1/Circ.1609)

Explanation	Term	Abbreviation	Icon (hot key)
To set collision avoidance limits and other target-related parameters (including CPA, TCPA, etc.)	Target settings	TGT SET	 TGT
To set radar controls (including tunings, anti-clutter, etc.)	Radar settings	RADAR SET	 RADAR
To set chart related limits and other chart-related parameters (including safety contour, safety depth, areas with special conditions, own ship check area, etc.)	Chart safety settings	CHART SET	 CHART
To set trial manoeuvre parameters	Trial Settings	TRIAL SET	 TRIAL
To add or remove information from the ECDIS display.	Chart display settings	CHART DISP SET	

Explanation	Term	Abbreviation	Icon (hot key)
To provide additional mariner's information.	User Chart	USR CHT	
To access route plan functionality	Route plan	ROUTE PLAN	
To access route monitoring functionality	Route monitoring	ROUTE MON	
To access management chart database	Chart management	CHART MGMT	
To access alert setting management	Alert Setting	ALERT SET	
To access functionality related to MSI	Not specified in this document	Not specified in this document	
To access functionality of received messages, e.g. AIS safety related messages	Not specified in this document	Not specified in this document	

Annex F
(normative)

Icons for presentation of the state of an alert

Icons for presentation of the state of an alert shall be presented as defined in IEC 62923-1.

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Annex G (normative)

Testing for colours, intensity and flicker

G.1 Testing for colours and intensity

G.1.1 General

The IHO ECDIS Presentation Library contains colour differentiation test diagrams to enable test personnel to determine whether it is possible to discriminate features by colour.

The colours in the IHO ECDIS Presentation Library are defined using the CIE 1931 colour coordinate system (x , y and L) which specify chrominance and luminance. CIE 15 defines the following units for colour difference in terms of chrominance and luminance:

- ΔE^* as a measure of the overall discrimination including both chrominance and luminance differences;

$$\Delta E^* = SQRT [(L_2^* - L_1^*)^2 + (u_2^* - u_1^*)^2 + (v_2^* - v_1^*)^2]$$

- $\Delta(u^*, v^*)$ as a measure of the discrimination in chrominance alone.

$$\Delta(u^*, v^*) = SQRT [(u_2^* - u_1^*)^2 + (v_2^* - v_1^*)^2]$$

Tolerances for conversion from CIE 1931 colour coordinates to RGB values for display equipment are defined by three terms:

- ΔE^* between the colour coordinates resulting from the RGB values calculated for each colour and the other colours from the same colour table for each ambient light condition;
- $\Delta(u^*, v^*)$ between the defined colour coordinates and the coordinates resulting from the RGB values calculated for each colour in each colour table for each ambient light condition;
- luminance ratio ($L_{\text{measured}}/L_{\text{defined}}$) between the defined coordinates of the colours within the colour table for each ambient light condition and the coordinates resulting from the RGB values calculated for each colour.

ΔE^* should be a minimum of 10 except for colour pairs listed in IHO S-52 Table of Colour – Colour pairs that are exempt from the colour separation tolerance test, which, as defined, are very close in colour.

$\Delta(u^*, v^*)$ should be a maximum of 16 for display equipment tested as part of the navigational system or equipment (i.e. where the display screen and its source of video are tested together) or for system components between which the transfer of the video is based on a lossless method (for example DVI-D for digital transfer). $\Delta(u^*, v^*)$ should be a maximum of 8 for system components that are tested independently of each other (i.e. where the display screen equipment is not tested with the identical video source that it will be installed with aboard ship or where a computer is not tested with the identical display screen that it will be installed with aboard ship).

For each colour token within the colour table, the luminance should be within 20 % of the value specified in IHO S-52, Colour conversion tolerances and tests, for each colour table specified in the IHO S-52, for example; day, dusk and night. The colour black is an exception, which should be a maximum 0,52 cd/m² as defined in the IHO S-52, Colour conversion tolerances and tests for the day colour table.

Calculations of L^* , u^* , and v^* shall be made in reference to the chromaticity and luminance specified for the brightest white colour token in the respective colour table (Y_0 , u_0 , y_0); where Y_0 is the luminance in cd/m². It should be noted that this is not the brightest white of the monitor.

G.1.2 Test personnel

Personnel conducting tests related to the discrimination of colours should have passed the minimum colour vision and acuity tests required for users by IMO STCW Code Part B. They should also have adapted to night viewing for 10 min before conducting tests using the night display.

G.1.3 Method of test

The method of test is as follows:

- a) confirm by analytical evaluation the measurement process of the manufacturer and confirm by inspection of documented evidence provided by the manufacturer that, for each colour table, the difference between the calculated RGB values for any two colours in the table are at least $10 \Delta E^*$ units, except for those pairs defined to have a tabular ΔE^* less than 20; as defined in the IHO S-52, Colour conversion tolerances and tests and IHO S-52, Table of Colour – Colour pairs that are exempt from the colour separation tolerance test;
- b) confirm by analytical evaluation the measurement process of the manufacturer and confirm by inspection of documented evidence provided by the manufacturer that the results of the colour calibration conversion of each specified colour (x, y, L) for each colour table into RGB values for an individual monitor are within the tolerance as defined in the IHO S-52, Calculations to achieve correct colours;
- c) colour table calibration verification measurements shall be carried out in a dark-room. Manufacturers may choose between two different methods of colour calibration. The first method is for the test of a monitor and a video source intended to be installed together as an integrated system. The second method is for the test of a monitor independent of the video source/computer with which it will be installed or, similarly, a video source tested independently of a monitor.
 - For independent test of monitors, the manufacturer shall provide a reference computer.
 - For independent test of computers, the manufacturer shall provide a reference monitor.

The test shall be performed as follows:

- 1) for the Day colour table, display a completely black image on the screen provided by the manufacturer. Confirm by measurement perpendicular to the centre of the screen that the luminance is as required (less than or equal to $0,52 \text{ cd/m}^2$ when the CHWHT is set to 80 cd/m^2 or more (Day colour table));
- 2) for the Day colour table, select a screen provided by the manufacturer which has a box of CHWHT (brightest white) on a black background. The box size should be at least 5 cm per side but not more than 25 % of the total screen area. Confirm by measurement perpendicular to the centre of the screen that the level of CHWHT is within the tolerances of $\Delta(u^*, v^*)$ for $\Delta(u^*, v^*) \leq 16$ for integrated units, $\Delta(u^*, v^*) \leq 8$ for independent test and L (is within 20 % of its specified value);
- 3) repeat the test for CHMGF (brightest magenta), CHYLW (brightest yellow) and BKAJ2 (darkest grey) from the Day colour table;
- 4) repeat the tests 2) and 3) for Dusk and Night colour tables and other colour tables provided, for example colour tables with black background for chart radar. Confirm by measurement that BKAJ1 (black background) luminance is $0,05 \text{ cd/m}^2$ in the night setting when the white level is dimmed down so that CHWHT is 1 cd/m^2 ;
- d) colour table calibration verification observations shall be carried out as follows. The user's manual brightness control and contrast control, if provided, shall be set to their calibration reference settings; while the display is off, adjust the ambient light level reflected from a white paper positioned on the display screen to the appropriate ambient values specified in Table 1. For each colour table provided, under the appropriate ambient light condition, display the colour differentiation test diagram as defined in the IHO S-52 ECDIS presentation library. Confirm by observation that:
 - 1) each foreground stripe is clearly distinguished from its background;

- 2) the foreground stripes representing yellow, orange, magenta, green, blue and grey may be clearly identified;
- e) under each of the ambient light conditions defined above, display the black-adjust boxes available from ECDIS Chart 1 (see ECDIS chart 1 chart AA5C1ABO.) Select each table in turn and confirm by observation that the ECDIS colour token BKAJ2 (dark grey) is clearly distinguished against a black background (BKAJ1);
- f) confirm by observation that the procedure for on-board use of the colour differentiation test diagrams is defined in the equipment manual;
- g) confirm by observation that means are provided to return the display to the calibrated brightness and contrast settings for each ambient light condition defined above;
- h) confirm by observation that each of the mandatory colour tables provided in the IHO-S-52 ECDIS presentation library may be selected by the user.

G.2 Testing for flicker

G.2.1 Overview

Clause G.2 reproduces the method originally developed in Annex B of ISO 13406-2:2001.

NOTE The actual perception of flicker is known to vary between individual observers and within an individual observer. Some of these variations are systematic. Flicker sensitivity decreases with age (between individuals) and with fatigue (for the individual). In addition, the conversion of display luminance to retinal illumination requires an assumption about the luminance that drives pupil response. In positive polarity displays, average display luminance and "adapting" luminance can be assumed to be the same. There is some evidence that this is not true for negative polarity displays. Due to cross-coupling of photo receptors in the eye, the correct value probably lies between the average and peak luminance. The average luminance is the worst case and is used in this method.

G.2.2 Analytic model

G.2.2.1 Principle

It can be predicted whether people will detect a homogeneously illuminated display appears to flicker or not by the amount of energy in the temporal frequencies of the display. The first step in the method, therefore, is to find out the amount of energy in the temporal frequencies, $E_{\text{obs } n}$. These numbers are then compared to the amounts of energies that people will detect as flicker, the predicted flicker threshold, $E_{\text{pred } n}$. Flat panels exhibit more diverse luminance-time functions than progressively scanned cathode ray tubes, so significant energy may exist at several different frequencies. The index, n is carried from 1, at the fundamental repetition frequency of the display (generally, 0,5 times the refreshment rate is necessary on LCD panels), in integer steps until the frequency exceeds 120 Hz. The observed energies may be calculated or measured. The energy at various frequencies is learned by examining the Fourier transform of the luminance-time function.

If $E_{\text{obs}} < E_{\text{pred}}$ at every frequency, then it is likely that people will not see flicker.

If $E_{\text{obs}} > E_{\text{pred}}$ at any frequency, then it is likely that people will see flicker.

G.2.2.2 Fourier coefficients

The average luminance of a luminance-time function, $f(t)$ is:

$$c_0 = \frac{1}{T} \int_{-\frac{T}{2}}^{\frac{T}{2}} f(t) dt$$

where

c_0 the zero Fourier coefficient, is the dark-room luminance averaged over time;
 T is the repetition period of the luminance-time function. For progressively scanned cathode ray tubes, the refreshment rate is $1/T$.

NOTE When measuring $f(t)$ and using a fast Fourier transform, FFT, it is sometimes not appropriate to use $\text{FFT}(v)_0$ for c_0 since this could lead to errors depending on the specific form of FFT used.

$\text{FFT}(v)_0$, is the 0 term of the fast Fourier transform of v .

v is the list of measured samples of $f(t)$. The number of items in the list shall be a power of 2 and an integer number of repetition times shall be sampled.

The average luminance c_0 is calculated from dark-room measurements $L_R = qE_S$. In this model, the "adapting" luminance L_t used in converting cd/m^2 to trolands is $c_0 + L_R$.

The general coefficients are:

$$c_n = \frac{1}{T} \int_{-\frac{T}{2}}^{\frac{T}{2}} f(t) e^{-\frac{2n\pi t}{T}} dt$$

where

c_n is the n th Fourier coefficient;

$i = \sqrt{-1}$;

T is the repetition time of $f(t)$.

In the case where $f(t)$ is the sum of components, for example, red, green and blue, the coefficients can be obtained one at a time and added.

$$c_0 = \sum_{j=1}^m c_{0j} = L_t - L_r$$

$$c_n = \sum_{j=1}^m c_{nj}$$

$$\text{AMP}_n = \frac{2 \times |c_n|}{c_0}$$

If there are m components, then:

$$|c_n| = \sqrt{[\text{Re}(c_n)]^2 + [\text{Im}(c_n)]^2}$$

where

AMP is a value between 0 and 2.

The frequency associated with AMP_n, f_n is:

$$f_n = \frac{n}{T} \text{ for } n = 1, 2, \dots$$

while $f_n < 120$ Hz

$$AMP_n = \frac{2 \times |FFT(v)_n|}{FFT(v)_0}$$

When using the fast Fourier transform, the set of observations, v_p for $p = 0 \dots 2^z - 1$ is sampled at frequency, f_s and processed with FFT, where z is 6, 7, ... The value AMP_n has a corresponding frequency $n \times f_s/z$. The sampling frequency is $k \times 2^z/T$, where $k = 1, 2, \dots$. The period of $f(t)$ shall be determined. Generally, $k = 1$ yields the best result.

G.2.2.3 Pupil

The pupil area shall be known to convert the luminance to trolands. The expression for pupil area can be simplified:

$$A = b_0 L_t^{b_1}$$

where

$$b_0 = 12,451\ 84;$$

$$b_1 = -0,160\ 32;$$

$$L_t \text{ is the adaptation luminance} = L_{H\text{-dark}}(\Theta_D, \Phi_D) + q_H(\Theta_D, \Phi_D) E_s.$$

G.2.2.4 DC component

To calculate the amount of energy in the temporal frequencies of interest.

- Convert the screen luminance into units of retinal illuminance (trolands).
- Calculate the pupil area, A from the formula in G.2.2.3.
- The DC component is:

$$DC = A \times c_0$$

G.2.3 Decision criteria

G.2.3.1 General case

This case applies to technologies with a luminance persistence of 1 ms or more (for example, CRT, LCDs, etc.).

Energy at each frequency is:

$$E_{obs\ n} = DC \times AMP_n$$

The criteria are that the energy at every frequency satisfies:

$$E_{obs\ n} \leq E_{pred\ n}$$

where

$$E_{\text{pred } n} = ae^{\frac{nb}{T}}$$

where

a and b are as given in Table G.1.

Table G.1 – Values of predicted energy and special coefficients

Row	Screen diagonal arc degrees	Predicted energy coefficients		Special case coefficients	
		a	b	D	E
1	< 20	0,127 6	0,191 9	36,44	13,83
2	20 to 40	0,191 9	0,120 1	39,81	16,40
3	40 to 65	0,507 6	0,100 4	37,93	19,62
4	> 65	0,530	0,099 2	37,96	19,86

G.2.3.2 Simpler special case

This case applies to technologies having luminance persistence that is much less than 1 ms (for example EL, dc plasma, light-emitting diode (LED)). For such technologies, AMP = 2 for refresh rates less than 100 Hz.

Conditions:

- a) Reflected luminance of 5 cd/m² to 15 cd/m².
- b) Average dark-room luminance L_{dark} is from 10 cd/m² to 340 cd/m².

Then, the display meets the requirement if the refresh rate is greater than

$$D + E \log_{10}(L_{\text{dark}})$$

where

D and E are given in the two right-hand columns of Table G.1.

Annex H (normative)

Single and simple operator actions

H.1 General

The requirements of Table H.1, Table H.2 and Table H.3 are from a recommendatory source (IMO MSC.1/Circ.1609/Appendix 4) for ECDIS, radar and INS. The implementation of these recommendations is optional. Manufacturers shall declare if these requirements have been implemented.

H.2 Tables for single and simple operator actions

**Table H.1 – Access to functions, as defined before June 2019
(based on MSC.1/Circ.1609)**

<i>Function</i>	<i>Equipment</i>	<i>Access</i>
Select ECDIS Standard Display	ECDIS	Single operator action
Remove radar (image and tracked target), AIS and other navigational target information overlaid over the ENC chart	ECDIS	Single operator action
Select route monitoring display covering own ship's position	ECDIS	Single operator action
Select default ECDIS settings	ECDIS	Single operator action followed by an action to confirm the selection
Select AIS target information	Radar/ECDIS	Simple operator action
Remove chart data	Radar	Single operator action
Reset VRM origin to CCRP	Radar/ECDIS	Simple operator action
Reset EBL origin to CCRP	Radar/ECDIS	Simple operator action
Reset ERBL origin to CCRP	Radar	Simple operator action
Reset Parallel Index line to own ship's heading	Radar	Simple operator action
Remove user defined maps	Radar	Simple operator action
Select default radar settings	Radar	Single operator action followed by an action to confirm the selection
Select presentation mode (radar, chart and other navigation information)	Radar/ECDIS	Simple operator action
Remove AIS Area Notice	Radar/ECDIS	Single operator action
Remove additional information, (including information for route planning, route monitoring, information overlays and supplementary navigation tasks)	Radar/ECDIS	Simple operator action

Table H.2 – Access to functions (based on MSC.1/Circ.1609)

Function	Equipment	Access
Set panel illumination	Radar/ECDIS	Simple operator action
Set display brilliance / Toggle Day /Night mode	Radar/ECDIS	Simple operator action
Select ECDIS mode	INS/Radar/ECDIS	Simple operator action
Select Radar mode	INS/Radar/ECDIS	Simple operator action
Select Conning display mode	INS	Simple operator action
Select CAM-HMI as defined in Bridge Alert Management (BAM) (for example as required by INS)	INS	Simple operator action
Select North Up display	Radar/ECDIS	Simple operator action
Select ship's Head Up display	Radar/ECDIS	Simple operator action
Select ship's Course Up display	Radar/ECDIS	Simple operator action
Select True Motion mode	Radar/ECDIS	Simple operator action
Select Relative Motion mode	Radar	Single operator action
Select Ship centred mode	Radar	Single operator action
Select Ship off centred mode	Radar/ECDIS	Simple operator action
Perform True Motion reset	Radar/ECDIS	Single operator action
Select range	Radar/ECDIS	Simple operator action
Perform Range up	Radar/ECDIS	Single operator action
Perform Range down	Radar/ECDIS	Single operator action
Temporarily suppress the "heading line"	Radar	Single operator action
Toggle Range Rings on and off	Radar/ECDIS	Simple operator action
Start Variable Range Marker adjustment	Radar/ECDIS	Simple operator action
Start Electronic Bearing Line adjustment	Radar/ECDIS	Simple operator action
Start Electronic Range and Bearing Line adjustment	Radar/ECDIS	Simple operator action
Perform Target Acquire	Radar	Simple operator action
Select tracked target	Radar/ECDIS	Simple operator action
Call up the information associated with an object by cursor pick on its symbol	ECDIS	Simple operator action
All AIS targets to Sleep Mode	Radar/ECDIS	Simple operator action
Acknowledge an Alert	Radar/ECDIS	Single operator action
Silence alerts	Radar/ECDIS (if CAM-HMI functionality is incorporated)	Single operator action

Table H.3 – Access to group of functions (based on MSC.1/Circ.1609)

Group of function	Equipment	Access
Record an event	ECDIS	Simple operator action
Set Trial Manoeuvre on	Radar	Simple operator action
Select True Vector	Radar	Single operator action
Select Relative Vector	Radar	Single operator action
Select True Trail	Radar	Simple operator action
Select Relative Trail	Radar	Simple operator action
Select CATZOC	INS/ECDIS	Single operator action
View ECDIS software version	ECDIS	Simple operator action
View ENC information	ECDIS	Simple operator action

Annex I (normative)

Default settings

I.1 General

The requirements of this Annex I are from a recommendatory source (MSC.1/Circ.1609/Appendix 5) for ECDIS, radar and INS. The implementation of these recommendations is optional. Manufacturers shall declare if these requirements have been implemented.

I.2 ECDIS default settings

Table I.1 lists the default settings for ECDIS.

**Table I.1 – ECDIS settings configured in response to "Default" selection
(based on MSC.1/Circ.1609)**

<i>Function</i>	<i>Setting</i>
<i>Display category</i>	<i>ECDIS Standard display</i>
<i>Selected sea area</i>	<i>Around own ship with appropriate off-set</i>
<i>Range / Scale</i>	<i>3 NM</i>
<i>Orientation</i>	<i>True motion, north-up</i>
<i>Geodetic datum, if selectable</i>	<i>WGS84</i>
<i>Manual updates</i>	<i>If applied, i.e. displayed if available</i>
<i>Mariner's notes</i>	<i>If applied, i.e. displayed if available</i>
<i>Selected route</i>	<i>Last selected route, including route parameters</i>
<i>Past track</i>	<i>On</i>
<i>Past track length, if selectable</i>	<i>Remain unchanged</i>
<i>Past track time-labels</i>	<i>Off, 30 min</i>
<i>Look-ahead time</i>	<i>6 min</i>
<i>Menu or Edit windows that overlap chart or route monitor data</i>	<i>Minimized or stacked to provide focus on chart and own ship location</i>
<i>Position data source</i>	<i>GNSS, sensor to remain unchanged if previously in use</i>
<i>Safety contour</i>	<i>Remain unchanged</i>
<i>Planned Safety depth</i>	<i>Remain unchanged</i>
<i>Planned Cross track limit</i>	<i>Remain unchanged</i>
<i>Graphical indication of crossing safety contour during route planning, if selection provided</i>	<i>On</i>
<i>Graphical indication of prohibited areas, areas with special conditions and navigational hazards during route planning, if selection provided</i>	<i>On</i>
<i>User-specified distance to prohibited areas, areas with special conditions and navigational hazards, when planning</i>	<i>Remain unchanged</i>
<i>Graphical indication of crossing safety contour during route monitoring, if selection provided</i>	<i>On</i>
<i>Graphical indication of prohibited areas and areas with special conditions during route monitoring, if selection provided</i>	<i>On</i>
<i>Graphical indication of navigational hazards during route monitoring, if selection provided</i>	<i>On</i>
<i>Object highlight, selected object, track display from log</i>	<i>Cleared from display</i>

Function	Setting
Cursor pick	Closed
Any additional window (dual view, 3d, tides, etc.)	Closed
Any additional information layer, proprietary layer (weather, tides, Additional Military Layer (AML), etc.)	Cleared from display
Chart update, Chart information exchange	Aborted
Colour differentiation test diagrams	Closed
Update review	Off
Chart 1	Closed
Units	m, NM, kn
Crossing a navigational hazard in route monitoring mode	Alert priority set as caution
Vector time (length)	6 min
Vector mode	True
Vector stabilization	Ground
Collision warnings, if provided	On (limits, CPA = 2 NM; TCPA = 12 min)
Radar and AIS target association, if provided	On
Radar and AIS target association priority	AIS
AIS target filtering, if provided	Target range = 6 NM
Target CPA = 4 NM	
Target TCPA = 24 min	
Target display = On	
Sleeping target display = Off	
Class A display = On	
Class B display = On	
AtoN display = On	
SART display = On	
Repeated target display = Off	
AIS data reports display, if provided	On
AIS locating devices display, if provided	On
AIS ASM display, if provided	Off
AIS true target outline	Off
AIS AtoN dimension outline	Off
Display of Radar image overlay, if provided	Off
Display of Radar tracked targets, if provided	On
Display of AIS reported targets, if provided	On
Target past positions, if provided	Off
Target trails, if provided	Off
Lost target warning, if provided	Off
AIS interrogation, if provided	Off
Own ship true outline	On, unless the resultant outline would be smaller than 6 mm on the screen
LOP source indication	Off
User selected time for warning escalation	60 s
Suppression of indication of user selected MSI messages based on first character of NAVTEX code field, if provided	Remain unchanged
Suppression of indication of user selected messages based on time and distance from own ship, monitored route or planned route	No
Brightness and contrast controls, if software controlled	Calibrated setting

I.3 Radar default settings

Table I.2 lists the default settings for Radar.

**Table I.2 – Radar control settings configured in response to "Default" selection
(based on MSC.1/Circ.1609)**

<i>Function</i>	<i>Setting</i>
<i>Band ^a</i>	X-band, if selectable, otherwise remain as selected
<i>Gain and anti-clutter functions (Sea, Rain)</i>	<i>Radar gain automatically optimized, where provided. Anti-sea and anti-rain clutter manual controls set "as is" or set to "zero" if such functionality exists</i>
<i>Tuning</i>	<i>Automatically optimized where provided, otherwise remain as is</i>
<i>Range</i>	6 NM
<i>Fixed range rings</i>	Off
<i>VRMs</i>	On
<i>EBLs</i>	On
<i>Parallel index lines</i>	Remain unchanged
<i>Orientation Mode</i>	North Up
<i>Presentation Mode</i>	True Motion
<i>Vector mode</i>	Relative
<i>Vector time</i>	6 min
<i>Stabilization Sea/Ground</i>	Sea
<i>Off-Centre</i>	Off-Centre, with appropriate look ahead
<i>Target trails</i>	On
<i>Past positions</i>	Off
<i>Radar target tracking</i>	Continued
<i>Automatic radar target acquisition</i>	Off
<i>Graphical AIS reported target display</i>	On
<i>Graphical AIS data report display</i>	On
<i>Graphical AIS locating device display</i>	On
<i>Graphical AIS ASM display</i>	Off
<i>Radar and AIS Target fusion</i>	Association on, priority AIS
<i>Operational alerts (except collision warnings)</i>	On
<i>Collision warnings</i>	On (limits CPA 2 nm; TCPA 12 min)
<i>Display of maps, navigation lines and routes</i>	Last setting
<i>Display of charts</i>	Off

^a Radar band default setting deviates from MSC.1/Circ.1609 due to alignment with IMO MSC 252(83).

Annex J (normative)

Implementation details of AIS ASM

J.1 General

This Annex J describes details of implementation of AIS ASM.

J.2 AIS ASM

Table J.1 specifies display layers and display sub-layers of AIS ASM and additionally specifies the symbols to be used from Annex A.

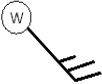
Table J.1 – Details of AIS ASM

Display layer	Display sub-layer	Symbol ^a	AIS ASM parameters to be available from cursor pick of the symbol	Source FI
Hydrological Data	Tidal window	5.6 	Combined from Source FI 32 (Tidal window)	
			Time Stamp	32
			Position #1 Latitude	32
			Position #1 Longitude	32
			From UTC Hour #1	32
			From UTC Minute #1	32
			To UTC Hour #1	32
			To UTC Minute #1	32
			Current Direction predicted #1	32
			Current Speed predicted #1	32
			Position #2 Latitude	32
			Position #2 Longitude	32
			From UTC Hour #2	32
			From UTC Minute #2	32
			Current Direction predicted #2	32
			Current Speed predicted #2	32
			Position #3 Latitude	32
			Position #3 Longitude	32
			From UTC Hour #3	32
			From UTC Minute #3	32
			To UTC Hour #3	32
			To UTC Minute #3	32
			Current Direction predicted #3	32
			Current Speed predicted #3	32

Display layer	Display sub-layer	Symbol ^a	AIS ASM parameters to be available from cursor pick of the symbol	Source FI
Hydrological Data	Water level	5.6 	Combined from Source FI 26 (Site Location) 26 (Station ID report) 26 (Water level report) 31 (Meteorological and Hydrographic data)	
			Site ID (from header)	26
			Time stamp (from header)	26, 31
			Data timeout (from site location)	26
			Latitude (from site location)	26, 31
			Longitude (from site location)	26, 31
			Position Accuracy	31
			Name (Station ID report)	26
			Water Level Type	26
			Sensor Data Description	26
			Water Level / Water level (incl, tide)	26, 31
			Water Level Trend	26, 31
			Vertical Reference Datum	26
			Forecast Water Level Type	26
			Forecast Water Level	26
			Valid Time of Forecast	26
			Duration (forecast)	26

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Display layer	Display sub-layer	Symbol ^a	AIS ASM parameters to be available from cursor pick of the symbol	Source FI
Hydrological Data	Current	5.13 	Combined from Source FI 26 (Site Location) 26 (Station ID report) 26 (Current flow report 2-D) 26 (Current flow report 3-D) 26 (Horizontal current flow report) 31 (Meteorological and Hydrographic data)	
			Site ID (from header)	26
			Time stamp (from header)	26, 31
			Data timeout (from site location)	26
			Latitude (from site location)	26, 31
			Longitude (from site location)	26, 31
			Position Accuracy	31
			Name (Station ID report)	26
			Sensor Data Description	26
			Current Measuring level #1	26
			Current Speed #1	26
			Current Direction #1	26
			Current Vector Component Up #1	26
			Surface Current Speed (incl. tide)	31
			Surface Current Direction	31
			Current Measuring level #2	26, 31
			Current Speed #2	26, 31
			Current Direction #2	26, 31
			Current Vector Component Up #2	26
			Current Measuring level #3	26, 31
			Current Speed #3	26, 31
			Current Direction #3	26, 31
The "Horizontal current flow report" may include two separate locations of current values. Both locations shall be presented by symbol 5.13 for which the location shall be based on calculation using parameters "Current Reading 1 Bearing/Current Reading 1 Distance" or "Current Reading 2 Bearing/Current Reading 2 Distance" applied on "Latitude/longitude". The alphanumeric presentation shall also present the calculated location of the symbol 5.13 instead of values used for calculation. The "Current flow report 3-D" may include two separate 3-D current values. The alphanumeric presentation shall be in form of "Current speed/Current direction" calculated from the parameters "Current Vector Component North/Current Vector Component East".				

Display layer	Display sub-layer	Symbol ^a	AIS ASM parameters to be available from cursor pick of the symbol	Source FI
Meteorological Data	Wind	5.5 Dover 	Combined from Source FI	
			26 (Site Location)	
			26 (Station ID report)	
			26 (Wind report)	
			31 (Meteorological and Hydrographic data)	
			Site ID (from header)	26
			Time stamp (from header)	26, 31
			Data timeout (from site location)	26
			Latitude (from site location)	26, 31
			Longitude (from site location)	26, 31
			Altitude (from site location)	26
			Position Accuracy	31
			Name (Station ID report)	26
			Average Wind Speed	26, 31
			Wind Direction	26, 31
			Wind Gust	26, 31
			Wind Direction	26, 31
			Sensor Data Description	26
			Forecast Wind Speed	26
			Forecast Wind Direction	26
			Forecast Wind Gust	26
			Forecast Wind Direction	26
			Valid Time of Forecast	26
			Duration (forecast)	26

Display layer	Display sub-layer	Symbol ^a	AIS ASM parameters to be available from cursor pick of the symbol	Source FI
Environmental Data	Sea state	5.13 	Combined from Source FI 26 (Site Location) 26 (Station ID report) 26 (Sea state report) 31 (Meteorological and Hydrographic data)	
			Site ID (from header)	26
			Time stamp (from header)	26, 31
			Data timeout (from site location)	26
			Latitude (from site location)	26, 31
			Longitude (from site location)	26, 31
			Position Accuracy	31
			Name (Station ID report)	26
			Sea state	26, 31
			Water Temperature	26, 31
			Water Temperature Depth	26
			Sensor Data Description (water temperature)	26
			Significant Wave Height	26, 31
			Wave Period	26, 31
			Wave Direction	26, 31
			Sensor Data Description (wave)	26
			Swell Height	26, 31
			Swell Period	26, 31
			Swell Direction	26, 31
			Sensor Data Description (swell)	26
			Ice	31
			Salinity	26, 31

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Display layer	Display sub-layer	Symbol ^a	AIS ASM parameters to be available from cursor pick of the symbol	Source FI
Meteorological Data	Weather	5.5 Dover 	Combined from Source FI 26 (Site Location) 26 (Station ID report) 26 (Weather report) 31 (Meteorological and Hydrographic data)	
			Site ID (from header)	26
			Time stamp (from header)	26, 31
			Data timeout (from site location)	26
			Latitude (from site location)	26, 31
			Longitude (from site location)	26, 31
			Name (Station ID report)	26
			Position Accuracy	31
			Air Temperature	26
			Sensor Data Description (air temperature)	26
			Relative Humidity	31
			Precipitation	26, 31
			Horizontal Visibility	26, 31
			Dew Point	26, 31
			Sensor Data Description (dew point)	26
			Air Pressure	26, 31
			Air Pressure Trend/Tendency	26, 31
			Sensor Data Description (air pressure)	26
			Salinity	26, 31
Navigational Services	Air Gap	5.12 	Combined from Source FI 26 (Site Location) 26 (Station ID report) 26 (Air gap/Air draft)	
			Site ID (from header)	26
			Time stamp (from header)	26
			Data timeout (from site location)	26
			Latitude (from site location)	26
			Longitude (from site location)	26
			Name (Station ID report)	26
			Air Gap	26
			Air Gap Trend	26
			Forecast Air Gap	26
			Valid Time of the Forecast UTC Day UTC Hour UTC Minute	26

Display layer	Display sub-layer	Symbol ^a	AIS ASM parameters to be available from cursor pick of the symbol	Source FI
Navigational Services	Area Notice may be sub-divided into: Caution Restricted Anchorage Distress Chart feature (see Notice description)	5.11  Default 5.14  when "Notice description = 18"	Combined from Source FI 22 (Area notice – broadcast) 23 (Area notice – addressed) 29 (Text description – broadcast) 30 (Text description – addressed)	
			Notice Description	22, 23
			Start date and time of Area	22, 23
			Duration	22, 23
			Text description – broadcast	29
			Text description – addressed	30
Navigational Services	Berthing Data	5.9 	Combined from Source FI 18 (Clearance time to enter port) 20 (Berthing data) 29 (Text description – broadcast) 30 (Text description – addressed)	
			Destination	18
			Latitude	18
			Longitude	18
			Centre position of Berth, Latitude	20
			Centre position of Berth, Longitude	20
			Clearance date/time to enter port	18
			Berthing date and time	20
			Name of port and berth	18
			Name of Berth	20
			Berth Length	20
			Water Depth at Berth	20
			Mooring Position	20
			Services availability	20
			Type of Services Available	20
			Text description – broadcast	29
			Text description – addressed	30

Display layer	Display sub-layer	Symbol ^a	AIS ASM parameters to be available from cursor pick of the symbol	Source FI
Navigational Services	Routing	5.8 	Combined from Source FI 27 (Route information – broadcast) 28 (Route information – addressed) 29 (Text description – broadcast) 30 (Text description – addressed)	
			Route Type	27, 28
			Sender Classification	27, 28
			Start Date and Time	27, 28
			Duration	27, 28
			Number of Waypoints	27, 28
			Waypoints WP #n, Latitude WP #n, Longitude	27, 28
			Text description – broadcast	29
			Text description – addressed	30
Navigational Services	Signal Station	5.7 	Combined from Source FI 19 (Marine traffic signal) 29 (Text description – broadcast) 30 (Text description – addressed)	
			Name of Signal Station	19
			Position of Station, Latitude	19
			Position of Station, Longitude	19
			Signal in Service	19
			Status of Signal	19
			Time of next signal shift	19
			Expected Next Signal	19
			Text description – broadcast	29
			Text description – addressed	30

Display layer	Display sub-layer	Symbol ^a	AIS ASM parameters to be available from cursor pick of the symbol	Source FI
Meteorological Data	Weather	5.19 	Combined from Source FI 21 (Weather observation report from ship), when Type of weather report = 0	
			Geographic Location (text, 20 characters)	21
			Source ID (MMSI of source)	21
			Date and Time of Observation	21
			Position of observation, Latitude	21
			Position of observation, Longitude	21
			Present Weather	21
			Horizontal Visibility	21
			Relative Humidity	21
			Average Wind Speed	21
			Wind Direction	21
			Air Pressure	21
			Air Pressure tendency	21
			Air Temperature	21
			Water Temperature	21
			Wave period	21
			Significant Wave height	21
			Wave Direction	21
			Swell Height	21
			Swell Direction	21
			Swell Period	21
See 4.3.2 for consistent time presentation.				
^a See requirements in Annex A.				

Annex K (informative)

Overview of AIS Messages

K.1 General

Table K.1 provides an overview of AIS Messages and Table K.2 provides an overview of AIS ASM Messages.

Table K.1 – AIS Messages

ITU-R M.1371 AIS standard Messages ID	AIS Message descriptions	Use in this document
1,2,3	Position Report – 1 = autonomous(A), 2 = assigned(C), 3 = interrogated/pollled(I) – every 2 s, 3½ s, 6 s, or 10 s; 3 min < 3 kn or anchored	AIS target AIS data report AIS locating device
4	Base Station Report – every 10 s.	AIS data report
5	Class A Report – static and voyage related data – every 6 min	AIS target
6,8	Binary message – addressed (6) or broadcast (8)	AIS ASM AIS synthetic target
7	Binary message – acknowledgment to a Message 6	Not applicable in this document
9	SAR aircraft position report – every 10 s.	AIS data report
10,11	Universal Time Coordinated / Date – 10 = enquiry, 11 = response	Not applicable in this document
12	Safety related Texting – addressed (12)	AIS safety related message
14	Safety related Texting – broadcast (14)	AIS safety related message AIS locating device
13	Safety related text message – acknowledgment to Message 12	Not applicable in this document
15	Interrogation – poll for specific messages	Not applicable in this document
16	Assignment Mode Command	Not applicable in this document
17	dGNSS Correction Binary message	Not applicable in this document
18	Class B Position Report – 3 min < 2 kn – Class B"CS" every 30 s/Class B"SO" every 5 s, 15 s, 30 s	AIS target
19	Class B Extended Report (when polled by a base station)	AIS target
20	Data Link Management – reserve slots	Not applicable in this document
21	ATON Report – position and status – every 3 min	AIS data report
22	Channel Management	Not applicable in this document
23	Group Assignment Command	Not applicable in this document
24 _{A/B}	Static Data Report – every 6 min (w/in 30 s upon a poll)	AIS target
25	Single-Slot Binary message	AIS ASM AIS synthetic target
26	Multi-Slot Binary message w/Communication State	AIS ASM AIS synthetic target
27	Long-range automatic identification system broadcast message	Not applicable in this document

Table K.2 – AIS ASM Messages

ITU-R M.1371 Message 8 Application Specific Message, FI	Description	Comment	Use in this document
11	Met/Hydrological	SN/Circ.236 Trial message; not to be used after 1 Jan 2013	Not applicable
13	Fairway closed	SN/Circ.236 Trial message; not to be used after 1 Jan 2013	Not applicable
14	Tidal window	SN/Circ.236 Trial message; not to be used after 1 Jan 2013	Not applicable
15	Extended ship static and voyage-related data	SN/Circ.236 Trial message 6; not to be used after 1 Jan 2013	Not applicable
16	Number of persons on board – addressed	SN/Circ.236 Trial message 6; as corrected in SN.1/Circ.289	AIS target
17	VTS-generated/synthetic targets – broadcast	SN/Circ.236 Trial message 7; SN.1/Circ.289 Renamed to "VTS-generated/Synthetic targets"	AIS synthetic targets
18	Clearance time to enter port – addressed	SN.1/Circ.289	AIS ASM
19	Marine traffic signal – broadcast	SN.1/Circ.289	AIS ASM
20	Berthing data – addressed	SN.1/Circ.289	AIS ASM (from shore to ship)
21	Weather observation report from ship – broadcast	SN.1/Circ.289	AIS ASM
22	Area notice – broadcast	SN.1/Circ.289	AIS ASM AIS synthetic targets
23	Area notice – addressed	SN.1/Circ.289	AIS ASM AIS synthetic targets
24	Extended ship static and voyage-related data – broadcast	SN.1/Circ.289	AIS target
25	Dangerous cargo indication – addressed	SN.1/Circ.289	Not applicable
26	Environmental – broadcast	SN.1/Circ.289	AIS ASM
27	Route information – broadcast	SN.1/Circ.289	AIS ASM
28	Route information – addressed	SN.1/Circ.289	AIS ASM
29	Text description – broadcast	SN.1/Circ.289	AIS ASM
30	Text description – addressed	SN.1/Circ.289	AIS ASM
31	Meteorological and Hydrographic data – broadcast	SN.1/Circ.289	AIS ASM
32	Tidal window – addressed	SN.1/Circ.289	AIS ASM
33-63	Reserved for Future Use	SN.1/Circ.289	
Not all ASMs (i.e. AIS binary messages 6, 8, 25 or 26) are defined in IMO SN.1/Circ.289.			
Regional ASMs provide the same parameter data denoted in Table J.1 and may optionally be presented consistent with this document.			
A catalogue of regional ASMs can be found at http://www.iala-aism.org/asm/ .			

K.2 Use case guidance on AIS ASM

Some details of the use of AIS ASM are given which are useful to know for implementers of presentation and functionality of AIS ASM for equipment which receives AIS ASM information.

- The AIS ASM concept includes a parameter called DAC. For the IMO SN.1/Circ.289 specified AIS ASMs addressed by this document, the DAC is always 1. Within each value of DAC, there could be as many as 64 different AIS ASMs specified by value of FI (6 bits). It should be noted that the value range of "10 bit" DAC is 700 for local/regional use and 10 for international use and within each value of DAC there could be 64 values of FI. Some AIS ASMs outside of DAC = 1 might be of interest to implement. More information is available from the following link <https://www.iala-aism.org/asm/>.
- Some AIS ASM objects include "message linkage ID". The value is set by the information provider and it is unique for each individual AIS ASM object which includes "message linkage ID". The information provider is identified by the first six digits of the source MMSI. The information provider controls the uniqueness of the "message linkage ID". When available, the "message linkage ID" together with value of source MMSI is used as part of unique identifier of an AIS ASM object. For some AIS ASM objects, the first six digits of the nine digits of MMSI is used and in some cases all digits of MMSI are used. The other use of "message linkage ID" is to combine the content of the "Text description" AIS ASMs (FI = 29 and 30) into the AIS ASM object defined by the "main" AIS ASM (FI = 18, 19, 22, 23, 27 and 28).
- AIS ASM object of category "Addressed"
 - These are strictly intended for reception by a single vessel and the "addressed" message type means that these are transmitted until acknowledged by AIS Message 7. This means that there cannot be any concept of automatic removal based on timeout from last reception.
 - Some of these could be valid for short time periods, but some could be valid for long time periods. This depends on the content and user decision. Therefore, the removal from the storage is under user control.
- Environmental information
 - Multiple AIS stations (for example AIS base stations, AIS repeater stations, AIS AtoN stations) may duplicate transmission of the content. An end user is intended to see only one AIS ASM object. This is done intentionally so that the resulting coverage area is larger.
 - May include "end of validity" concept. Again, multiple AIS stations may transmit duplicate AIS ASMs. One should note that the information may be necessary after the vessel has left the reception range of the transmitting AIS stations because coverage area of the information might be much larger. Therefore, these AIS ASMs with "end of validity" concept information are not automatically removed from the storage after the standard 18 min timeout from last reception. Therefore, the manufacturer may as well provide an option for the user to remove these by criteria (i.e. user is able to make decision to remove or to keep depending of the content).
- Area notices
 - Separate area notices are identified by unique combination of "message linkage ID" and MMSI of source. Addressed area notices are possible only by a single source station (for example AIS base station, AIS AtoN station) as the unique identification includes full content of the MMSI of the source. Broadcast area notices use only the first six digits of the source MMSI and therefore transmission of them is possible by multiple source stations when the information provider has coordinated their system to assign the MMSI.
 - Area notices may include "end of validity" concept as described in environmental information.

Annex L

(informative)

Overview of the use AIS AtoN status field bits

NOTE Refer to IALA A-126 for possible later versions of Table L.1.

Table L.1 provides an overview of AIS AtoN status field bits.

Table L.1 – AIS AtoN status field

Bit order		RACON/Light	Bit order		Mobile AtoN and method and direction of movement		Regional AtoN
8 th 7 th and 6 th	Bits	Page ID = 111	8 th 7 th and 6 th	Bits	Page ID = 101		Page ID = 001
5 th and 4 th	00	No RACON installed	5 th , 4 th , 3 rd and 2 nd	0000	Direction not reported	No further information default	Reserved for regional use ^a
	01	RACON installed but not monitored		0001		Free-floating ABCD values denote an area (e.g. oil spill)	
	10	RACON operational		0010		Free-floating ABCD values denote an object (e.g. craft, gear, flotsam, etc.)	
	11	RACON Error		0011		Moves as defined (Synthetic) ABCD values denote an object (e.g. craft, gear, flotsam, etc.)	
3 rd and 2 nd	00	No light or no monitoring		0100		Moves as defined (Synthetic) ABCD values denote an area (e.g. dredging zone)	
	01	Light ON		0101		Tethered from a watercraft (e.g. cable, pipe, net)	
	10	Light OFF		0110		Reserved for future use	
	11	Light fail or at reduced range		0111		Self-propelled, but direction not reported or unavailable	
1 st	0	Good health		1000	Direction of movement (COG)	000° ± 22,5°	
				1001		045° ± 22,5°	
				1010		090° ± 22,5°	
				1011		~~000° ± 22,5°~~ 135° ± 22,5°	
			1100	~~135° ± 22,5°~~ 180° ± 22,5°			
			1101	~~180° ± 22,5°~~ 225° ± 22,5°			
			1110	~~225° ± 22,5°~~ 270° ± 22,5°			
			1111	~~270° ± 22,5°~~ 315° ± 22,5°			
			1	Alarm		1 st	0
				1	Unmonitored		

NOTE 8th bit is most significant and 1st bit is least significant.

^a E.g. VTT-EG AIS AtoN for inland use standard.

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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

FOREWORD

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This consolidated version of the official IEC Standard and its amendment has been prepared for user convenience.

IEC 62288 edition 3.1 contains the third edition (2021-12) [documents 80/1013/FDIS and 80/1017/RVD] and its amendment 1 (2024-11) [documents 80/1117/CDV and 80/1128/RVC].

This Final version does not show where the technical content is modified by amendment 1. A separate Redline version with all changes highlighted is available in this publication.

IEC 62288 has been prepared by IEC technical committee 80: Maritime navigation and radiocommunication equipment and systems. It is an International Standard.

This third edition cancels and replaces the second edition published in 2014. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

- a) Clause 4 has been revised to remove requirements for indications of alerts which are now given in IEC 62923-1;
- b) Clause 5 has been extensively revised to add new requirements for AIS, ASM and DSC presentation together with three new supporting annexes, Annex J, Annex K, Annex L;
- c) Annex A and Annex B have been revised to incorporate changes to IMO circular SN.1/Circ.243;
- d) Annex E has been revised to incorporate changes to IMO resolution MSC.191(79) and renamed as "Operational controls and logical grouping".
- e) two new annexes have been added, Annex H on operator actions and Annex I on default settings in support of IMO circular MSC.1/Circ.1609.

The text of this International Standard is based on the following documents:

Draft	Report on voting
80/1013/FDIS	80/1017/RVD

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

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/standardsdev/publications.

The committee has decided that the contents of this document and its amendment will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn, or
- revised.

IMPORTANT – The "colour inside" logo on the cover page of this document indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

INTRODUCTION to Amendment 1

This amendment updates the interpretation of the bit encoding for reporting various cases of AtoN errors or failures to be compliant with the notes available in the IALA R-0126 Ed.2 published in December 2021. The amendment further corrects an inconsistency between Table L.1 of IEC 62288:2021 and Figure 4 section 4.8.4 of IALA Rec.R-0126:2021.

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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

1 Scope

This document specifies the general requirements, methods of testing, and required test results, for the presentation of navigation-related information on shipborne navigational displays in support of IMO resolutions MSC.191(79) as amended by MSC.466(101) in June 2019, and where applicable MSC.302(87).

This document also supports the guidelines included in the related IMO Circulars MSC.1/Circ.1609 on the standardization of user interface design for navigation equipment and SN.1/Circ.243 as revised in June 2019 on the presentation of navigation related symbols, terms and abbreviations.

This document also specifies the presentation of AIS data reports and the AIS Application Specific Messages defined for international use in IMO SN.1/Circ.289 and intended to be received by a ship for display onboard.

NOTE All text in this document whose wording is identical to text contained in an IMO document is printed in *italics*. Reference to the document is noted at the beginning of the paragraph. The notation contains a prefix referring to the document and a suffix with the paragraph number from the document (for example, (MSC191/1); (SN243/1), etc.).

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.

IEC 60945:2002, *Maritime navigation and radiocommunication equipment and systems – General requirements – Methods of testing and required test results*

IEC 61174, *Maritime navigation and radiocommunication equipment and systems – Electronic chart display and information system (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 62388, *Maritime navigation and radiocommunication equipment and systems – Shipborne radar – Performance requirements, methods of testing and required test results*

IEC 62923-1, *Maritime navigation and radiocommunication equipment and systems – Bridge alert management – Part 1: Operational and performance requirements, methods of testing and required test results*

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

IMO, *Seafarers' Training, Certification and Watchkeeping Code (STCW Code)*

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

IMO MSC.192(79):2004, *Performance standards for radar equipment*

IMO MSC.232(82):2006, *Revised performance standards for electronic chart display and information systems (ECDIS)*

IMO SN.1/Circ.243/Rev.2:2019+Corr.1, *Guidelines for the presentation of navigation related symbols, terms and abbreviations*

IMO SN.1/Circ.289:2010, *Guidance on the use of AIS application-specific messages*

IMO MSC.302(87):2010, *Performance standards for bridge alert management (BAM)*

IMO MSC.1/Circ.1609:2019, *Guidelines for the standardization of user interface design for navigation equipment*

IMO A.1021(26):2009, *Code on Alerts and Indications*

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

3 Terms, definitions and abbreviated terms

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

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

3.1 Terms and definitions

3.1.1

activated AIS target

(MSC191/A) *target representing the automatic or manual activation of a sleeping target for the display of additional graphically presented information*

3.1.2

automatic identification system

AIS

system which complies with the requirements set forth in Annex 3 of IMO Resolution MSC.74(69)

3.1.3**AIS Application Specific Message****AIS ASM**

AIS Messages 6, 8, 25 or 26, excluding AIS synthetic targets

Note 1 to entry: This document specifically addresses only AIS ASM defined for international use in IMO SN.1/Circ.289 and that are intended to be received by a ship for display onboard. Various Administrations have implemented application specific messages not defined in IMO SN.1/Circ.289, but are catalogued by IALA at <https://www.iala-aism.org/asm/> which, if appropriate, may be displayed using the same symbols and rules in this document.

Note 2 to entry: See Annex J.

3.1.4**AIS ASM object**

information constructed from one or more AIS ASMs

Note 1 to entry: See Annex J.

3.1.5**AIS data report**

information derived from AIS Aids to Navigation (AtoN), AIS SAR Aircraft and AIS Base Stations reports

Note 1 to entry: See Annex J.

3.1.6**AIS locating devices**

AIS-SART, EPIRB-AIS and AIS MOB stations that transmit AIS Messages 1 and 14 using the burst transmissions as described in ITU-R M.1371

Note 1 to entry: AIS MOB means information derived from a DSC Class M device capable of reporting using AIS burst transmissions.

3.1.7**AIS safety related messages**

AIS Messages 12 or 14

3.1.8**AIS synthetic target**

object generated from an AIS Message 6, 8, 25 or 26 when FI=17 VTS-generated/synthetic target; or when FI=22 or FI=23 Area Notice with "Sub-areas" set to "0" circle or point and "Area shape" set to "0" and "Radius" set to "0" and "Notice Description" set to a value in range from 64 to 74

Note 1 to entry: AIS Synthetic targets are generated by shore-based information systems (for example VTS) and transmitted through AIS base stations.

Note 2 to entry: "Notice Description" set to a value in the range from 64 to 73 represents vessel distress situations and set to a value 74 represents person distress situation. These messages may or may not have an associated GMDSS Distress Alert.

3.1.9**AIS target****reported AIS target**

(MSC191/A) *target generated from an AIS position report message* from a ship, vessel or craft, based on AIS Message 1, 2, 3 or 18

Note 1 to entry: The MMSI number within AIS Messages 1, 2, 3 or 18 identifies the source as a ship, vessel or craft in accordance with ITU-R M.585-8:2019, Annex 1, Sections 1 and 5.

Note 2 to entry: AIS Class A uses Messages 1, 2 and 3. AIS Class B uses Message 18.

3.1.10 alarm

(MSC.302/A) *condition requiring immediate attention and action by the bridge team, to maintain the safe navigation of the ship*

Note 1 to entry: An alarm is a *high-priority alert*.

3.1.11 alert

(MSC.302/A) *announcement of abnormal situations and conditions requiring attention.*

Note 1 to entry: Alerts are divided in four priorities: emergency alarms, alarms, warnings and cautions. An alert provides information about a defined state change in connection with information about how to announce this event in a defined way to the system and the operator.

3.1.12 associated target

(MSC191/A) *target simultaneously representing a tracked radar target and a reported AIS target having similar parameters (for example, position, course, speed, etc.) and which comply with an association algorithm*

3.1.13 brilliance

adjustment of luminance of a display for ambient light

EXAMPLE Control of backlight for LCD (liquid crystal display).

3.1.14 caution

(MSC.302/A) *awareness of a condition which does not warrant an alarm or warning condition, but still requires attention out of the ordinary consideration of the situation or of given information*

Note 1 to entry: A caution is the *lowest priority of an alert*.

3.1.15 consistent common reference point CCRP

(MSC191/A) *location on own ship, to which all horizontal measurements such as own ship position, heading, and target range, bearing, relative course, relative speed, closest point of approach (CPA) or time to closest point of approach (TCPA) are referenced, typically the conning position of the ship*

Note 1 to entry: An alternative location (or multiple locations) may be used, as necessary, where clearly indicated or distinctively obvious, for example, the origin of the reference axis of the ship.

3.1.16 composite presentation

integrated presentation that is derived from the simultaneous display of information from two or more navigational systems or from other pieces of equipment

3.1.17 dangerous target

(MSC191/A) *tracked radar or reported AIS target with a predicted CPA and TCPA that violates values preset by the user*

Note 1 to entry: The respective target is marked by a "dangerous target" symbol.

3.1.18**dead reckoned position****DR**

position extrapolated from the last accepted position update, based on present course and speed, and updated on a time interval

3.1.19**display base**

(MSC191/A) *level of information which cannot be removed from the ECDIS display, consisting of information which is required at all times in all geographic areas and all circumstances*

Note 1 to entry: It is not intended to be sufficient for safe navigation.

3.1.20**display equipment**

device capable of representing information visually

3.1.21**doubtful integrity**

state when integrity cannot be verified

3.1.22**DSC received call**

information generated from a received DSC message

Note 1 to entry: DSC received call may be available from all DSC-compliant equipment classes which are able to provide information through a standardized interface.

3.1.23**electronic chart display and information system****ECDIS**

system which complies with the requirements set forth in IMO Resolution MSC.232(82)

3.1.24**electronic chart information**

electronic chart database(s)

EXAMPLE ENC.

3.1.25**electronic navigational chart****ENC**

(MSC191/A) *database standardised as to content, structure and format according to IHO S-57 and its Appendix B.1 and issued by, or on the authority of, a Government*

3.1.26**emergency alarm**

(MSC.302/A) *alarms which indicate immediate danger to human life or to the ship and its machinery exists and require immediate action*

Note 1 to entry: An emergency alarm is the *highest priority of an alert*.

3.1.27**estimated position****EP**

position extrapolated from the last accepted position update, based on present course and speed (STW), including effects of wind, tide, current, and updated on a time interval

3.1.28

fix

position of own ship determined, without reference to any former position

3.1.29

heading

(MSC191/A) horizontal *direction in which the bow of a ship is actually pointing* at any instant, *expressed as an angular displacement from north*

3.1.30

icon

graphical symbol with a particular meaning used to convey information independent of language

Note 1 to entry: Icons may be used for visual identification or reinforcement of a textual description, to invoke a function, or to open an object when selected with the cursor.

3.1.31

important indication

(MSC191/A) *marking of an operational status of displayed information which needs special attention, for example, information with low integrity or invalid information*

Note 1 to entry: The important indication is not part of alert classification.

3.1.32

indication

display of regular information and conditions, not part of alert management

3.1.33

integrated navigation system

INS

system which complies with the requirements set forth in IMO Resolution MSC.252(83) as amended by IMO Resolution MSC.452(99)

3.1.34

integrity

property of information as being within the specified accuracy in a timely, complete and unambiguous manner

3.1.35

line of position

LOP

plotted line on which own ship is located determined by observation or measurement of the range or bearing to an aid to navigation or other charted element

3.1.36

lost target

(MSC191/A) tracked radar or reported *target* for which the system is no longer receiving *valid position data*

Note 1 to entry: The target is *represented* by a "lost target" symbol.

3.1.37

maritime safety information

MSI

(SOLAS IV/2) *navigational and meteorological warnings, meteorological forecasts and other urgent safety-related messages broadcast to ships*

Note 1 to entry: MSI is promulgated using NAVTEX and EGC services (see IMO MSC.468(101)).

3.1.38**menu**

area of the display that is allocated to a structured list of options for the selection and entry of operational parameters, data and commands

3.1.39**multifunction display**

single visual display unit that can present, either simultaneously or through a series of selectable pages, information from multiple systems or equipment

Note 1 to entry: A multifunction display may typically be part of an INS (for example, providing dedicated presentation modes conforming to both radar and ECDIS presentation requirements), and may replace their individual display units.

3.1.40**operational display area**

(MSC191/A) *area of the display used to graphically present electronic chart and/or radar information, excluding the user dialogue area*

Note 1 to entry: *On the chart display this is the area of the chart presentation. On the radar display this is the area encompassing the radar video image.*

3.1.41**past positions**

(MSC191/A) *time-spaced marks on the past track of own ship, or a tracked radar or reported AIS target*

3.1.42**permanent**

property of information as existing for a long time (or forever) without change

3.1.43**persistent**

property of information as existing continuously

3.1.44**radar**

system which complies with the requirements set forth in IMO Resolution MSC.192(79)

3.1.45**radar echo**

returned radar signal (i.e. "paint") appearing in the radar video image

3.1.46**radar video image**

set of displayed information constructed from radar echoes processed, for example by anti-clutter means and other tools

3.1.47**readily available**

<information> directly accessible

Note 1 to entry: For example, in a top-level menu, from a screen function, or an icon, etc.

3.1.48**selected target**

(MSC191/A) *target selected manually or automatically for the display of detailed alphanumeric data, information and text in a separate user dialogue area*

Note 1 to entry: *The target is represented by a "selected target" symbol.*

3.1.49

simple operator action

(MSC252/A1) *procedure achieved by no more than two hard-key or soft-key actions, excluding any necessary cursor movements, or voice actuation using programmed codes or equivalent alternative means*

3.1.50

single operator action

(MSC252/A1) *procedure achieved by no more than one hard-key or soft-key action, excluding any necessary cursor movements, or voice actuation using programmed codes*

3.1.51

sleeping AIS target

(MSC191/A) *AIS target indicating the presence of a vessel equipped with AIS in a certain location*

Note 1 to entry: *The target is represented by a "sleeping target" symbol indicating the vessel's orientation. No additional information is presented until the AIS target is activated.*

3.1.52

standard display

(MSC191/A) *level of information that should be shown when a chart is first displayed on ECDIS*

Note 1 to entry: *The level of the information it provides for route planning or route monitoring may be modified by the user according to the user's needs.*

3.1.53

target tracking system

system which complies with the requirements set forth in IMO Resolution MSC.192(79)

3.1.54

task-at-hand

specific navigation-related activity performed by a user

EXAMPLE Route planning, route monitoring, target tracking, collision avoidance.

3.1.55

tracked radar target

object, fixed or moving, which is tracked by a radar or target tracking function

3.1.56

trial manoeuvre

(MSC191/A) *facility used to assist the user to perform a simulated manoeuvre for navigation and collision avoidance purposes, by displaying the predicted future status of all tracked radar and reported AIS targets as a result of the simulated manoeuvres*

3.1.57

user-added electronic chart information

electronic chart information manually entered by the user for presentation

EXAMPLE Navigational notes, safety zones of interest, local notices to mariners.

3.1.58

user-configured presentation

(MSC191/A) *auxiliary presentation configured by the user for a specific task-at-hand*

Note 1 to entry: *The presentation may include radar and/or electronic chart information, in combination with other navigational or ship related data.*

3.1.59**user dialogue area**

(MSC191/A) *area of the display consisting of data fields and/or menus that is allocated to the interactive presentation and entry or selection of operational parameters, data, information, text and commands mainly in alphanumeric form*

3.1.60**validity**

property of information as conforming to specified criteria, and the marking of such information as being "valid" or "invalid" (i.e. "good" or "no good") for its intended use

3.1.61**warning**

(MSC.302/A) *alert for condition requiring immediate attention, but no immediate action by the bridge team*

Note 1 to entry: *Warnings are presented for precautionary reasons to make the bridge team aware of changed conditions which are not immediately hazardous, but may become so if no action is taken.*

3.2 Abbreviated terms

DAC designated area code

FI function identifier

MID maritime identity digits

VTs vessel traffic services

4 General requirements for all displays on the bridge of a ship**4.1 Relationship to IMO standards**

(MSC191/1) IMO resolution MSC.191(79) *harmonizes the requirements for the presentation of navigation-related information on the bridge of a ship to ensure that all navigational displays adopt a consistent human machine interface philosophy and implementation.*

(MSC191/1) IMO resolution MSC.191(79) *supplements and, in the case of a conflict, takes priority over, the presentation requirements of the individual performance standards adopted by the IMO for relevant navigational systems and equipment and covers the presentation of navigation-related information by equipment for which Performance Standards have not been adopted by the IMO.*

This document supplements and, in the case of a conflict, takes priority over, the presentation requirements of the individual testing standards for relevant navigational systems and equipment and covers the presentation of navigation-related information by equipment for which testing standards are not available.

NOTE 1 Individual testing standards are, for example, standards for specific equipment published by IEC or ISO. An example of equipment without a testing standard at the time of publishing of this document is navigation lights control.

(MSC302/3.6) *In case of conflict with alert requirements of existing performance standards, the present Performance standards (MSC.302(87)) will take precedence.*

NOTE 2 In case of conflict for alert presentation related issues, the priority of IMO performance standards is from the highest MSC.302(87), MSC.252(83), MSC.191(79), after which all performance standards are equal.

(MSC191/2) IMO resolution MSC.191(79) as amended by IMO resolution MSC.466(101) *specifies the presentation of navigational information on the bridge of a ship, including the consistent use of navigational terms, abbreviations, colours and symbols, as well as other presentation characteristics.*

(MSC191/2) IMO resolution MSC.191(79) *also addresses the presentation of information related to specific navigational tasks by recognising user selected presentations in addition to presentations required by the relevant individual performance standards adopted by the IMO.*

This document further addresses the guidelines for the presentation of navigation-related symbols, terms and abbreviations in Safety of Navigation circular SN/Circ.243.

(MSC191/3) This document *is applicable to any display equipment associated with the navigational systems and equipment for which individual performance standards have been adopted by the IMO.* It addresses the stand-alone displays for radar, ECDIS, multifunction displays and composite presentations that integrate information derived from two or more systems. This document *also addresses display equipment associated with navigational systems and equipment for which individual performance standards have not been adopted by the IMO.*

(MSC191/3) *The general principles* and the physical characteristics specified in Clause 4 and Clause 7, respectively, of this document *are applicable to all displays on the bridge of a ship.*

Some requirements set forth in MSC.191(79) duplicate requirements set forth in other IMO documents or in the IEC standards further specifying the methods of test and required test results for those requirements (for example, IEC 60945, IEC 61174, IEC 61993-2, IEC 62388, etc.). Where this document duplicates a requirement in another standard, the method(s) of test for that requirement may refer to the other standard. Manufacturers may offer relevant test data from compliance tests to other standards as evidence of compliance with appropriate tests of this document.

AIS messages are defined in ITU-R M.1371. The IMO performance standards for Presentation and Radar use the term "AIS targets" and "reported targets" for targets received by AIS messages and use the term "AIS information" for information related to these AIS targets.

NOTE 3 The word "target" as used in "radar target", "AIS target" and "reported target" derives from the original development of radar for gunnery control.

The IMO performance standards for Integrated Navigation System (INS) refers to the following types of AIS messages:

- AIS targets;
- AIS reports of AtoNs;
- AIS safety related and binary messages;
- Application Specific Messages (ASM).

This document refers to the following types of AIS messages (see Annex K):

- AIS targets;
- AIS data reports;
- AIS locating devices;
- AIS synthetic targets;
- AIS safety related messages;
- AIS ASM.

This document uses the following terms for the concept that IMO refers to as "AIS targets" and "reported targets":

- AIS targets;
- AIS data reports;
- AIS locating devices;

- AIS synthetic targets.

IMO use the term "AIS report of AtoNs" for the concept referred to as:

- "AIS AtoNs" in this document.

NOTE Additional technical guidance on AIS ASM can be found in IMO SN.1/Circ.289.

The additional guidance on display and dialogue design in IMO MSC/Circ.982 is referenced in Annex C.

4.2 Application of IEC 60945

4.2.1 Remark

If display equipment is permitted to be monochrome, then the colour-related requirements specified in 4.5.1, 4.7.1, 4.7.2, 4.7.3 and 4.8.2 will not apply.

4.2.2 General requirements

4.2.2.1 Requirement

(MSC191/3) *In addition to the general requirements set forth in IMO Resolution A.694(17) and further specified in IEC 60945, display equipment shall meet the requirements set forth in IMO Resolution MSC.191(79) and further specified in this document, as applicable.*

4.2.2.2 Methods of test and required results

See Annex D for guidance in the application of IEC 60945 for testing.

4.3 Arrangement of information

4.3.1 Consistency of layout and logical grouping

4.3.1.1 Requirement

(MSC191/5.1.1 as amended by MSC.466) *The presentation of information shall be consistent within the user interface with respect to screen layout and arrangement of information, for example, with respect to concepts, terminology, labelling and interaction paradigms used across the application and from screen to screen and/or from page to page. Data and control functions shall be logically grouped according to their function or the task-at-hand, see Annex E. Clause E.2 defines groups of related navigational information. Priority information essential to the task-at-hand shall be identified for each application (for example, radar, ECDIS, etc.), permanently or persistently displayed, as appropriate for the application, and presented to the user in a prominent manner by, for example, use of position (for example, screen location), size and colour.*

(MSC/Circ.1609/Appendix 3/1) *Clause E.2 defines groups of related navigational information that shall be displayed together on the user interface, to enable the user to quickly locate and react to essential navigation information, if available on the screen. Logical grouping in Clause E.2 applies to radar equipment, ECDIS and minimum INS functions. Logical grouping in Clause E.2 may be applied to other electronic navigation equipment and navigation sensors where applicable, to improve standardization and usability.*

(MSC/Circ.1609/Appendix 3/2) *Clause E.2 does not specify where the groups of information should appear on the screen, or the order in which the individual information elements should be grouped. The groups of related navigational information presented on the user interface are not limited to the information listed in Clause E.2. The groups in Clause E.2 may be extended by associated information. These groupings apply to both mandatory and non-mandatory information. Within an individual group, it is not required to display all information, only to group it, if displayed.*

4.3.1.2 Methods of test and required results

The methods of test and the required results are as follows:

- a) confirm by analytical evaluation that the arrangement, logical grouping, operation and identification of controls, screen displays and indications are in accordance with Annex E and IEC 60945:2002, 4.2.1.2 through 4.2.1.5;
- b) confirm by analytical evaluation that the concepts, terminology, labelling and interaction paradigms, screen layout and arrangement of information is consistent from screen to screen and/or page to page;
- c) confirm by analytical evaluation that priority information essential to the task-at-hand is identified and permanently or persistently displayed in a prominent manner, as appropriate, for each application.

4.3.2 Consistent presentation of information

4.3.2.1 Requirement

(MSC191/5.1.2) *The presentation of information shall be consistent with respect to:*

- numerical *values* (for example, position, speed, distance, time, etc.);
- *units*;
- *meaning* of information (for example, using the terms and abbreviations in Annex B);
- *sources* of information (for example, using the terms and abbreviations in Annex B);
- *validity* of information (see also 4.8.1 and 4.8.2); and
- *integrity* of information, if available (see also 4.8.1 and 4.8.2).

(See also IEC 60945:2002, 4.2.1.5)

4.3.2.2 Methods of test and required results

Confirm by observation that numerical values and their units, the meaning and source(s) of information, and the validity and integrity of information are presented in a consistent manner.

4.3.3 Separation of operational display area

4.3.3.1 Requirement

(MSC191/5.1.3) *The presentation of information shall be clearly separated into one or more operational display areas (for example radar, chart) and one or more user dialogue areas (for example, menus, data, control functions).*

4.3.3.2 Methods of test and required results

Confirm by observation that the presentation is clearly separated into one or more operational display areas and one or more user dialogue areas.

4.4 Readability

4.4.1 Readability under all ambient light conditions

4.4.1.1 Requirement

(MSC191/5.2.1) *The presentation of alphanumeric data, text, symbols and other graphical information (for example, chart information, radar echoes or a radar video image, etc.) shall support readability from typical user positions (i.e. with respect to reading distance) under all ambient light conditions likely to be experienced on the bridge of a ship (for example, day, dusk and night), and with due consideration to the night vision of the officer of the watch. (See also 4.5.1 and 7.2.1)*

Table 1 characterizes light levels for the ambient light conditions day, dusk and night.

Table 1 – Ambient light conditions

Ambient condition	Light level
Day	200 cd/m ² ± 50 %
Dusk	10 cd/m ² ± 50 %
Night	Darkness (i.e. where the display is the predominant light source)

NOTE 1 Natural daylight is preferred for the day and dusk conditions.

NOTE 2 The adjustment of the appropriate ambient light conditions for calibrated monitors, for example to display charted information, is described in G.1.3 d).

NOTE 1 It is possible the white background used in the "Day" colour table provided in the IHO ECDIS Presentation Library does not support readability under all light conditions and is a risk to safety of navigation for some navigational systems and equipment, including radar. Readability can be achieved by using the black background in the "Dusk" or "Night" colour tables provided in the IHO ECDIS Presentation Library and adjusting brightness and contrast, if provided, for use under all light conditions.

Display equipment shall provide a luminance of at least 85 cd/m² measured at the centre of the display when set to the maximum brightness setting. The white luminance level of the display shall be adjustable down to 1 cd/m² ± 20 % and may be extinguishable below that point.

If provided, dimming below 0,8 cd/m² as white level shall continue to ensure readability of alerts (alarms, warnings and cautions) while readability of all other items is not required.

NOTE 2 General requirements for illumination are described in IEC 60945.

Transflective and reflective displays shall provide adjustable self-illumination suitable for all ambient light conditions likely to be experienced on the bridge of a ship (day, dusk and night) and with due consideration to the night vision of the officer of the watch. It shall be adjustable to produce display luminance at least from 1 cd/m² to 5 cd/m² under night conditions.

The luminance across the operational display area shall not have a variance of more than 30 % from the brightest point to the dimmest point.

NOTE 3 Variance is determined by the equation:

$$1 - \left(\frac{L_{\min}}{L_{\max}} \right)$$

where

$L_{\min}$ is the minimum luminance;

$L_{\max}$ is the maximum luminance measured across the operational display area, or the entire screen depending on the application.

It shall be possible to display alphanumeric data, text, symbols (see 4.6) and other graphical information using a lighter foreground (for instance character, symbol, etc.) against a dark background of high contrast, emitting as little light as possible at night. The brightest elements of the presentation shall be restricted to points and thin lines.

If display equipment is intended to present symbols for charted information (see 4.6.2), it shall provide a means or method for the user to verify that the colour black is visually distinguishable against a background set to dark grey and vice-versa.

NOTE 4 The IHO ECDIS Presentation Library provides "black-adjust" symbols BKAJ1 and BKAJ2, for the colours black and grey, respectively.

If display equipment is not intended to present symbols for charted information (see 4.6.2), it shall maintain that any colours used are visually distinguishable against the background.

NOTE 5 Visually distinguishable is at least luminance ratio 1:2 when using instrumental verification.

It is important to avoid affecting the night vision of the officer of the watch by excessive glow from displays on the bridge at night. The display shall be capable of providing a contrast of 100:1 between the 1 cd/m² white level and the black background.

NOTE 6 The white level can be created using a standardized method (i.e. RGB values or the CIE 1931 colour coordinates (x, y and L) for white) specified by the manufacturer or, if no manufacturer specification is available, using the RGB values 255, 255, 255.

4.4.1.2 Methods of test and required results

Set up the display equipment for measurements of luminance, contrast and colour according to the guidelines of IEC 61966-4 or the VESA Flat Panel Display Measurement (FPDM), see VESA-2001-6. Before measurements are taken, power up the display equipment and allow it to stabilize for the period of time specified by the manufacturer, as follows.

- a) Confirm by observation at the manufacturer's recommended viewing distance that alphanumeric data, text, symbols and other graphical information including alerts are readable under the ambient light conditions described in Table 1.
- b) For direct view displays (for example CRT (cathode ray tube), LCD (liquid crystal display) with backlight, etc.), confirm by measurement using a test image with a white square at the centre of the operational display area (to be provided by the manufacturer) that the brightness can be varied from a minimum level of at most 1 cd/m² ± 20 % to a maximum level of at least 85 cd/m² measured under dark condition. Confirm by measurement that the values for brightness used for the setup are stable after the stabilisation period defined by the manufacturer. Confirm by measurement in the night ambient condition that the contrast ratio between the 1 cd/m² white level and the black background is 100:1, minimum.
- c) For transfective and reflective displays, confirm by measurement using a test image with a white square at the centre of the operational display area (to be provided by the manufacturer) that the brightness can be adjustable at least from 1 cd/m² to 5 cd/m² under conditions of night ambient illumination to a maximum level of at least 85 cd/m² under conditions of daylight ambient illumination. Confirm by measurement that the values for brightness used for the setup are stable after the stabilisation period defined by the manufacturer. Confirm by measurement in the night ambient condition that the contrast ratio between the 1 cd/m² white level and the black background is 100:1, minimum. The ambient illumination levels shall be as specified in Table 1.

NOTE This test image is not generated internally by the display equipment.

- d) Confirm by observation that alphanumeric data, text, symbols and other graphical information including alerts can be presented using a lighter foreground against a dark background.
- e) Confirm by measurement that, when the display equipment is set to maximum brightness, the luminance does not vary across the operational display area by more than 30 % from the brightest point to the dimmest point.
- f) Confirm by observation that the brightest elements of the presentation in the night ambient light condition described in Table 1 are points and thin lines.
- g) Where display equipment is intended to present symbols for charted information, confirm by observation for each ambient light condition that the user can verify that the colour black is visually distinguishable against a background set to dark grey, and vice-versa.
- h) Where display equipment is not intended to present symbols for charted information, confirm by observation for each ambient light condition that any colours used are visually distinguishable against background.

- i) If dimming below $0,8 \text{ cd/m}^2$ as white level is provided, then confirm by observation after 10 min adaptation period to night ambient light condition by the observer that at least the alerts (alarms, warnings, cautions) are readable and different alert levels are distinguishable from each other.

4.4.2 Legibility of alphanumeric data and text

4.4.2.1 Requirement

(MSC191/5.2.2) *Alphanumeric data and text shall be presented using a clearly legible non-italic, sans-serif font. The font size shall be appropriate for the viewing distance from user positions (i.e. with respect to reading distance and viewing angles) likely to be experienced on the bridge of a ship.*

The character height in millimetres shall be not less than 3,5 times the nominal viewing distance in metres. The manufacturer's documentation shall identify the nominal viewing distance for the display equipment.

4.4.2.2 Methods of test and required results

The methods of test and the required results are as follows:

- confirm by observation that alphanumeric data and text is presented using non-italic, sans-serif font;
- confirm by measurement that the character height (i.e. the distance between the top and bottom edges of the smallest capital letter used in the presentation) in millimetres is not less than 3,5 times the nominal viewing distance in metres;
- confirm by inspection of manufacturer's documentation that the nominal viewing distance for the display equipment is identified in the manufacturer's documentation.

4.4.3 Presentation of text and icons

4.4.3.1 Requirement

(MSC191/5.2.3 as amended by MSC.466) *Text shall be presented using simple unambiguous language that is easy to understand (for example, standard marine terminology or text that provides clear meaning by its context). Navigational terms and abbreviations shall be presented using the nomenclature set forth in Annex B and Clause E.3.*

(MSC191/5.2.4 as amended by MSC.466) *When icons are used, their purpose shall be intuitively recognized by appearance, placement, and grouping as defined in Clause E.3.*

Circ.1609/Appendix 2 and Clause E.3 identify commonly-used functions on navigation equipment and for each function specifies the associated terminology, abbreviation and (where appropriate) icons to achieve consistency of presentation across navigation equipment.

For the functions listed in Clause E.3, the following applies.

- (Circ.1609/Appendix 2/2) *Where icons, terms and/or abbreviations are used, they shall meet the requirements of Clause E.3. Where a standard term, abbreviation, or icon is not available, another icon, term or abbreviation may be used, but these shall not conflict with those listed in Clause E.3.*
- (Circ.1609/Appendix 2/3) *The icons specified may indicate a status, may execute a specific function (hot key), or may provide access to a group of related functions (shortcut).*
- (Circ.1609/Appendix 2/4) *Only the shape of the icon is specified; Clause E.3 does not specify a colour scheme for icons, except for the icons depicted in colour in Table E.6 which shall follow the IHO colour scheme or similar.*

- d) (Circ.1609/Appendix 2/5) *Where appropriate and practical, a brief explanation of the purpose of an icon shall be easily obtainable by the user. This functionality shall be able to be turned off easily by the user.*

Icons used for the presentation of alerts shall be presented according to Annex F.

4.4.3.2 Methods of test and required results

The methods of test and the required results for text are as follows:

- a) confirm by analytical evaluation that text is presented using simple unambiguous language;
- b) confirm by observation that navigational terms and abbreviations are presented using the nomenclature in Annex B and in Clause E.3;
- c) confirm by inspection of documented evidence that other terminology or abbreviations, if used, are explained in the operator's manual and do not conflict with those listed in Clause E.3.

The methods of test and the required results for icons are as follows:

- d) for icons not specified in Clause E.3 or Annex F, confirm by analytical evaluation that icons and their purpose can be intuitively recognized by appearance, placement, and grouping and that these icons do not conflict with those in Clause E.3;
- e) confirm by observation that shape of icons used for data and control function are presented according to Clause E.3;
- f) confirm by observation that colours of icons specified in Table E.6 follows the IHO colour scheme or similar;
- g) confirm by observation that icons used for the presentation of alerts are presented according to Annex F (see also 5.6.1.2).

4.5 Colours and intensity

4.5.1 Discrimination of colours – Requirement

(MSC191/5.3.1) *The colours used for the presentation of alphanumeric data, text, symbols and other graphical information shall provide sufficient contrast for discrimination and identification against the background under all ambient light conditions likely to be experienced on the bridge of a ship (for example, day, dusk and night) and with due consideration to the night vision of the officer of the watch.*

(MSC191/5.3.2) *The colours and brightness shall take into account the ambient light conditions of day, dusk and night. The presentation shall support night viewing by showing lighter foreground information on a dark non-reflecting background.*

(MSC191/5.3.3) *The background colour and contrast shall be chosen to allow displayed information to be easily discriminated without degrading the colour coding aspects of the presentation.*

Display equipment may use a range of tones of basic colours, provided they are identifiable and visually distinguishable from each other. Colours used for the presentation of information in the user dialogue areas shall not detract from the presentation of information in the operational display area.

If display equipment is intended to present symbols for charted information, it shall use colours that comply with or are based upon the colours specified in the relevant IHO standards, for example the IHO ECDIS Presentation Library in IHO S-52 and its Appendices, or an equivalent set of colour tables, as far as practical.

NOTE It is possible the white background used in the "Day" colour table provided in the IHO ECDIS Presentation Library does not support readability under all light conditions and is a risk to safety of navigation for some navigational systems and equipment, including radar. Readability can be achieved by using the black background in the "Dusk" or "Night" colour tables provided in the IHO ECDIS Presentation Library and adjusting brightness and contrast, if provided, for use under all light conditions.

4.5.2 Methods of test and required results

The person conducting this test shall have passed the minimum colour vision and acuity tests required for users by IMO STCW Code Part B and have adapted to night viewing for 10 min before checking the night display.

- a) Confirm by observation that the colours used for the presentation of alphanumeric data, text, symbols and other graphical information provide sufficient contrast for identification and discrimination against the background under the ambient light conditions described in Table 1.
- b) Confirm by observation that the colours used for the presentation of alphanumeric data, text, symbols and other graphical information support night viewing by showing lighter foreground information on a dark non-reflecting background.
- c) Confirm by observation that the colours used for the presentation of alphanumeric data, text, symbols and other graphical information are identifiable and visually distinguishable from each other.
- d) Confirm by observation that the colours used in the user dialogue areas do not detract from the presentation of information in the operational display area.
- e) Where display equipment is intended to present symbols for charted information, confirm by analytical evaluation that the colours used conform to the IHO specified colours in the IHO S-52 ECDIS Presentation Library, or equivalent, as far as practical (see Clause G.1 for additional guidance).

4.6 Symbols

4.6.1 Operational information

4.6.1.1 Requirement

(MSC191/5.4.1) *Symbols used for the presentation of operational information other than chart information shall comply with or be based upon the symbols set forth in Annex A.*

(SN-Circ.243/1/3) *Where a standard symbol is not available, another symbol may be used, but this symbol shall not conflict with the symbols listed in Annex A or in the IHO S-52 ECDIS presentation library. (For additional guidance, see also ISO 80416-4.)*

Colours used for the presentation of operational information shall be discriminated from the colours used for the presentation of the radar image, target trails, additional processed radar information and electronic chart information.

For symbols for which the size is not specified by this document, the following applies: A symbol shall subtend at least 5 mm/m (17 min of arc) at the nominal viewing distance. Where accurate colour identification of a symbol is required by an individual equipment standard, then, in the absence of size requirements in that standard, the symbol shall subtend at least 8,7 mm/m (30 min of arc) at the nominal viewing distance. The use of spectrally extreme blue ($v' < 0,2$) shall be avoided for images subtending less than 35 mm/m (2° of arc) of viewing distance.

Annex A specifies standardized symbols including the size at a viewing distance of 1 m. Where the manufacturer declares a different viewing distance, the symbol size shall be measured according to the ratio to a viewing distance (e.g. a symbol of 5 mm at 1 m viewing distance shall be 7,5 mm if the declared viewing distance is 1,5 m).

4.6.1.2 Methods of test and required results

The methods of test and the required results are as follows:

- a) confirm by inspection of documented evidence that the symbols used to present operational information are presented in accordance with Annex A;
- b) confirm by measurement that the largest dimension of the symbol is at least 5 mm/m (17 min of arc) at the nominal viewing distance, and includes at least 16 pixels;
- c) where accurate colour identification is required for a symbol, confirm by measurement that the largest dimension of the symbol is at least 8,7 mm/m (30 min of arc) at the nominal viewing distance, and includes at least 29 pixels;

4.6.2 Electronic chart information

4.6.2.1 Requirement

(MSC191/5.4.2) *Symbols used for the presentation of charted information shall comply with relevant IHO standard*, for example, the IHO ECDIS Presentation Library in IHO S-52 and its Appendices, or an equivalent symbol set, as far as practical.

NOTE It is possible some symbols provided in the IHO ECDIS Presentation Library are not suitable for the display of electronic chart information on radar or in a composite presentation based upon radar. IHO S-52 and its Appendices allow minor deviations to symbology. It provides a framework and guidelines for chart symbolization from which manufacturers can derive a customized symbol set.

If symbols that deviate from the IHO S-52 ECDIS Presentation Library are used for the presentation of any chart information, then they shall:

- be legible;
- be certain and unambiguous in their meaning;
- be of sufficient size to support the nominal viewing distance (see also 4.4.2);
- have the same general shape as IHO S-52 ECDIS Presentation Library symbols used for the same or similar purpose(s).

Symbols added to the ECDIS Presentation Library shall not be confused with IHO S-52 ECDIS Presentation Library symbols.

4.6.2.2 Methods of test and required results

The methods of test and the required results are as follows:

- a) confirm by inspection of documented evidence that the symbols used to present charted information are presented in accordance with relevant IHO standards, for example IHO S-52 and its Appendices;
- b) where symbols deviate from the IHO S-52 ECDIS Presentation Library, confirm by observation that they:
 - 1) are legible;
 - 2) are certain and unambiguous in their meaning;
 - 3) are of sufficient size to support the nominal viewing distance;
 - 4) have the same general shape as IHO S-52 ECDIS Presentation Library symbols used for the same or similar purposes;
- c) confirm by observation that symbols added to the ECDIS Presentation Library cannot be confused with IHO S-52 ECDIS Presentation Library symbols.

4.7 Colour coding

4.7.1 Colour coding for discrimination

4.7.1.1 Requirement

(MSC191/5.5.1) If *colour coding is used for discrimination or conspicuousness of alphanumeric text, symbols and other graphical information all colours in each colour table shall clearly differ from one another* (see also 4.5.1).

4.7.1.2 Methods of test and required results

Confirm by observation that the colours within each colour table clearly differ from one another.

4.7.2 Colour coding of information

4.7.2.1 Requirement

(MSC191/5.5.2) If *colour coding is used*, then *the colour red shall be used for the coding of alert related information* for alarm and emergency alarm conditions unless otherwise specified by the IMO (for example in Tables 7.1.1 and 7.1.2 of the IMO A.1021(26) Code on Alerts and Indications).

If colour coding is used and if the colour red is used for other purposes than for the coding of alert related information for alarm and emergency alarm conditions, its purpose (e.g. for the indication of port vs starboard, colour of a buoy, colour of a light, etc.) shall be sufficiently clear.

4.7.2.2 Methods of test and required results

If colour coding is used, confirm by inspection of documented evidence or by observation that the colour red is used to indicate an alarm or emergency alarm condition unless otherwise specified by the IMO or unless the purpose is sufficiently clear.

4.7.3 Colour coding in combination with other attributes

4.7.3.1 Requirement

(MSC191/5.5.3). If *colour coding is used it shall be used in combination with other symbol attributes, such as size, shape and orientation*.

A specific implementation shall not rely solely on a single saturated colour. If the display equipment technology relies on the separate transmission of primary colours, the presentation of alerts shall be visible and identifiable even after the failure of any one primary colour input to the display.

4.7.3.2 Methods of test and required results

The methods of test and the required results are as follows:

- confirm by inspection of documented evidence or by observation that the colour coding is always combined with another symbol attribute;
- where the display equipment technology relies on the separate transmission of primary colours, confirm by observation that alerts remain identifiable even after transmission of each of the primary colours is disabled one at a time.

4.7.4 Flashing of information

4.7.4.1 Requirement

(MSC191/5.5.4) *Flashing of information shall be reserved for indicating the state of unacknowledged alerts*.

4.7.4.2 Methods of test and required results

Confirm by observation that flashing of information is only used for unacknowledged alerts.

4.8 Integrity marking

4.8.1 Indication of source, validity and integrity status

4.8.1.1 Requirement

(MSC191/5.6.1) *The source, validity, and where possible, the integrity of information shall be indicated. Invalid information or information with low integrity shall be clearly marked qualitatively and/or quantitatively (see important indication). Invalid information or information with low integrity may be quantitatively indicated by displaying absolute or percentage values.*

4.8.1.2 Methods of test and required results

The methods of test and the required results are as follows:

- a) confirm by observation that the source of information can be indicated;
- b) confirm by observation that the validity of information is indicated;
- c) confirm by observation that the integrity of information is indicated, where available. Where integrity is indicated quantitatively, confirm by observation that either absolute values or percentage values are displayed.

4.8.2 Colour coding of validity and integrity

4.8.2.1 Requirement

(MSC191/5.6.2) *If colour coding is used, then information with low or doubtful integrity shall be qualitatively marked by using the colour as defined in Table 2, and invalid information shall be qualitatively marked by using the colour as defined in Table 2.*

4.8.2.2 Methods of test and required results

If colour coding is used, the methods of test and the required results are as follows:

- a) confirm by observation that the colour as defined in Table 2 is used to indicate information with low or doubtful integrity;
- b) confirm by observation that the colour as defined in Table 2 is used to indicate invalid information.

4.8.3 Indication of presentation failure

4.8.3.1 Requirement

(MSC191/5.6.3) *In many cases, information on the display does not change frequently enough to make presentation failure immediately obvious to the user. In order to show that the screen is being refreshed, a means or method shall be provided to immediately make the user aware of a presentation failure on an operational display (for example, "picture freeze").*

A conspicuous periodically time-varying element shall be provided as a prominent indication of normal screen refresh (for example two alternating dots, etc.).

4.8.3.2 Methods of test and required results

Confirm by observation that a conspicuous periodically time-varying indication is provided in all presentation modes.

4.9 Alerts and indications

4.9.1 Operational status

4.9.1.1 Requirement

(MSC191/5.7.1) *The operational status of information (indications) shall be indicated as in Table 2 unless otherwise specified by the IMO (for example in Tables 7.1.1 and 7.1.2 of the Code on Alerts and Indications, 2009).*

For alerts, the equipment shall comply with IEC 62923-1.

Table 2 – Operational status of indications

Status	Visual indication	Audible signal
<i>Invalid information</i>	<i>Red</i>	<i>Silence</i>
<i>Information with low integrity</i>	<i>Yellow</i>	<i>Silence</i>
<i>Important Indications</i>	<i>Yellow</i>	<i>Silence</i>
<i>Indication</i>	<i>No special requirement</i>	<i>Silence</i>
<i>Normal state</i>	<i>Optionally green</i>	<i>Silence</i>

4.9.1.2 Method of test and required results

Confirm by inspection of documented evidence that indications are presented in accordance with Table 2 unless otherwise specified by the IMO and that the equipment complies with IEC 62923-1.

4.9.2 List of alerts

See IEC 62923-1 for the requirements and tests regarding the list of active alerts.

NOTE Resolution MSC.302 and derived IEC 62923-1 have superseded the requirement: (MSC191/5.7.2).

4.9.3 Alert related information from multiple sources

See IEC 62923-1 for the requirements and tests.

NOTE Resolution MSC.302 and derived IEC 62923-1 have superseded the requirement: (MSC191/5.7.3).

4.9.4 Speech output for alarms and warnings

See IEC 62923-1 for the requirements and tests.

4.10 Presentation mode

4.10.1 Requirement

(MSC191/5.8) *If displays are capable of presenting information in different modes, then there shall be a clear indication of the modes in use, for example:*

- *orientation* (north-up, course-up, head-up);
- *stabilisation* (ground-stabilised, sea-stabilised);
- *motion* (true, relative); *and*
- *chart projection* (Mercator, gnomonic, etc.).

The indication of chart projection is only required when electronic chart information is presented. It can be provided to the user on request.

4.10.2 Methods of test and required results

Confirm by observation that the presentation modes in use are clearly indicated.

4.11 User manuals, instructions and reference guides

4.11.1 Requirement

(MSC191/5.9) *The user manual and instructions and reference guides shall be available in the English language at least. The user manual or reference guide shall include a list of all terms, abbreviations, symbols, icons and their explanations presented by the equipment. (See also Annex A, Annex B and Annex E.)*

4.11.2 Methods of test and required results

The methods of test and the required results are as follows:

- a) confirm by observation that user manual, instructions and reference guide are available in the English language;
- b) confirm by inspection of documented evidence that the user manual and/or reference guide includes a list of all terms, abbreviations, symbols, icons and their explanations used by the system.

5 Presentation of operational information

5.1 Application

The provisions of Clause 5 are applicable to displays on the bridge of a ship that provide functionality as described in 5.2 to 5.20.

5.2 Presentation of own ship information

5.2.1 Graphical representation of own ship – Requirement

(MSC191/6.1.1) *When a graphical representation of own ship is provided, it shall be possible for the user to select either a true scaled ship's outline or a simplified symbol as set forth in Annex A. The size (length) of the ship's true scaled outline or the simplified symbol in the graphical presentation shall be the true scale size of the ship or 6 mm, at a nominal viewing distance of 1 m, whichever is greater.*

The manufacturer should adjust the symbol sizes to properly account for the nominal viewing distance of the display equipment.

Display equipment may (unless stipulated as mandatory in an equipment standard) provide the capability to automatically switch from the ship's true scaled outline to the simplified symbol when the beam of own ship's true scale outline is less than 3 mm at the nominal viewing distance, and vice versa. The true scaled outline shall not be used when the heading is not known in a gyro/THD-stabilized mode. The user shall always have the capability to select the simplified symbol in lieu of the scaled ship's outline.

(MSC191/6.1.2) *A heading line, and where appropriate a velocity vector, shall be associated with own ship symbol and shall originate at the position of the consistent common reference point (CCRP) as set forth in Annex A.*

The combination of the heading line and beam line (the minimised symbol) may be used as an alternative to the simplified symbol and may be selectable as such. Display equipment may provide the capability to automatically switch from the ship's true scaled outline to the heading and beam line when the beam of own ship's true scale outline is less than 3 mm at the nominal viewing distance, and vice versa.

5.2.2 Methods of test and required results

Where display equipment provides a graphical representation of own ship:

- a) confirm by observation that the system provides a ship's true scaled outline and a simplified symbol in accordance with Annex A;
- b) confirm by observation that the display equipment provides the user with the capability to select the representation of own ship as either the ship's true scaled outline or the simplified symbol;
- c) confirm by measurement that the size of the ship's outline is correct for the scale of the display;
- d) confirm by observation that the simplified symbol is automatically selected when the beam of the ship's true scaled outline is less than 3 mm, and vice versa;
- e) confirm by observation that the display equipment provides a heading line in accordance with Annex A;
- f) confirm by observation that the display equipment provides a velocity vector in accordance with Annex A.

Note that the minimised symbol may be used as alternative to the simplified symbol.

5.3 Presentation of chart information

5.3.1 Alteration of chart information

5.3.1.1 Requirement

It shall not be possible to alter the electronic chart information, except by update.

5.3.1.2 Methods of test and required results

Confirm by observation that it is not possible to alter the electronic chart information.

5.3.2 Colours and symbols for charted information

5.3.2.1 Requirement

(MSC191/6.2.1) *The presentation of official electronic charted information that is issued by, or on the authority of a government authorized hydrographic office, or other relevant government institution or agency (for example, ENC), shall comply with the relevant IHO standards, for example, colours and symbols specified for the IHO ECDIS Presentation Library in IHO S-52 and its Appendices, or an equivalent colour and symbol set, as far as is practicable.*

(MSC191/6.2.2) *The presentation of proprietary electronic chart information shall comply with relevant IHO standards, as far as practical, for example, be based upon the colours and symbols specified for the IHO ECDIS Presentation Library in IHO S-52 and its Appendices, or an equivalent colour and symbol set. There shall be a clear indication when the presentation is not in accordance with IHO standards.*

(MSC191/6.2.3) *The presentation of user-added electronic chart information shall comply with the relevant IHO standards, as far as practical, for example, be based upon the colours and symbols specified for the IHO ECDIS Presentation Library in IHO S-52 and its Appendices, or an equivalent colour and symbol set.*

NOTE It is possible some colours and symbols provided in the IHO ECDIS Presentation Library or otherwise specified by IHO in S-52 and its Appendices are not suitable for the display of electronic chart information on radar or in a composite presentation based upon radar. IHO S-52 and its Appendices allow minor deviations to symbology. It provides a framework and guidelines for chart symbolization from which manufacturers can derive a customized symbol set.

(MSC191/6.2.4) *If electronic chart information derived from different scales appears in the presentation, the scale boundary shall be clearly indicated as defined in the relevant IHO standards, for example, IHO ECDIS Presentation Library in IHO S-52 and its Appendices.*

5.3.2.2 Methods of test and required results

The methods of test and the required results are as follows:

- a) confirm by observation that the presentation of official and user-added electronic charted information, as applicable, is in accordance with 5.3.2.1 and 4.5.1;
- b) confirm by observation that the presentation of proprietary electronic charted information, as applicable, is either in accordance with 5.3.2.1 and 4.5.1 or that an indication is provided;
- c) when electronic chart information derived from different scales (for example, adjacent ENC cells) is displayed, confirm by observation that a scale boundary is presented between the scales.

5.4 Presentation of radar information

5.4.1 Radar video images

5.4.1.1 Requirement

(MSC191/6.3.1) *Radar video images shall be displayed by using a basic colour that provides optimum contrast. Radar echoes shall be clearly visible when presented on top of a chart background. The relative strength of radar echoes may be differentiated by tones of the same basic colour. The colours may be different for operation under different ambient light conditions (day, dusk and night) likely to be experienced on the bridge of a ship, and with due consideration to the night vision of the officer of the watch.*

Additional processed radar information that is not a part of the radar video image may be discriminated from the radar video by tones of the basic colour used to present the image. Alternatively, it may be differentiated by tones of other basic colours.

For radar displays, a dark non-reflecting background shall be used. The colour used for the radar image shall provide contrast against the background and shall be clearly visible when presented over a chart background.

NOTE 1 It is possible the "Day" table based on a white background included in the colour tables specified by IHO and provided in IHO ECDIS Presentation Library does not support readability under daylight conditions and can be a risk to safety of navigation for some navigational systems and equipment, including radar. Readability under daylight conditions can be achieved by using the black background in the "Dusk" or "Night" colour tables provided in IHO ECDIS Presentation Library and adjusting brightness and contrast, if provided.

If the colour red is used for the radar video image, then it shall be distinguishable from other uses of the colour red, for example, alarms including dangerous targets.

If electronic chart information overlays radar information (i.e. a radar video image), or a radar image overlays chart information, then the overlay may be displayed as transparent or opaque. If a transparent overlay is used, then it may be variable so that the underlying information is visible through the overlay. If an opaque chart overlay is used, then the colour fill of area objects shall be excluded. Optionally, the colour fill of point objects may also be excluded. In either case, the background of the radar image shall be the same basic colour as the chart's water surfaces.

NOTE 2 If display equipment provides facilities for the overlay of radar information that are independent of a shipborne radar system (for example, by a separate radar scan converter), then the facilities are described in the relevant clauses of IEC 62388.

5.4.1.2 Methods of test and required results

The methods of test and the required results are as follows:

- a) confirm by observation, under each of the ambient light conditions described in Table 1, that radar information is presented using a contrasting colour against the background and that the background shall be dark for radar displays;
- b) confirm by observation that radar information is clearly visible when presented on top of a chart background for the ambient light conditions described in Table 1;
- c) if the colour red is used for the radar video image, confirm by observation that it is distinguishable from other uses of the colour red, for example, alarms including dangerous targets.

5.4.2 Target trails

5.4.2.1 Requirement

(MSC191/6.3.2) If display equipment provides *target trails*, then they shall be *distinguishable from radar echoes and clearly visible under all ambient light conditions* (day, dusk and night) likely to be experienced on the bridge of a ship, and with due consideration to the night vision of the officer of the watch. Target trails may be differentiated by tones of the basic colour used for the radar video image. Alternatively, they may be distinguished by tones of another basic colour.

If display equipment provides target trails, then there shall be an indication of trail time and motion stabilisation *mode*.

5.4.2.2 Methods of test and required results

Where target trails are provided:

- a) confirm by observation that they are distinguishable from radar echoes and clearly visible under the ambient light conditions described in Table 1;
- b) confirm by observation that the trail time and motion stabilization mode are indicated.

5.5 Presentation of target information

5.5.1 Providing target information

5.5.1.1 Requirement

(MSC191/6.4.1.1) *Target information may be provided by a radar target tracking system and/or by the AIS.*

A radar target tracking system detects and tracks radar targets. Other navigational systems may provide remote presentation of tracked radar targets. These systems shall present reported radar targets in accordance with Annex A.

NOTE If display equipment provides facilities for radar target detection and tracking that are independent of a shipborne radar system, then the facilities are described in the relevant clauses of IEC 62388.

Any navigational system or equipment may provide remote presentation of reported AIS targets. These systems shall present reported AIS targets in accordance with Annex A.

Navigational system or equipment may receive information of AIS targets via an interface from a radar and receive information of AIS targets from an AIS. AIS target information from these sources shall be combined using the MMSI of each AIS target to avoid duplication of AIS targets.

NOTE Radar can report AIS targets using TTD and TLB sentence. The MMSI value included in the TLB sentence is the basis for the combination process of both radar and AIS as sources of AIS targets.

An AIS target may be repeated (see 5.5.4.1). In such case, the presentation shall be as for reported AIS target in accordance with Annex A.

5.5.1.2 Methods of test and required results

The methods of test and the required results are as follows:

- a) where display equipment provides the capability to connect to a radar target tracking system, confirm by observation that the presentation is in accordance with Annex A;
- b) where display equipment provides the capability to connect to an AIS: confirm by observation that the presentation is in accordance with Annex A;
- c) where display equipment provides the possibility to receive AIS targets both via an interface from a radar and from an AIS, use a radar simulation arrangement and an AIS simulator to provide AIS target information from both sources and confirm by observation that AIS target information has been combined from both sources to avoid duplication of AIS targets.

5.5.2 Consistent user interface for target information

5.5.2.1 Requirement

(MSC191/6.4.1.3) *As far as practical, the user interface and data format for operating and presenting tracked radar target information and reported AIS target information shall be consistent.*

5.5.2.2 Methods of test and required results

Confirm by observation that the presentation of tracked radar target information and reported AIS target information is consistent.

5.5.3 Indication of exceeding target capacity

5.5.3.1 Requirement

(MSC191/6.4.2.1) *There shall be an indication when the target tracking and/or reported target processing/display capacity is about to be exceeded unless otherwise specified in individual equipment standards (for example as a caution).*

(MSC191/6.4.2.2) *There shall be an indication when the target tracking and/or reported target processing/display capacity have been exceeded unless otherwise specified in individual equipment standards (for example as a warning).*

Target tracking means the capability of a target tracking system to track targets. Reported targets means targets reported by AIS. The manufacturer shall declare the processing and display capacity of the equipment separately for tracked and reported targets (i.e. 4 values of capacity).

NOTE A definition of minimum target capacities is given in IEC 62388.

Processing capacity means the number of targets that it is possible to process simultaneously by the equipment. Display capacity means the number of targets that it is possible to display at same time. Processing capacity may be higher than display capacity. If the manufacturer declared processing capacity is higher than the manufacturer declared display capacity, there shall be separate indications, or alerts, if specified by individual equipment standards, for exceeding the display and processing capacities.

NOTE Equipment can provide functionality to select or filter displayed targets. This can lead to a situation in which processing capacity is about to be exceeded or exceeded while the display capacity is not.

The user manual shall describe the operational consequences of the processing and displaying of current and new targets in the event that the capacity for processing or displaying has been reached and further targets occur.

5.5.3.2 Methods of test and required results

Confirm by inspection of manufacturer documentation that the processing and display capacity of the equipment are declared separately for tracked and reported targets (i.e. 4 values of capacity).

Then there are two methods of test depending on the capability of the equipment.

- a) Where display equipment provides the capability to connect to a radar target tracking system:
 - 1) confirm by observation that it provides an indication, or an alert (e.g. a caution) if specified by an individual equipment standard, that the tracked radar target display capacity is about to be exceeded, for example, when the number of tracked radar targets presented exceeds 95 % of the display capacity;
 - 2) confirm by observation that it provides an indication, or an alert (e.g. a warning) if specified by an individual equipment standard, that the tracked radar target display capacity has been exceeded when the number of tracked radar targets presented exceeds 100 % of the display capacity;
 - 3) if processing capacity is higher than display capacity, confirm by observation that it provides an indication, or an alert (e.g. a caution) if specified by an individual equipment standard, that the tracked radar target processing capacity is about to be exceeded, for example, when the number of tracked radar targets processed exceeds 95 % of the processing capacity;
 - 4) if processing capacity is higher than display capacity, confirm by observation that it provides an indication, or an alert (e.g. a warning) if specified by an individual equipment standard, that the tracked radar target processing capacity has been exceeded when the number of tracked radar targets processed exceeds 100 % of the processing capacity.
- b) Where display equipment provides the capability to connect to an AIS:
 - 1) confirm by observation that it provides an indication, or an alert (e.g. a caution) if specified by an individual equipment standard, that the reported AIS target display capacity is about to be exceeded, for example, when the number of reported AIS targets presented exceeds 95 % of the display capacity;
 - 2) confirm by observation that it provides an indication, or an alert (e.g. a warning) if specified by an individual equipment standard, that the reported AIS target display capacity has been exceeded when the number of reported AIS targets presented exceeds 100 % of the display capacity;
 - 3) if processing capacity is higher than display capacity, confirm by observation that it provides an indication, or an alert (e.g. a caution) if specified by an individual equipment standard, that the reported AIS target processing capacity is about to be exceeded, for example, when the number of reported AIS targets processed exceeds 95 % of the processing capacity;
 - 4) if processing capacity is higher than display capacity, confirm by observation that it provides an indication, or an alert (e.g. a warning) if specified by an individual equipment standard, that the reported AIS target processing capacity has been exceeded when the number of reported AIS targets processed exceeds 100 % of the processing capacity.

Confirm by inspection of the user manual that it contains a description of the operational consequences of the processing and display of current and new targets in the event that the capacity for processing or displaying has been reached and further targets occur.

5.5.4 Presentation of repeated AIS reports

5.5.4.1 Requirement

AIS Base Stations and AIS Repeater Stations may repeat AIS information and target reports with a lower update rate than transmitted from the sending vessel and with latency that is significant and variable.

If both repeated and direct AIS reports are received for the same target, the repeated reports shall not be processed for display of the AIS target or related information.

If multiple repeated AIS reports are received for the same target, only the report with the lowest repeat count shall be processed for display of the AIS target or related information.

5.5.4.2 Methods of test and required results

The methods of test and the required results are as follows:

- confirm, by analytical evaluation and using the AIS simulator to produce AIS reports for a nearby AIS target moving at 24 kn and repeated AIS reports for this target with delayed and reduced update rate (for example: delayed by 30 s with a 10 s update rate), that the repeated data is not displayed;
- confirm, by analytical evaluation and using the AIS simulator to produce two or more repeated AIS reports for a target with delayed and reduced update rate (for example: delayed by 30 s with a 10 s update rate), that only data from lowest repeat count is displayed.

5.5.5 Filtering sleeping AIS targets

5.5.5.1 Requirement

(MSC191/6.4.3.1) *It shall be possible to filter the presentation of sleeping AIS targets (for example, by target range, CPA/TCPA, AIS target class A/B, or proximity to or otherwise related to a monitored route, etc.).*

Criteria for filtering shall only include sleeping class A or sleeping class B when combined with one or more other factors, for example including CPA/TCPA, Speed, Range or Course.

(MSC191/6.4.3.2) *If a filter is applied, then there shall be a clear and permanent or persistent indication, as appropriate for the application. The filter criteria in use shall be readily available to the user.*

(MSC191/6.4.3.3) *It shall not be possible to remove individual AIS targets from the presentation.*

5.5.5.2 Methods of test and required results

The methods of test and the required results are as follows:

- a) confirm by observation that the user can filter the presentation of sleeping AIS targets and that filtering criteria includes only sleeping class A or sleeping class B combined with one or more other factors;
- b) confirm by observation that an indication is provided when sleeping targets are filtered from the presentation;
- c) confirm by observation that the indication remains while the filter is active;
- d) confirm by analytical evaluation that the filter criteria in use is readily available;
- e) confirm by observation that the user cannot remove individual AIS targets from the presentation.

5.5.6 Activation of AIS targets

5.5.6.1 Requirement

(MSC191/6.4.4.1) *If zones for the automatic activation of AIS targets are provided, they shall be the same as for automatic radar target acquisition, if available. Any user defined zones (for example, acquisition/activation zones) in use shall be presented in graphical form with their relevant symbols set forth in Annex A.*

(MSC191/6.4.4.2) *In addition, sleeping AIS targets shall be automatically activated when they meet user defined parameters (for example, target range, activation zones, CPA/TCPA or AIS target class A/B).*

Automatic activation is independent of AIS target filtering. If means are provided for automatic activation of AIS targets, then means for disabling that function shall be provided and the disable status shall be indicated.

NOTE If display equipment provides facilities for the calculation of CPA/TCPA that are independent of a shipborne radar target tracking system, then the facilities are described in the relevant clauses of IEC 62388.

5.5.6.2 Methods of test and required results

Where display equipment provides zones for the automatic activation of AIS targets:

- confirm by observation that the zones are the same as for automatic radar target acquisition, if provided;
- confirm by observation that the zones are presented in accordance with Annex A;
- confirm by observation that it is possible to disable automatic activation and that the disabled status is indicated;
- confirm by observation that both filtered and displayed sleeping AIS targets entering a zone are automatically activated when they meet user defined criteria.

5.5.7 Graphical presentation of targets

5.5.7.1 Requirement

(MSC191/6.4.5.1) *Targets shall be presented with their relevant symbols as set forth in Annex A.*

(MSC191/6.4.5.2) *Reported AIS targets shall be graphically presented at predicted positions either as sleeping or activated. Where no separate symbol is defined for the active and sleeping states, the reported AIS target shall be graphically presented with the single symbol type available in Annex A.*

EXAMPLE AIS SAR vessel (symbol 2.16) keeps all requirements for AIS sleeping target and AIS activated target except for the graphical representation of the symbol.

(MSC191/6.4.5.3) *The course and speed of a tracked radar target or an activated reported AIS target shall be indicated by a vector that clearly shows the predicted motion. The vector time (i.e. length) shall be consistent for presentation of any target regardless of its source.*

(MSC191/6.4.5.4) *The presentation of vector symbols shall be consistent irrespective of the source of information. The presentation mode shall be clearly and permanently or persistently indicated, as appropriate for the application, including for example,*

- *True/Relative motion,*
- *vector time, and*
- *stabilisation.*

(MSC191/6.4.5.5) *The orientation of the AIS target symbol shall indicate its heading (HDG). If the heading information is not received, the orientation of the AIS symbol shall be aligned to the reported course over ground (COG). If neither heading nor course over ground (COG) is available, the orientation of the AIS symbol shall be aligned towards top of the operational display area. If available, the turn or rate of turn (ROT) indicator and/or the path prediction shall indicate the manoeuvre of an activated AIS target.*

(MSC191/6.4.5.6) *Own ship's CCRP shall be used for alignment of tracked radar target symbols and reported AIS target symbols with other information on the same display.*

(MSC191/6.4.5.7) *On large scale, low range displays, a means or method to present a true scale outline of an activated AIS target shall be provided in accordance with Annex A.*

(MSC191/6.4.5.8) *It shall be possible to display the past positions of activated AIS targets.*

The user manual shall describe the length in time or in number of the past positions available for each target.

5.5.7.2 Methods of test and required results

The methods of test and the required results are as follows:

- a) confirm by observation that targets are presented with their relevant symbols according to Annex A;
- b) confirm by observation that reported AIS targets are graphically presented at predicted position as sleeping or activated targets in accordance with Annex A;
- c) confirm by observation that the predicted motion of tracked radar targets and activated reported AIS targets is clearly indicated by a vector;
- d) confirm by observation that the vector time (i.e. length) is consistent for all targets;
- e) confirm by observation that the presentation of vector symbols are consistent irrespective of the source of information;
- f) verify that the presentation mode is clearly indicated in accordance with 4.10.1;
- g) confirm by observation that the vector time is clearly indicated;
- h) confirm by observation that the orientation of the AIS target symbol clearly indicates its heading. Change the heading information to "not available" for one reported AIS target and confirm by observation that the orientation of the AIS symbol is aligned to the reported COG. Change also the COG information to "not available" for the same reported AIS target and confirm by observation that the orientation of that reported AIS target is aligned towards the top of the operational display area;
- i) confirm by observation that the turn or rate of turn (ROT) flag and/or the path prediction, if available, indicates the manoeuvre of an activated AIS target changing course;
- j) confirm by analytical evaluation that own ship's CCRP is used to align tracked radar target symbols and reported AIS target symbols with other information on the same display;
- k) confirm by observation that on large scale, low range displays, a means or method to present a true scaled outline of an activated AIS target is provided;
- l) confirm by observation that it is possible to display the past positions of activated AIS targets for the length in time or in number as described in the user manual.

5.5.8 Target selection

5.5.8.1 Requirement

(MSC191/6.4.6.1) *A target selected for the display of its alphanumeric information shall be identified by the relevant symbol set forth in Annex A. If more than one target is selected for data display, the symbols and the corresponding target data shall be clearly identified.*

5.5.8.2 Methods of test and required results

The methods of test and the required results are as follows:

- a) confirm by observation that a selected target is identified in accordance with Annex A;
- b) confirm by observation that, if more than one target is selected, the symbols and corresponding target information is clearly identified in accordance with Annex A.

5.5.9 Indication of target derivation

5.5.9.1 Requirement

(MSC191/6.4.6.2) *There shall be a clear indication to show that target information is derived from radar or AIS or from a combination of these.*

5.5.9.2 Methods of test and required results

Confirm by analytical evaluation that there is a clear indication of the source of target information.

5.5.10 Presentation of tracked radar target information

5.5.10.1 Requirement

(MSC191/6.4.6.3) *For each selected tracked radar target the following information shall be presented in alphanumeric form:*

- *source(s) of target information,*
- *measured range of target,*
- *measured bearing of target,*
- *predicted target range at the closest point of approach (CPA),*
- *predicted time to CPA (TCPA),*
- *calculated CTW of target (or calculated COG if ground stabilised),*
- *calculated STW of target (or calculated SOG if ground stabilised).*

Additional target information, where available, shall be provided to the user on request. If additional target information is available, an indication shall be provided when viewing alphanumeric information of the selected target.

If multiple targets are selected, a subset of alphanumeric data, information and text may be presented.

Target information shall be logically "paired" for presentation (i.e. range and bearing, CPA and TCPA, course and speed).

NOTE If display equipment provides facilities for the calculation of CPA/TCPA that are independent of a shipborne radar target tracking system, then the facilities are described in the relevant clauses of IEC 62388.

5.5.10.2 Methods of test and required results

The methods of test and the required results are as follows:

- a) confirm by observation that the information listed above is presented in alphanumeric form for each selected target;
- b) confirm by observation that additional information, where available, is indicated and provided to the user on request;
- c) confirm by analytical evaluation that the target information is logically "paired" for presentation.

5.5.11 Presentation of reported AIS target information

5.5.11.1 Requirement

(MSC191/6.4.6.4) *For each selected reported AIS target, the following information shall be presented in alphanumeric form:*

- *source(s)* of target information (for example, repeated);
- target *identification* (at least one of MMSI, call sign, name or IMO number);
- reported *position and* where available *its quality* (Position accuracy as " $\leq 10\text{m}$ " or " $> 10\text{m}$ " and RAIM as "not in use" or "in use");
- calculated *range* of target;
- calculated *bearing* of target;
- calculated *CPA*;
- calculated *TCPA*;
- reported *COG* (or calculated *CTW* if the display is sea stabilised). In sea stabilized display, the reported *COG* shall at least be available on demand;
- reported *SOG* (or calculated *STW* if the display is sea stabilised). In sea stabilized display, the reported *SOG* shall at least be available on demand;
- reported *navigational status*;
- reported *heading* (HDG) and reported *rate of turn* (ROT) shall also be made available.

Additional target information shall be provided to the user on request. If additional target information is available, an indication shall be provided when viewing alphanumeric information of the selected target. Additional target information consists of:

- MMSI, if not yet presented;
- call sign, if not yet presented;
- name, if not yet presented;
- IMO number, if not yet presented;
- dimensions;
- ship and cargo type;
- destination;
- ETA;
- static draught;
- DTE indicator;
- AIS class;
- if supported, extended reported AIS target information (see Table 8 and 5.18);
- if receiving of AIS safety related messages is supported, on user request, where available, a link to or full content of most recent received AIS safety related messages related to the same MMSI, see 5.19;
- optionally, if sending of AIS safety related messages is supported, a link to or full content of all AIS safety related messages sent by the own ship to the target (basis is MMSI), see 5.20.

Further target information may be presented as well.

If multiple targets are selected, a subset of alphanumeric data, information and text may be presented.

Target information shall be logically "paired" for presentation (i.e. range and bearing, CPA and TCPA, COG and SOG, heading and ROT).

(MSC191/6.4.6.5) *If the received AIS target information is incomplete, then the absent information shall be clearly indicated in the target data field as missing.*

5.5.11.2 Methods of test and required results

The methods of test and the required results are as follows.

Select a reported AIS target and:

- a) confirm by observation that the information listed above is presented in alphanumeric form;
- b) confirm by observation that all additional target information, where available, is provided to the user on request;
- c) confirm by analytical evaluation that the target information is logically "paired" for presentation;
- d) confirm by observation that there is a clear indication of absent information in the target data field.
- e) confirm by observation that when available there is a clear indication that additional information is available.

5.5.12 Continual update of target information

5.5.12.1 Requirement

(MSC191/6.4.6.6) *The information for a selected target shall be displayed and continually updated, until another target, AIS data report, AIS locating device or AIS synthetic target is selected for information display or, if applicable, until the user dialogue area is closed.*

NOTE Information can be displayed in a separate user dialogue area.

5.5.12.2 Methods of test and required results

The methods of test and the required results are as follows:

- a) confirm by observation that information displayed for a selected target is continually updated;
- b) confirm by observation that the information displayed for a selected target remains displayed until another target, AIS data report, AIS locating device or AIS synthetic target is selected or the user dialogue is closed.

5.5.13 Own ship's AIS information

5.5.13.1 Requirement

(MSC191/6.4.6.7) *A means or method shall be provided to present own ship AIS data on request.*

Own ship AIS data includes:

- identification (MMSI, call sign, name, IMO number);
- navigational status;
- additional information (dimensions, ship and cargo type, destination, ETA, static draught);
- if supported, extended information (see Table 8).

5.5.13.2 Methods of test and required results

Confirm by observation that it is possible to present own ship's AIS data on request.

5.5.14 Obscuring the operational display area

5.5.14.1 Requirement

(MSC191/6.4.6.8) *The display of alphanumeric data, information and text shall not obscure graphically presented operational information.*

5.5.14.2 Methods of test and required results

Confirm by analytical evaluation that the display of alphanumeric data, information and text does not obscure graphically presented operational information.

5.6 Operational alerts

5.6.1 Alert status

5.6.1.1 Requirement

(MSC191/6.4.7.1) *A clear indication of the status of the alerts and the alert criteria (i.e. identification) shall be given to the user. (See also 4.9.1 and 4.9.3.)*

The equipment shall comply with IEC 62923-1 to ensure that the status of alerts is clearly given to the user, see 4.9.1.2.

Except for IMO requirements for radar and AIS target symbols displayed in the operational area and for ECDIS highlight of danger, warnings, and caution in the chart area, only text-based visual indication of alert (e.g. in user dialog area) is mandatory. Optionally icons can be presented together with the text, see IEC 62923-1 and Annex F.

5.6.1.2 Methods of test and required results

Confirm by analytic evaluation that a clear indication of the alert criteria is provided as text to the user.

Confirm by observation that, if icons are additionally provided, they conform to IEC 62923-1 and Annex F (see also 4.4.3.2)

5.6.2 CPA/TCPA alarms

5.6.2.1 Requirement

(MSC191/6.4.7.2) *A CPA/TCPA alarm of a tracked radar or activated AIS target shall be clearly indicated and the target shall be clearly marked by a dangerous target symbol as set forth in Annex A (both acknowledged and unacknowledged state). This includes cases when CPA/TCPA alarm information is received by TTD-sentence (see IEC 61162-1).*

NOTE 1 If display equipment provides facilities for the calculation of CPA/TCPA that are independent of a shipborne radar target tracking system, then the facilities are described in the relevant clauses of IEC 62388.

CPA/TCPA alarms shall not be repeated as an alert by the equipment receiving target information by TTD sentence.

NOTE 2 The presentation of the symbol is related to state of the target and is not related to the alert functionality of the equipment.

5.6.2.2 Methods of test and required results

Confirm by observation that dangerous targets are presented in accordance with Annex A.

For equipment receiving target information by TTD sentence, confirm by observation that there are no alerts generated from targets with active CPA/TCPA alarms indicated by the TTD sentence.

5.6.3 Acquisition/activation zones warnings

5.6.3.1 Requirement

(MSC191/6.4.7.3) *If a user defined acquisition/activation zone facility is provided, a target entering or within the zone shall be clearly identified with the relevant symbol set forth in Annex A and for tracked radar targets a warning shall be given. The zone shall be identified with the relevant symbology set forth in Annex A, and shall be applicable to both tracked radar and reported AIS targets.*

A radar target tracking system shall control radar target acquisition zones. The target tracking system shall provide all warnings and indications associated with target detection and tracking including entry into or detection within an acquisition area. Other navigational systems and equipment may provide acquisition zone warnings and indications only if they provide a radar target tracking function complying to IEC 62388.

NOTE 1 The TTD sentence does not provide other navigational systems and equipment that provide remote presentation of tracked radar targets with information about whether the target was manually or automatically acquired nor the status of any automatic acquisition alert.

Any navigational system or equipment may provide remote presentation of reported AIS targets. These systems shall provide their own AIS activation zone facilities.

NOTE 2 If display equipment provides facilities for acquisition zones for the detection of radar targets that are independent of a shipborne radar target tracking system, then the facilities are described in the relevant clauses of IEC 62388.

5.6.3.2 Methods of test and required results

Where display equipment provides zones for automatic acquisition/activation:

- a) confirm by observation that the zones are presented with their relevant symbology in accordance with Annex A;
- b) confirm by observation that detected radar targets entering or within a zone are acquired;

NOTE The acquisition status of tracked radar targets is reported by the radar target tracking system, for example, in accordance with IEC 61162 (all parts).

- c) confirm by observation that radar targets in acquisition state are presented in accordance with Annex A;
- d) confirm by analytical evaluation that the zones apply to both radar targets and reported AIS targets in accordance with 5.5.7;

5.6.4 Lost target warnings

5.6.4.1 Requirement

(MSC191/6.4.7.4) *The last predicted position of a lost target shall be clearly marked by a lost target symbol on the display as set forth in Annex A, and the lost target warning shall be given if the lost target warning function is enabled. The lost target symbol shall disappear if the signal (or message) for the target is received again or after the warning has been acknowledged. A means or method shall be provided for the user to enable/disable the lost target warning function. There shall be a clear indication whether the lost target warning function for tracked radar targets and activated AIS targets is enabled or disabled. If a target is beyond a user defined range, then no warning shall be generated.*

Navigational systems and equipment that provide remote presentation of received tracked radar targets and activated AIS targets (for example by TTD sentence) shall present the lost target symbol and shall not provide warnings in lost target state.

5.6.4.2 Methods of test and required results

The methods of test and the required results are as follows:

- a) confirm by observation that, when a tracked radar target or reported AIS target that is not received from remote equipment (for example by TTD sentence) is lost, a warning is given and the last predicted position is clearly marked by the lost target symbol in accordance with Annex A;
- b) for navigational system or equipment that provides remote presentation of received tracked radar targets and activated AIS targets (for example by TTD sentence) in lost target state, confirm by observation that there is the lost target symbol and that there is no related warning;
- c) confirm by observation that the lost target symbol disappears if the signal for the target is received again or after the lost target warning has been acknowledged;
- d) confirm by observation that a means or method is provided to enable/disable the lost target warning function;
- e) confirm by observation that there is a clear indication of whether the lost target warning function for tracked radar targets and activated AIS targets is enabled or disabled;
- f) confirm by observation that no warning is generated for a lost target that is beyond the user defined range.

5.7 AIS and radar target association

5.7.1 Requirement

(MSC191/6.4.8.1) *If target information from AIS and radar tracking are both available and where the AIS and radar information are considered as one target, then as a default condition, the activated AIS target symbol and the alphanumeric AIS target information shall be automatically selected and displayed as set forth in Annex A. The user shall have the option to change the default condition to the display of tracked radar targets and shall be permitted to select either radar tracking or AIS alphanumeric information.*

(MSC191/6.4.8.2) *Where the AIS and radar information are considered as two distinct targets, one activated AIS target symbol and one tracked radar target symbol shall be displayed as set forth in Annex A. No alert shall be raised.*

NOTE If display equipment provides facilities for the automatic association of reported AIS targets with tracked radar targets that are independent of a shipborne radar target tracking system, then the facilities are described in the relevant clauses of IEC 62388.

5.7.2 Methods of test and required results

Where display equipment provides the capability to automatically associate reported AIS targets with tracked radar targets:

- a) confirm by observation that a reported AIS target associated with a tracked radar target is presented in accordance with Annex A:
 - 1) as an activated AIS target, the default condition;
 - 2) as a tracked radar target, based upon user-selection as the default condition;
- b) confirm by observation that the user can select either AIS or radar tracking information.

5.8 AIS presentation user selectors and their status indications

5.8.1 Requirement

Where applicable (i.e. if equipment provides related functionality for presentation), the user selectors for AIS presentation shall be provided according to Table 3.

Table 3 – User selectors for AIS presentation

Selector	Function
AIS ON/OFF This is master selector for all AIS presentation	Select all AIS related graphical presentation on or off
AIS sleeping target filter Separate selector for each provided AIS sleeping target filter criteria (see 5.5.5)	Select AIS sleeping target filter for criteria N on or off ^a
AIS locating devices (see 5.14.3.1)	Select AIS locating devices presentation on or off
AIS base stations (see 5.13.3.1 a))	Select AIS base stations presentation on or off
AIS SAR aircraft (see 5.13.3.1 b))	Select AIS SAR aircraft presentation on or off
AIS AtoNs, physical (see 5.13.3.1 c) and symbol 2.10 a)	Select AIS AtoN, physical presentation on or off or unhealthy (unhealthy AtoNs include symbol '2.10a' versions "Off Posn", "Unlit", "Racon err", "Error" and "Missing")
AIS AtoNs, virtual (see 5.13.3.1 c) and symbol 2.10 b)	Select AIS AtoN, virtual presentation on or off
AIS AtoNs, mobile physical (see 5.13.3.1 c) and symbol 2.10 c)	Select AIS AtoN, mobile physical presentation on or off
AIS AtoNs, mobile virtual (see 5.13.3.1 c) and symbol 2.10 c)	Select AIS AtoN, mobile virtual presentation on or off
AIS AtoNs, synthetic (see 5.13.3.1 c) and symbol 2.10 a)	Select AIS AtoN, synthetic presentation on or off
AIS AtoNs, dimension outline (see 5.13.4 and symbol 2.10 d)	Select AIS AtoN outline presentation on or off
AIS ASMs Separate selector for each layer or sub-layers (see 5.15 and Annex J)	Select AIS ASM presentation for layer/sub-layer N on or off ^b
AIS ASMs Optionally separate selector for each display criteria (see 5.15.4.1)	Select AIS ASM presentation for criteria N on or off ^a
AIS Synthetic targets (see 5.16)	Select AIS Synthetic targets presentation on or off
AIS safety related messages (see 5.19 and symbol 5.16)	Select AIS safety related messages on or off
^a Replace "N" by each available criteria.	
^b Replace "N" by each available layer or sub-layer.	

When a user selector in Table 3 has caused any related AIS object not to be displayed, a permanent or persisting indication shall be provided (see also 5.5.5.1). The details of individual selectors shall be readily available to the user.

(MSC191/6.4.9) Where applicable (i.e. if equipment provides related functionality), *the AIS presentation status shall be indicated as follows* in Table 4.

Table 4 – AIS status indications

Function	Cases to be presented		Presentation
	<i>AIS processing switched ON/ graphical presentation switched OFF</i>	<i>AIS processing switched ON/ graphical presentation switched ON</i>	
<i>AIS ON/OFF</i>	Indicate AIS graphical presentation is switched OFF	Indicate AIS graphical presentation is switched ON	<i>Alphanumeric or graphical</i> (see Table E.4)
<i>Filtering of sleeping AIS targets</i> (see 5.5.5)	Indicate whether the <i>filter status</i> for sleeping AIS targets is switched ON or OFF	Indicate whether the <i>filter status</i> for sleeping AIS targets is switched ON or OFF	Indications may be <i>alphanumeric or graphical</i> (for example by icon)
<i>Activation of targets</i> (see 5.5.6)		Indicate the status of automatic <i>activation criteria</i> for AIS targets, including graphical presentation of automatic activation zones in use	Indications shall be <i>graphical</i> (see symbol 2.14)
<i>CPA/TCPA alarm</i> (see 5.6.2)	Indicate whether the CPA/TCPA Alarm <i>function</i> is switched ON/OFF Indicate the CPA/TCPA <i>Criteria</i> Indicate whether <i>Sleeping AIS targets</i> are <i>included</i> or <i>excluded</i> from CPA/TCPA processing	Indicate whether the CPA/TCPA Alarm <i>function</i> is switched ON/OFF Indicate the CPA/TCPA <i>Criteria</i> Indicate whether <i>Sleeping AIS targets</i> are <i>included</i> or <i>excluded</i> from CPA/TCPA processing	Indications shall be <i>alphanumeric and, if applicable, graphical</i> (for example by icon)
<i>Lost target warning</i> (see 5.6.4)	Indicate whether the Lost Target Warning <i>function</i> is switched ON/OFF If applicable, indicate the <i>Lost target Filter Criteria</i>	Indicate whether the Lost Target Warning <i>function</i> is switched ON/OFF If applicable, indicate the <i>Lost target Filter Criteria</i>	Indications shall be <i>alphanumeric and, if applicable, graphical</i>
<i>Target association</i> (see 5.7)	Indicate whether the Target Association <i>function</i> is switched ON/OFF Indicate the Association <i>Criteria</i> Indicate the target priority as AIS (<i>Default</i>) or Tracked <i>Target Priority</i>	Indicate whether the Target Association <i>function</i> is switched ON/OFF Indicate the Association <i>Criteria</i> Indicate the target priority as AIS (<i>Default</i>) or Tracked <i>Target Priority</i>	Indications shall be <i>alphanumeric</i>

5.8.2 Methods of test and required results

Where applicable, the methods of test and the required results are as follows:

- confirm by observation that the user selectors for AIS presentation are provided according to Table 3;
- confirm by observation that when a user selector in Table 3 has caused any related AIS object not to be displayed, a permanent or persisting indication is provided and that the details of individual selectors are readily available to the user;
- confirm by observation that the AIS presentation status is indicated according to Table 4.

5.9 Trial manoeuvre

5.9.1 Requirement

(MSC191/6.4.10) *A trial manoeuvre simulation shall be clearly identified by the relevant symbol set forth in Annex A, positioned in a conspicuous location within the operational display area, for example, nominally centred at the bottom of the presentation area or astern of own ship symbol.*

NOTE If display equipment provides facilities for trial manoeuvre that are independent of a shipborne radar target tracking system, then the facilities are described in the relevant clauses of IEC 62388.

5.9.2 Methods of test and required results

Where display equipment provides a trial manoeuvre simulation:

- a) confirm by observation that the manoeuvre is identified in accordance with Annex A;
- b) confirm by analytical evaluation that the symbol is positioned in a conspicuous location.

5.10 Measurement

5.10.1 Measurement from own ship

5.10.1.1 Requirement

Measurements from own ship (for example, range rings, range and bearing, cursor, tracking data) shall be made with respect to the CCRP (for example, conning position).

For consistency of measured ranges and bearings, the recommended reference location should be the conning position. Alternative reference locations may be used where clearly indicated or distinctively obvious.

5.10.1.2 Methods of test and required results

The methods of test and the required results are as follows:

- a) confirm by observation that the means of taking measurements are centred on to the CCRP and not centred on any other position except where specifically selected and clearly indicated;
- b) confirm by measurement, by comparing at least two alternative sensor inputs that have different position offsets from CCRP, that the range and bearing measurements are correct to the CCRP position and, if provided, alternative reference position;
- c) confirm by measurement that, when switching from CCRP to an alternative reference position, displayed data is changing accordingly but data transmitted via the interface remains referenced to the CCRP.

5.10.2 Bearing and range measurements

5.10.2.1 Requirement

Bearings and distances (ranges) drawn on the display, or bearing and range measurements between features already drawn on the display, shall have an accuracy no less than that afforded by the scale and resolution of the display.

Range measurements shall be in nautical miles. In addition, facilities for metric measurements may be provided. All indicated values for range measurement shall be consistent and unambiguous. Where metric range measurements are required, the accuracy shall not be inferior to other range measurements.

5.10.2.2 Methods of test and required results

The methods of test and the required results are as follows:

- a) confirm by analytical evaluation that bearings and distances are measured to an accuracy consistent with the scale and resolution of the display;
- b) confirm by observation that distances can be measured in nautical miles;
- c) confirm by observation that the units used for range measurements and range scales are consistent within the system;
- d) confirm by observation that an indication of the units used for measurement is provided.

5.11 Navigation tools

5.11.1 General requirements

Subclause 5.11 addresses user tools that are common to navigational systems and equipment. Requirements for the provision of these tools are addressed in the relevant individual performance standards. When provided, these tools shall be presented with their relevant symbol(s) as set forth in Annex A.

5.11.2 Range rings

5.11.2.1 Requirement

(MSC191/7.1.4) If *range rings are displayed*, then *the range ring scale shall be indicated*.

Range rings shall be spaced to logically separate the range scale into equal divisions. Typically from two to six range rings would be provided for nautical mile range scale units, and up to five rings for metric range scale units.

The system accuracy of range rings shall be within 1 % of the maximum range of the range scale in use or 30 m, whichever is the greater distance.

Range rings shall always be centred at the CCRP.

A means or method shall be provided to enable and disable the set of range rings (see also 6.1.4).

5.11.2.2 Methods of test and required results

Where range rings are provided:

- a) confirm by observation that range rings are presented in accordance with Annex A;
- b) confirm by observation that the range ring separation (scale) is indicated;
- c) confirm by analytical evaluation that the range ring spacing logically separates each range scale into equal divisions;
- d) confirm by measurement that the accuracy of the range rings is within ± 1 % of the range scale in use or 30 m, whichever is greater;
- e) confirm by observation that the range rings are always centred at the CCRP;
- f) confirm by observation that a means or method is provided to enable and disable the set of range rings.

5.11.3 Variable range marker (VRM)

5.11.3.1 Requirement

Variable range marker(s) (VRMs) may be provided to measure the range of any point object within the operational display area.

Each active VRM shall have a numerical readout and the readout shall have a resolution compatible with the range scale in use.

Each active VRM shall be capable of adjustment to resolution of 0,01 NM, or to appropriate metric equivalent. A coarser resolution may be provided for higher range scales. The readout shall be available in the user dialogue area or, additionally, adjacent to the cursor when the cursor is over the VRM.

The VRM shall enable the user to measure the range of an object within the operational display area with a maximum system error of 1 % of the range scale in use or 30 m, whichever is the greater distance.

It shall be possible to use each VRM to measure the range to any point within the operational area and with the specified accuracy within 5 s.

A means or method to switch each VRM on and off shall be provided.

The VRM range set by the user shall be retained when there is a change in range scale.

If means are provided to move VRM origin from the CCRP to other points within the operational display area, geographically fixed or moving with the velocity of own ship, then a means shall be provided to reset the VRM origin to the CCRP position by a simple operator action.

5.11.3.2 Methods of test and required results

Where a VRM is provided:

- a) confirm by observation that each VRM is presented in accordance with Annex A;
- b) confirm by observation that a dedicated readout is available for each active VRM;
- c) confirm that the VRMs are capable of adjustment to 0,01 NM (or appropriate metric equivalent). A coarser adjustment may be provided for ranges greater than 24 NM or appropriate metric equivalent;
- d) confirm by measurement that the accuracy of the VRMs meet the requirement using a calibrated target or marker;
- e) confirm by measurement that, when metric measurements are provided, the readout and accuracy is equivalent to those relevant to nautical miles;
- f) confirm by measurement that the range to any object within the operational display area can be measured within 5 s with the required accuracy;
- g) confirm by observation that a means or method to switch each VRM on and off is provided;
- h) confirm by observation that the range of the VRM is maintained from range scale to range scale;
- i) confirm by observation that, if means are provided to move VRM origin from the CCRP to other points, means are provided to reset the VRM origin to the CCRP position by a simple operator action.

5.11.4 Bearing scale

5.11.4.1 Requirement

A bearing scale may be provided. The bearing scale shall indicate the bearing from the CCRP.

For radar display equipment, including radar with charted information, the bearing scale shall be outside of the operational display area (i.e. around its periphery and outside of which no radar video shall be displayed). For other display equipment, the bearing scale may be inside the operational display area. It shall be numbered at least every 30° division and shall have division marks of at least 5°. The 5° and 10° division marks shall be clearly distinguishable from each other. 1° division marks may be presented where they are clearly distinguishable from each other and from the 5° and 10° division marks.

If the display is off-centred or the position of own ship is outside of the operational display area, then the bearing scale shall be suppressed or its marks shall be adjusted to represent the bearing from CCRP.

For display equipment not presenting radar, a means or method shall be provided to enable and disable the bearing scale.

5.11.4.2 Methods of test and required results

Where a bearing scale is provided:

- a) confirm by analytical evaluation that the bearing scale indicates bearings as measured from the CCRP;
- b) for radar display equipment, confirm by observation that the bearing scale is around the periphery of the operational display area;
- c) confirm by observation that the bearing scale remains centred at the CCRP (for example, in a true motion display mode);
- d) confirm by observation that the bearing scale is numbered at least every 30° and has division marks at least every 5°;
- e) confirm by observation that the 5° division marks are clearly distinguishable from the 10° division marks;
- f) where 1° division marks are provided, confirm by observation that they are clearly distinguishable from each other and from the 5° and 10° division marks;
- g) for display equipment not presenting radar, confirm by observation that a means or method is provided to enable and disable the bearing scale.

5.11.5 Electronic bearing line (EBL)

5.11.5.1 Requirement

Electronic bearing line(s) (EBLs) may be provided to measure the bearing of any point object within the operational display area, with a maximum system error of 1° at the periphery of the display.

The EBL(s) shall be capable of measurement from the CCRP relative to the ships heading and relative to true north. There shall be a clear indication of the bearing reference (i.e. true or relative).

It shall be possible to move the EBL origin from the CCRP to any point within the operational display area and to reset the EBL to the CCRP by a simple operator action.

It shall be possible to fix the EBL origin or to move the EBL origin at the velocity of own ship.

A means or method shall be provided to ensure that the user is able to position the EBL smoothly in either direction, with an incremental adjustment adequate to maintain the system measurement accuracy requirements.

It shall be possible to use the EBL to measure the bearing to any point object in the operational display area within 5 s.

Each active EBL shall have a numerical readout with a resolution of $0,1^\circ$ adequate to maintain the system measurement accuracy requirements based on a measurement uncertainty of $\pm 0,5^\circ$.

A means or method shall be provided to enable and disable each EBL.

The bearing of the EBL (i.e. set by the user) shall be retained while the EBL is enabled (for example, after a change in range scale or after a change in display orientation).

5.11.5.2 Methods of test and required results

Where an EBL is provided:

- a) confirm by observation that each EBL is presented in accordance with Annex A;
- b) confirm by measurement that the bearing to any point object within the operational display area can be measured to within an accuracy of 1° ;
- c) confirm by analytical evaluation that bearings can be measured relative to the ships heading and relative to true north, and that a clear indication of the bearing reference is provided;
- d) confirm by observation that a means or method is provided to move the origin of an EBL from the CCRP to any point within the operational display area;
- e) confirm by observation that it is possible to return the origin of the EBL to the CCRP by a simple user action;
- f) confirm by observation that a means or method is provided to fix the origin of the EBL in a geographic location;
- g) confirm by observation that a means or method is provided to move the origin of the EBL at the velocity of own ship;
- h) confirm by observation that the EBL can be rotated smoothly in either direction;
- i) confirm by observation that the incremental adjustment is at least $0,1^\circ$;
- j) confirm by measurement that the EBL can be used to measure the bearing to any point object in the operational display area within $\pm 0,5^\circ$ in less than 5 s;
- k) confirm by observation that a numerical readout with a resolution of $0,1^\circ$ is available for each active EBL;
- l) confirm by observation that a means or method is provided to enable and disable each EBL;
- m) confirm by observation that an enabled EBL remains over the same point object during a change of range scale and a change of orientation mode.

5.11.6 Parallel index lines (PI)

5.11.6.1 Requirement

Parallel index (PI) lines may be provided. If parallel index lines are provided:

- independent parallel index lines with a means or method to truncate and switch off individual lines shall be provided;
- a simple and quick means or method of setting the bearing and beam range of a parallel index line shall be provided.

The bearing and beam range of any selected parallel index line shall be available on demand.

It shall be possible to set the bearing and beam range of a parallel index line within 5 s.

PI line range settings shall remain constant when the operator changes the range scale of the display and PI line bearing settings shall remain constant when own ship heading changes.

In addition to on/off selection of individual PI lines, means shall be provided to turn on/off all PI lines as a group.

5.11.6.2 Methods of test and required results

Where parallel index lines are provided:

- a) confirm by observation that parallel index lines are presented in accordance with Annex A;
- b) confirm by observation that a means or method is provided to truncate the length of each PI line;
- c) confirm by observation that PI lines are selectable for display on/off individually and as a group including all PI lines;
- d) confirm by measurement that a means or method is provided to set the bearing or range of a parallel index line within 5 s;
- e) confirm by observation that means are provided to display the bearing and range for any parallel index line on demand;
- f) confirm by observation that the distance of a PI line from the own ship and the true bearing of PI line does not change when a different range scale is selected, when own ship heading changes, and during True motion operation.

5.11.7 Offset measurement of range and bearing

5.11.7.1 Requirement

There may be a means or method to measure the range and bearing of one position on the display relative to any other position within the operational display area. This may be accomplished, for example, using an electronic range and bearing line (ERBL), a combination of a VRM and an EBL, or the cursor.

If a separate tool is provided to measure the combination of range and bearing (for example, an ERBL):

- it shall have a numerical range and bearing readout. The resolution of the range readout shall be compatible with the range scale in use. The resolution of the bearing readout shall be $0,1^\circ$ adequate to maintain the system measurement accuracy requirements;
- it shall enable the user to measure the range of an object within the operational display area with a maximum system error of 1 % of the range scale in use or 30 m, whichever is the greater distance, and the bearing of any point object with a maximum system error of 1° based on a measurement uncertainty of $\pm 0,5^\circ$ at the periphery of the display;
- the user setting shall be retained while the tool is enabled (for example, after a change in range scale or after a change in display orientation);
- it shall enable the user to position its bearing component smoothly in either direction, with an incremental adjustment adequate to maintain the system measurement accuracy requirements.

It shall be possible to measure the range and bearing to any object in the operational display area within 5 s.

5.11.7.2 Methods of test and required results

Where a means or method is provided to measure the range and bearing from one position to another in the operational display area:

- a) confirm by observation that numerical readouts are available to display the range and bearing;
- b) confirm by analytical evaluation that the resolution of the range readout is compatible with each range scale;
- c) confirm by observation that the resolution of the bearing readout is $0,1^\circ$;

- d) confirm by measurement that the range from one position within the operational display area to any other position can be measured to an accuracy of ± 1 % of the range scale in use or 30 m, whichever is greater;
- e) confirm by measurement that the bearing from one position within the operational display area to any position can be measured to an accuracy of $0,5^\circ$ at the periphery of the display;
- f) confirm by observation that the bearing component can be rotated smoothly in either direction;
- g) confirm by measurement that the range and bearing to any object within the operational display area can be measured within 5 s;
- h) where a separate tool is provided to measure the combination of range and bearing, confirm by observation that a means or method is provided to enable and disable that tool;
- i) confirm by observation that the user settings are retained after the change of the range scale and a change of orientation mode while the tool is enabled.

5.11.8 User cursor

5.11.8.1 Requirement

A user cursor may be provided to enable a fast and concise means or method to designate any position on the operational display area. If a user cursor is provided:

- the cursor position shall have a continuous numerical readout to provide the range and bearing, measured from the CCRP, and the latitude and longitude of the cursor position presented either alternatively or simultaneously;
- a means or method shall be provided to easily locate the cursor position in the operational display area;
- the accuracy of the range and bearing measurements provided by the cursor shall meet the relevant requirements for VRM and EBL.

It shall be possible to measure the range and bearing to any object in the operational display area within 5 s.

5.11.8.2 Methods of test and required results

Where a user cursor is provided:

- a) confirm by observation that the cursor is presented in accordance with Annex A;
- b) confirm by observation that a numerical readout is available and that it continuously displays, either alternatively or simultaneously, the range and bearing of the cursor's position measured from own ship's CCRP, and the latitude and longitude of the cursor's position;
- c) confirm by observation that a means or method is provided to locate the cursor in the operational display area;
- d) confirm by analytical evaluation that the resolution of the range readout is compatible with each range scale;
- e) confirm by observation that the resolution of the bearing readout is $0,1^\circ$;
- f) confirm by analytical evaluation that the resolution of the latitude and longitude readout is compatible with each display scale;
- g) confirm by measurement that the range to an object within the operational display area can be measured to within an accuracy of ± 1 % of the range scale in use or 30 m, whichever is greater;
- h) confirm by measurement that the bearing to any point object within the operational display area can be measured to within an accuracy of $0,5^\circ$ at the periphery of the display;
- i) confirm by observation that the cursor can be moved smoothly to create rotation in either direction;

- j) confirm by measurement that the range and bearing to any object within the operational display area can be measured within 5 s.

5.12 AIS data link message processing capacity

5.12.1 General

Presentation of AIS related information may be provided. If provided, the following requirements and tests apply.

5.12.2 Requirements

The data link message processing capacity of the equipment shall provide the capability to process the number of VDM (VHF data link messages) corresponding to 90 % of fully loaded VDL (VHF data link). In that condition, continuous and smooth update of displayed AIS data shall be maintained.

NOTE IEC 61162-1 describes the AIS interface as having a maximum data rate of 4 500 messages per minute.

5.12.3 Methods of test and required results

Use the AIS simulator to generate a scenario of VDM sentences for 130 moving AIS targets updated every 2 s and for 10 other AIS objects supported by the equipment and updated every 3 min, corresponding to approximately 90 % of a fully loaded VDL. Confirm by observation that the displayed update of AIS objects supported by the equipment shows smooth and continuous updates.

If AIS targets are supported, use the AIS simulator to generate a scenario of VDM sentences for 6 000 AIS targets at anchor updated every 3 min with one or more moving AIS targets updated every 2 s. Confirm by observation that the displayed update of a sample set of 10 displayed AIS targets of both types selected at random shows smooth and continuous updates.

5.13 AIS data report

5.13.1 General

AIS data reports include AIS AtoNs, AIS SAR aircraft and AIS base stations.

Presentation of AIS data reports may be provided. If provided, then the following requirements and tests apply.

5.13.2 AIS data report capacity

5.13.2.1 Requirements

The equipment shall provide the capability to display a minimum number of AIS data reports according to Table 5 if no higher number is specified in individual equipment standards.

The user manual shall specify the processing and display capacity of AIS data reports. In addition, the user manual shall describe the operational consequences to the processing and display of current and new AIS data reports in the event that the capacity is at the maximum provided for each case when further AIS data reports are received.

There shall be an indication, or an alert (e.g. a caution) if specified by individual equipment standards, when the AIS data report processing or display capacity has been exceeded.

Table 5 – AIS data report capacity

Requirement	Capacity
Minimum display capacity for AIS data reports	20
Minimum processing capacity for AIS data reports	20

5.13.2.2 Methods of test and required results

The methods of test and the required results are as follows:

- confirm by inspection of the user manual that it specifies the processing and display capacity of AIS data reports and that at least the minimum capacities are provided;
- use the AIS simulator and confirm by observation that there is an indication, or an alert (e.g. a caution) if specified by individual equipment standards, when the capacity of processing or display of AIS data reports has been exceeded and that the EUT operates as described in the user manual;
- confirm by inspection of the user manual that it describes the operational consequences to the processing and display of current and new AIS data reports in the event that the processing or display capacity is at the maximum provided for each case when further AIS data reports are received.

5.13.3 AIS data report display**5.13.3.1 Requirement**

It shall be possible to add or remove AIS data reports from the display by layer, but not as individual objects. The following layers shall be provided:

- AIS AtoNs, physical (including unhealthy state);
- AIS AtoNs, virtual;
- AIS AtoNs, mobile physical;
- AIS AtoNs, mobile virtual;
- AIS AtoNs, synthetic;

NOTE 1 Synthetic AtoN is a physical AtoN structure, without an AIS transmitter, but for which AIS messages are broadcast from another (usually land-based) location. An AtoN is a physical AtoN when "virtual AtoN flag = 0" and "repeat indicator = 0". An AtoN is a synthetic AtoN when "virtual AtoN flag = 0" and "repeat indicator = 1, 2 or 3".

- AIS SAR aircraft;
- AIS base stations.

The "unhealthy" state provides an easy-to-use method to detect charted AtoNs which cause significant issues for navigation. The unhealthy AtoN includes symbol 2.10 a versions "Off Posn", "Unlit", "Racon err", "Error" and "Missing".

AIS data reports shall be presented by means of an appropriate symbol displayed using the reported/predicted position, see Annex A. Requirements related to the graphical presentation of AIS AtoN dimensions are in 5.13.4.

An AIS data report selected for display of its alphanumeric information shall be identified by the relevant symbol 2.12 given in Annex A.

For each selected AIS data report, the following information shall be presented in alphanumeric form:

a) Message 4, Base station report

- identification (Name, from AIS Message 24A, and/or MMSI. Both available at least on demand);
- reported position;
- if receiving of AIS safety related messages is supported, on user request, where available a link to or full content of the most recent received AIS safety related messages related to the same MMSI, see 5.19.

b) Message 9, SAR aircraft position report

- identification (Name from AIS Message 5 or 24A, Call sign from AIS Message 5 or 24B and MMSI. All available at least on demand);
- reported position and where available its quality (Position accuracy as " ≤ 10 m" or " > 10 m" and RAIM as "not in use" or "in use");
- reported altitude and where available its source;
- calculated range of target (2-dimensional calculation without altitude);
- calculated bearing of target;
- reported COG;
- reported SOG;
- if receiving of AIS safety related messages is supported, on user request, where available a link to or full content of the most recent received AIS safety related messages related to the same MMSI, see 5.19.

c) Message 21, AtoN report

- identification (Name, if not available then MMSI. MMSI at least available on demand);

NOTE 2 Name for an AtoN is a combination from "Name of Aid-to-Navigation" and "Name of Aid-to-Navigation Extension".
- reported position and where available its quality (Position accuracy as " ≤ 10 m" or " > 10 m" and RAIM as "not in use" or "in use") and source (Type of electronic position fixing device);
- indication of type (nature);
- AtoN status, see Annex L;
- dimensions, at least available on demand;
- if receiving of AIS safety related messages is supported, a link to a list or full content of all AIS safety related messages received from the AIS AtoN report (basis is MMSI). It shall at least be possible to present the most recent AIS safety related message for each AtoN. The AIS safety related messages received from the AIS AtoN shall be automatically removed after a timeout period of 18 min after reception or after removal of the related AtoN itself;
- optionally for Mobile AtoN, if derived from movement of position, calculated COG/SOG if ground stabilised (or calculated CTW/STW if sea stabilised).

If the received AIS data report information is incomplete, then the absent information shall be clearly indicated in the related data field as missing.

The information for a selected AIS data report shall be displayed and continually updated, until another target, AIS data report, AIS locating device or AIS synthetic target is selected for information display or, if applicable, until the user dialogue area is closed.

NOTE 3 Information can be displayed in a separate user dialogue area.

AIS data reports shall become lost after 6 times the nominal reporting interval for AtoNs, SAR aircraft and base stations from the last received report.

NOTE 4 Nominal reporting intervals are given in ITU R M.1371.

For lost AIS SAR aircraft and AIS base stations, there shall be no lost AIS data report symbol and the AIS data report symbol shall be removed automatically from the display.

The last reported/predicted position of an AIS AtoN shall be clearly marked by a lost AIS AtoN symbol on the display as set forth in Annex A, and the lost AIS AtoN warning shall be given if the lost AIS AtoN warning function is enabled. If the lost AIS AtoN warning function is disabled or if the AIS AtoN is beyond a user defined range, there shall be no lost AIS AtoN symbol and the AIS AtoN symbol shall be removed automatically from the display.

The lost AIS AtoN symbol shall disappear if the signal (or message) for the AIS AtoN is received again or after the warning has been acknowledged.

A means or method shall be provided for the user to enable/disable the lost AIS AtoN warning function. There shall be a clear indication of whether the lost AIS AtoN warning function is disabled. If an AIS AtoN is beyond a user defined range, then no warning shall be generated.

The lost AIS AtoN function enable/disable and the user defined range parameters may be shared with the lost target function, see 5.6.4, and/or the lost AIS locating device function, see 5.14.3.1.

5.13.3.2 Methods of test and required results

Use the AIS simulator and confirm by observation that the user can add and remove information from the presentation by layers, but not as individual objects.

Use the AIS simulator and confirm by observation that AIS data reports are displayed at the reported/predicted position and that the symbol is as defined in Annex A.

Use the AIS simulator and confirm by observation that an AIS data report selected for the display of its alphanumeric information is identified by the relevant symbol 2.12 given in Annex A.

Use the AIS simulator and confirm by observation that, for each selected AIS data report, the required information is presented in alphanumeric form or that there is a clear indication of absent information in the related data field.

Use the AIS simulator and confirm by observation that, for each AIS AtoN, the received AIS safety related messages are automatically removed after 18 min or after removal of the related AtoN itself.

Use the AIS simulator and confirm by observation that information displayed for a selected AIS data report is continually updated and that the information displayed for a selected target. AIS data report, AIS locating device or AIS synthetic target remains displayed until another AIS data report is selected or the user dialogue is closed.

For the following tests related to the lost AIS data reports, the timeout for the state of the lost AIS data report is 6 times the nominal reporting interval for AtoNs from the last received report.

Use the AIS simulator to simulate a lost AIS SAR aircraft and a lost AIS base station and confirm by observation that no lost AIS data report symbol is displayed and that the AIS data report symbol is removed automatically from the display.

Confirm by observation that a means or method is provided for the user to enable/disable the lost AIS AtoN warning function; and that there is a clear indication of whether the lost AIS AtoN warning function is disabled; and that a user defined range is available to control the functionality of the lost AIS AtoN.

Use the AIS simulator to simulate a lost AIS AtoN and confirm by observation that, when the lost AIS AtoN warning function is enabled, the last reported/predicted position of a AIS AtoN is clearly marked by a lost AIS AtoN symbol on the display and that the lost AIS AtoN warning is created.

Use the AIS simulator to simulate a lost AIS AtoN and confirm by observation that, when the lost AIS AtoN function is disabled or when the AIS AtoN is beyond a user defined range, no lost AIS AtoN symbol is displayed and that the AIS AtoN symbol is removed automatically from the display.

Use the AIS simulator and confirm by observation that, when signal (or message) for the AIS AtoN is received again or after the lost AIS AtoN warning has been acknowledged, the lost AIS AtoN symbol disappears.

5.13.4 Graphical presentation of AIS AtoN dimensions

5.13.4.1 Requirements

Graphical presentation of physical AIS AtoN dimensions may be provided. If provided, the following requirements and tests apply.

The user shall have means to select and deselect the graphical display of the true scaled dimensional outline of physical AIS AtoNs (symbol 2.10 d) in addition to the related physical AIS AtoN symbol as set forth in Annex A. The size of this outline shall be the true scale representation based on the reported dimensions. The true scaled outline shall only be presented when the largest of the ABCD values is at least 9 mm at a nominal viewing distance of 1 m.

Equipment may provide user selectable means to automatically select or deselect display of the AIS AtoN true scaled outline based on conditions provided by the manufacturer. The user shall be able to disable the functionality of the automatic selection.

5.13.4.2 Methods of test and required results

Use the AIS simulator to send the physical AIS AtoN objects including true scaled outline and:

- a) confirm by observation that the true scaled outline and the related symbol are as given in Annex A;
- b) confirm by observation that means are provided to select and deselect the graphical presentation of AIS AtoN dimensions;
- c) confirm by measurement that the dimension of the outline of the AIS AtoN is correct for the scale of the display;
- d) confirm by observation that the true-scaled outline of the AIS AtoN is not presented when none of the ABCD values is at least 9 mm at the nominal viewing distance of 1 m;
- e) if provided, confirm by observation that user selectable means to automatically select or deselect the display of the AIS AtoN true scaled outline are based on conditions described in the user manual.

5.14 AIS locating device

5.14.1 General

Presentation of AIS locating devices may be provided. If provided, then the following requirements and tests apply.

5.14.2 AIS locating device capacity

5.14.2.1 Requirements

The equipment shall provide the capability to display a minimum number of AIS locating devices nearest to the own ship according to Table 6 if no higher number is specified in individual equipment standard.

The user manual shall specify the processing and display capacity of AIS locating devices. In addition, the user manual shall describe the operational consequences to the processing and display of AIS locating devices in the event that the capacity is at the maximum provided for each case when further AIS locating devices are received.

There shall be an indication, or an alert (e.g. a caution) if specified by individual equipment standards, when the AIS locating devices processing or display capacity has been exceeded.

Table 6 – AIS locating devices capacity

Requirement	Capacity
Minimum display capacity for AIS locating devices	20
Minimum processing capacity for AIS locating devices	20

5.14.2.2 Methods of test and required results

The methods of test and the required results are as follows:

- confirm by inspection of user manual that it specifies the processing and display capacity of AIS locating devices; and that at least the minimum capacities are provided;
- use the AIS simulator and confirm by observation that there is an indication, or an alert (e.g. a caution) if specified by individual equipment standards, when the capacity of processing or display of AIS locating devices has been exceeded; that the displayed AIS locating devices are the nearest and that the EUT operates as described in the user manual;
- confirm by inspection of the user manual that it describes the operational consequences to the processing and display of AIS locating devices in the event that the processing or display capacity is at the maximum provided for each case when further AIS locating devices are received.

5.14.3 AIS locating device display

5.14.3.1 Requirement

It shall be possible to add or remove AIS locating devices from the display by a single layer (see Table 3) and it may be possible to add or remove AIS locating devices from the display by sub-layer (AIS-SART, EPIRB-AIS and AIS MOB), but not as individual objects.

AIS locating devices shall be presented by means of an appropriate symbol displayed using the predicted position, see Annex A.

An AIS locating device selected for display of its alphanumeric information shall be identified by the relevant symbol 2.12 given in Annex A;

For each selected AIS locating device, the following information shall be presented in alphanumeric form:

- Message 1 and 14, for AIS locating devices
 - identification (Name, from AIS Message 24A, 15-character HEX ID (applicable for EPIRB AIS), from Message 14, and/or MMSI. All available at least on demand);

- reported position, its age (based on current time and 'Time stamp' from AIS Message 1) and where available its quality (Position accuracy as " ≤ 10 m" or " > 10 m" and RAIM as "not in use" or "in use");
- calculated range of target;
- calculated bearing of target;
- reported COG (or calculated CTW if the display is sea stabilised). In sea stabilized display, the reported COG shall at least be available on demand;
- reported SOG (or calculated STW if the display is sea stabilised). In sea stabilized display, the reported SOG shall at least be available on demand;
- reported navigational status (active or under test);
- on user request, where available for AIS-SART and AIS MOB text from last received and for EPIRB-AIS text from the last two received unique AIS Message 14 related to the same MMSI. Received AIS Messages 14 having identical source and content shall replace existing messages that they duplicate. Received AIS Message 14 shall be automatically removed when the related AIS locating device is removed.

NOTE 1 Some examples of textual content of AIS Message 14 for AIS locating devices are: "SART ACTIVE", "SART TEST", "MOB ACTIVE", "MOB TEST", "EPIRB ACTIVE", "EPIRB TEST" and the 15-character HEX-ID of a Cospas-Sarsat beacon.

If the received AIS locating device information is incomplete, then the absent information shall be clearly indicated in the related data field as missing.

The information for a selected AIS locating device shall be displayed and continually updated, until another target, AIS data report, AIS locating device or AIS synthetic target is selected for information display or, if applicable, until the user dialogue area is closed.

NOTE 2 Information can be displayed in a separate user dialogue area.

AIS locating devices shall become lost after 6 min from the last received report.

NOTE 3 Nominal reporting intervals are given in ITU R M.1371.

The last predicted position of an AIS locating device shall be clearly marked by a lost AIS locating device symbol on the display as set forth in Annex A, and the lost AIS locating device warning shall be given if the lost AIS locating device warning function is enabled. If the lost AIS locating device warning function is disabled or if the AIS locating device is beyond a user defined range or if the AIS locating device is in testing, there shall be no lost AIS locating device symbol and the AIS locating device symbol shall be removed automatically from the display.

The lost AIS locating device symbol shall disappear if the signal (or message) for the AIS locating device is received again or after the warning has been acknowledged.

A means or method shall be provided for the user to enable/disable the lost AIS locating device warning function. There shall be a clear indication of whether the lost AIS locating device warning function is enabled or disabled. If an AIS locating device is beyond a user defined range, then no warning shall be generated.

The lost AIS locating device function enable/disable and the user defined range parameters may be shared with the lost target function, see 5.6.4, and/or the lost AIS data report device function, see 5.13.3.1.

5.14.3.2 Methods of test and required results

Use the AIS simulator and confirm by observation that the user can add and remove information from the presentation by layer and optionally sub-layers, but not as individual objects.

Use the AIS simulator and confirm by observation that AIS locating devices are displayed at the predicted position and that the symbol is as defined in Annex A.

Use the AIS simulator and confirm by observation that an AIS locating device selected for the display of its alphanumeric information is identified by the relevant symbol 2.12 given in Annex A.

Use the AIS simulator and confirm by observation that, for each selected AIS locating device, the required information is presented in alphanumeric form or that there is a clear indication of absent information in the related data field.

Use the AIS simulator and confirm by observation that information displayed for a selected AIS locating device is continually updated and that the information displayed for a selected AIS locating device remains displayed until another target, AIS data report, AIS locating device or AIS synthetic target is selected or the user dialogue is closed.

For the following tests related to the lost AIS reports, the timeout for the state of the lost AIS report is 6 min from the last received report.

Confirm by observation that a means or method is provided for the user to enable/disable the lost AIS locating device warning function; and that there is a clear indication of whether the lost AIS locating device warning function is disabled; and that a user defined range is available to control the functionality of the lost AIS locating device.

Use the AIS simulator to simulate a lost AIS locating device and confirm by observation that, when the lost AIS locating device warning function is enabled, the last predicted position of a AIS locating device is clearly marked by a lost AIS locating device symbol on the display and that the lost AIS locating device warning is created.

Use the AIS simulator to simulate a lost AIS locating device and confirm by observation that, when the lost AIS locating device function is disabled or when the AIS locating device is beyond a user defined range, no lost AIS locating device symbol is displayed and that the AIS locating device symbol is removed automatically from the display.

Use the AIS simulator and confirm by observation that, when signal (or message) for the AIS locating device is received again or after the lost AIS locating device warning has been acknowledged, the lost AIS locating device symbol disappears.

Use the AIS simulator to send an AIS locating device with associated AIS Message 14 and allow the AIS locating device to be lost and to be removed. Resend the AIS locating device after it has been removed and confirm by observation that no information remains available from the associated AIS Message 14.

5.15 AIS ASM

5.15.1 General

AIS ASMs used in this document are specified in IMO SN.1/Circ.289. An AIS ASM object represents information received from one or more AIS ASMs related to same uniquely identified AIS ASM object. See Annex J for the combinations of AIS ASMs to be combined as an AIS ASM object.

AIS ASMs are uniquely identified by their Application Identifier (AI), which is the combination of Designated Area Code (DAC) and Function Identifier (FI). All AIS ASMs described in this document have the DAC set as 1.

The AIS ASM objects used in this document are identified by the AI and one of the following:

- "Message linkage ID" and first six digits of source MMSI (FI = 18);
- "Message linkage ID" and first six digits of source MMSI (FI = 19);
- "Centre position of Berth, Latitude", "Centre position of Berth, Longitude" (FI = 20);
- "Position of observation, Latitude" and "Position of observation, Longitude" (FI = 21);
- "Message linkage ID" and first six digits of source MMSI (FI = 22);
- "Message linkage ID" and full source MMSI (FI = 23);
- "Latitude (from site location)" and "Longitude (from site location)" (FI = 26 and 31);
- "Message linkage ID" and first six digits of source MMSI (FI = 27 and 28);
- "Position #1 Latitude" and "Position #1 Longitude" (FI = 32).

NOTE 1 For the AIS base station as source, the first six digits of the source MMSI are $0_1 0_2 M_3 I_4 D_5 X_6$ of $0_1 0_2 M_3 I_4 D_5 X_6 X_7 X_8 X_9$. This leaves the last three digits $X_7 X_8 X_9$ available for possible repeated transmission of AIS ASMs by multiple sources coordinated by the shore operator.

NOTE 2 MMSI of the AIS ASM identifies the transmission source. For example, for redundancy purposes or expanded range, there cannot be multiple AIS Base or AIS AtoN stations with different MMSIs transmitting the same AIS ASM object.

Some AIS ASMs support a concept of "end of validity". This concept is based on the following combination of attributes related to AIS ASM validity, where provided and depending on the FI:

- End of "Duration" after "Start Date and Time" (FI=22 or 27);
- End of "Duration (forecast)" after "Valid time of forecast" (FI=26);
- End of "Data timeout (from site location)" (FI=26); or
- End of "Expected Next Signal" (FI=19).

NOTE 3 The validity period can include the current time or can start in the future.

Text description AIS ASMs (FI = 29 and 30) provide additional information related to an AIS ASM object (FI = 18, 19, 22, 23, 27 and 28). In the case that "Message linkage ID" and "MMSI of the source" from the text description AIS ASM matches an existing AIS ASM object, the text is combined into the AIS ASM object.

5.15.2 Categories

There are three categories of AIS ASM objects. For some categories of AIS ASM objects, the user can manage the storage by removing individual AIS ASM objects from the storage. The user may be able to remove and exclude AIS ASM objects from the storage by setting criteria. The user may also be able to control the display of AIS ASM objects in the storage by setting display criteria. The criteria can be for example, by layer, by range, by category.

For all categories of AIS ASM objects, only AIS ASM objects available from the storage can be displayed. Removing an AIS ASM object from the storage also causes it to be removed from the display.

NOTE Many AIS related objects, for example AIS targets, have one user functionality rule both for removal from storage and for add/remove from the display. AIS ASM does not apply one user functionality rule both for removal from storage and for add/remove from the display.

The three categories of AIS ASM objects are:

- 1) Addressed (FI = 18, 20, 23, 28, 30 and 32)
 - a) transmitted as addressed to a single vessel identified by the MMSI (AIS Message 6, Destination ID);
 - b) transmission is repeated until the source ends repetition or the destination has acknowledged received AIS ASM (AIS Message 7);
 - c) there is no timeout for automatic removal of the received AIS ASM;
 - d) automatic removal of AIS ASM object FI = 23 or FI = 28 happens after reception of a cancellation message as per IMO SN.1/Circ.289;
 - e) when the storage capacity limit is reached, the oldest AIS ASM object is replaced by the new AIS ASM object. The oldest AIS ASM object is the object for which the last reception of any related AIS ASM is the oldest;
 - f) an individual AIS ASM object can be removed from the storage by the user;
 - g) optionally received AIS ASM objects may be excluded and AIS ASM objects may be automatically removed from the storage by user selectable criteria. Examples of criteria are:
 - i) selected range: when outside, then excluded from reception and removed from the storage;
 - ii) selected by sub-layers (see Annex J): when de-selected, then excluded from reception and removed from the storage;
 - iii) selected by source (MMSI of source): when de-selected, then excluded from reception and removed from the storage;
 - iv) selected by FI: when de-selected, then excluded from reception and removed from the storage;
 - v) selected time since reception, when time passed, then excluded from reception and removed from the storage;
- 2) Broadcast – Date dependent (FI = 19, 22, 26, and 27; Include "end of validity")
 - a) transmitted as broadcast (AIS Message 8) with the combination of received AIS ASM information (i.e. AIS ASM object) and including "end of validity" concept related information;
 - b) transmission is repeated until end of validity;
 - c) optionally received AIS ASM may be excluded and AIS ASM objects may be automatically removed from the storage by user selectable criteria. Examples of criteria are:
 - i) selected range: when outside, then excluded from reception and removed from the storage;
 - ii) selected by sub-layers (see Annex J): when de-selected, then excluded from reception and removed from the storage;
 - iii) selected by source (MMSI of source): when de-selected, then excluded from reception and removed from the storage;
 - iv) selected by FI: when de-selected, then excluded from reception and removed from the storage;
 - v) selected time since reception, when time passed, then excluded from reception and removed from the storage;
 - d) automatic removal of AIS ASM object from the storage happens at the end of validity or after reception of a cancellation message as per IMO SN.1/Circ.289;
 - e) when the storage capacity limit is reached, the behaviour is as described by the manufacturer in the user manual;

- 3) Broadcast – Other (FI = 19, 21, 22, 26, 27, 29 and 31; Not including "end of validity")
 - a) transmitted as broadcast (AIS Message 8) with the combination of received AIS ASM information (i.e. AIS ASM object) and does not include "end of validity" concept related information;
 - b) transmission is repeated as long as the information is valid;
 - c) timeout for automatic removal of AIS ASM objects from the storage is 18 min from the last AIS ASM reception for a single AIS ASM object;
 - d) when the storage capacity limit is reached, the oldest AIS ASM object is replaced by the new AIS ASM object;
 - e) optionally received AIS ASM may be excluded and AIS ASM objects may be automatically removed from the storage by user selectable criteria. Examples of criteria are:
 - i) selected range: when outside, then excluded from reception and removed from the storage;
 - ii) selected by sub-layers (see Annex J): when de-selected, then excluded from reception and removed from the storage;
 - iii) selected by source (MMSI of source): when de-selected, then excluded from reception and removed from the storage;
 - iv) selected by FI: when de-selected, then excluded from reception and removed from the storage.

5.15.3 AIS ASM capacity

5.15.3.1 Requirements

If implementation of AIS ASM is provided, the equipment shall provide the capability to process and to display a minimum number of AIS ASM objects according to Table 7.

Table 7 – AIS ASM object capacity

AIS ASM object category	Minimum display capacity	Minimum processing capacity
Addressed and intended for own ship	10	10
Broadcast – Data dependent	20	20
Broadcast – Other	12	12
Storage capacities for each category should be bigger than or equal to display capacities for each category.		

The user manual shall specify the processing and display capacity of AIS ASM objects for each category. In addition, the user manual shall describe the operational consequences to the processing and display of current and new AIS ASM objects from the user point of view in the event that the capacity is at the maximum provided for each case specified in Table 7 when further AIS ASM objects are received.

For the AIS ASM categories "Addressed" and "Broadcast – Other" when reaching the capacity limit, on reception of AIS ASMs for a new AIS ASM object, the oldest AIS ASM object shall be replaced in the storage by the new AIS ASM object.

There shall be an indication, or an alert (e.g. a caution) if specified by individual equipment standards, when the AIS ASM processing or display capacity has been exceeded.

For AIS ASM objects of category "Addressed", the user shall be able to remove individual AIS ASM objects from the storage.

AIS ASM objects shall be automatically removed from the storage after reception of a cancellation message as per IMO SN.1/Circ.289.

Optionally, the functionality of the exclusion of received AIS ASMs and removal of AIS ASM objects from the storage may be provided by criteria. If provided, the user manual shall describe the functionality including details of the user selectable criteria. The functionality shall operate based on the criteria described in the user manual.

AIS ASM objects of category "Broadcast – Date dependent" shall be automatically removed from the storage after the end of validity (see 5.15.1).

AIS ASM objects of category "Broadcast – Other" shall be automatically removed from the storage after 18 min from the last received AIS ASM related to the AIS ASM object.

NOTE The nominal reporting interval is assumed to be 6 min.

EXAMPLE An area notice exists as long as reports for it are received at least once within the timeout period of 18 min and as long as it is within its specified validity period (i.e. until end of "duration" starting from "start date and time of area") and as long as it is not cancelled (i.e. "duration = 0").

5.15.3.2 Methods of test and required results

The methods of test and the required results are as follows:

- a) confirm by inspection of user manual that it specifies the processing and display capacity of AIS ASM objects and that at least the minimum capacities according to Table 7 are provided;
- b) confirm by inspection of the user manual that it describes the operational consequences to the processing and display of AIS ASM objects in the event that the capacity is at the maximum provided for each case when further AIS ASM objects are received;
- c) use the AIS simulator and confirm by observation that for AIS ASM categories "Addressed" and "Broadcast – Other" at reaching the capacity limit on reception of AIS ASMs for a new AIS ASM object the oldest AIS ASM object is replaced in the storage by the new AIS ASM object;
- d) use the AIS simulator and confirm by observation that there is an indication, or an alert (e.g. a caution) if specified by individual equipment standards, when the capacity of processing or display of AIS ASM objects has been exceeded and that the EUT operates as described in the user manual;
- e) use the AIS simulator and confirm by observation that AIS ASM objects of the AIS ASM category "Addressed" can be removed from the storage by user selection of individual AIS ASM object;
- f) use the AIS simulator and confirm by observation that AIS ASM objects are automatically removed from the storage after reception of a cancellation message as per IMO SN.1/Circ.289;
- g) if provided, confirm by inspection of the user manual that it describes the functionality of the exclusion of received AIS ASMs and removal of AIS ASM objects from the storage including details of the user selectable criteria;
- h) if provided, use the AIS simulator and confirm by observation that the functionality of exclusion of received AIS ASMs and removal of AIS ASM objects from the storage operate based on the user selectable criteria as described in the user manual and does not operate based on individual AIS ASM objects;
- i) use the AIS simulator and select display of all provided cases and confirm by observation that AIS ASM objects of the AIS ASM category "Broadcast – Date dependent" are removed after the end of validity;
- j) use the AIS simulator and select display of all provided cases and confirm by observation that AIS ASM objects of AIS ASM category "Broadcast – Other" are automatically removed after 18 min from the last received AIS ASM related to the AIS ASM object.

5.15.4 AIS ASM display

5.15.4.1 Requirement

Presentation on case-by-case basis for each AIS ASM Functional Identifier and display sub-layer (see Table J.1) may be provided.

If implementation of AIS ASM is provided, the user manual shall specify which AIS ASM Functional Identifiers and display sub-layers are supported (see Table J.1).

It shall be possible to add or remove AIS ASM objects from the display by layer or sublayer as defined in Table J.1, but not as individual objects.

Optionally, the equipment may allow the user to select by criteria which AIS ASM objects are displayed. Examples of criteria are:

- a) selected range: when outside, then not displayed;
- b) selected by source (MMSI of source): when de-selected, then not displayed;
- c) selected time since reception: when time passed, then not displayed.

AIS ASM objects shall be presented by means of an appropriate symbol or symbols displayed using the reported position. For selection of appropriate symbols, see Annex J. The shape of the symbol shall be as defined in Annex A.

NOTE Some AIS ASM objects require more than one symbol to present the information therein.

Where the user settings cause multiple different AIS ASM point symbols to be presented in the same position, a symbol shall be presented to represent all the AIS ASM point symbols at that position as follows:

- when the multiple different AIS ASM point symbols only include two or more of the symbols 5.6 (tidal and water level info), 5.7 (signal station) and/or 5.13 (environmental report) in Table A.5, the representing symbol shall be 5.13 (without optional addition of symbol 3.4 (tidal stream));
- when the multiple different AIS ASM point symbols include two or more different symbols including at least one symbol that is not symbol 5.6, 5.7 or 5.13, the representing symbol shall be symbol 5.18 (co-located AIS ASM objects).

Selection of an AIS ASM object for display of its alphanumeric information shall be possible from a list of available AIS ASM objects and by selecting the related symbol of the AIS ASM object.

When selecting the single symbol that represents multiple AIS ASM objects, the details of all the represented AIS ASM objects shall be provided to the user.

An AIS ASM object selected for display of its alphanumeric information shall be identified for point geometry objects by the symbol 2.12 given in Annex A and for line and area geometry objects the user manual shall describe the method used to identify the selection.

For each AIS ASM object selected for the display of its alphanumeric information, the values of the applicable and available fields contained in Table J.1 and Source ID (i.e. MMSI) shall be presented at least in alphanumeric form. The field of text description shall only be shown if content is available.

The alphanumeric presentation of the reason of an AIS ASM "Area Notice" (FI = 22 or 23) is based on "Notice Description". For values 0 to 125 of the "Notice Description", the alphanumeric presentation is the standardized text from the table in IMO SN.1/Circ.289. For value 127 of the "Notice Description", the alphanumeric presentation is the content of the "Associated Text".

The viewing date or viewing date range shall determine which date dependent objects are displayed. The viewing date or viewing date range shall be user selectable. When charted information is present, then the viewing date or viewing data range shall be common with charted information (for example S-57 ENC charts). If a date dependent AIS ASM object does not provide a start of validity information, it shall be considered valid up to the end of the validity.

There shall be a permanent indication when the viewing date or viewing date range does not include the current date. When an equivalent indication is required for charted information, a single, common, indication shall be presented.

AIS ASM objects that include the "end of validity" concept shall only be presented graphically when the viewing date or viewing date range overlaps the validity period.

AIS ASM objects shall not initiate any alerts.

5.15.4.2 Methods of test and required results

Confirm by inspection of user manual that it specifies which AIS ASM Functional Identifiers and display sub-layers are supported (see Table J.1).

If the equipment allows the user to select by criteria which AIS ASM objects are displayed, use the AIS simulator and confirm by observation that the selected criteria are used for the display of AIS ASM objects.

Use the AIS simulator and confirm by observation that the user can add and remove AIS ASM objects from the presentation by layers or sublayers as defined in Table J.1, but not as individual objects.

Use the AIS simulator and confirm by observation for each case supported and available in Table J.1 that AIS ASM objects are displayed at the reported position and that the symbol is as defined in Annex J and that the shape of the symbols is as defined in Annex A.

Use the AIS simulator to create cases of multiple point AIS ASM objects that are supported and that are in the same position (at least, where supported, the cases of: Air Gap + Berthing data; Wind + Weather; Wind + Water level; Tidal window + Water level) and confirm by observation for each case that symbol 5.13 or 5.18 is displayed as required in 5.15.4.1.

Use the AIS simulator and confirm by observation that it is possible to select an AIS ASM object for display of its alphanumeric information from the list of available AIS ASM objects and by selecting the related symbol of the AIS ASM object.

Use the AIS simulator and confirm by observation that, when selecting a single symbol that represent multiple AIS ASM objects, the details of all the represented AIS ASM objects are available to the user.

Use the AIS simulator and confirm by observation that an AIS ASM object selected for the display of its alphanumeric information is identified for point geometry objects by the symbol 2.12 given in Annex A and for line and area geometry objects by the method described in the user manual.

Use the AIS simulator and confirm by observation that, for each AIS ASM object selected for the display of its alphanumeric information, the values of the applicable and available fields contained in Table J.1 and Source ID (i.e. MMSI) are presented and that the field of text description is only shown if content is available.

Use the AIS simulator and confirm by observation that, for each AIS ASM "Area Notice" (FI = 22 or 23), the reason is based on "Notice Description" and that, for values 0 to 125 of the "Notice Description", the alphanumeric presentation is the standardized text from IMO SN.1/Circ.289 and that, for value 127 of the "Notice Description", the alphanumeric presentation is the content of the "Associated Text".

Confirm by observation that the viewing date and viewing date range are user selectable and that, when charted information is present, then the viewing date or viewing data range is common with charted information.

Confirm by observation that there is a permanent indication when viewing date or viewing date range does not include current date and that, when charted information is present, this indication is common with the indicator for the charted information.

Use the AIS simulator and confirm by observation that graphical presentation of AIS ASM objects which include the "end of validity" concept are only presented graphically when the viewing date or viewing date range overlaps the validity period.

Use the AIS simulator and confirm by observation that AIS ASM objects do not initiate any alerts.

5.16 Presentation of AIS synthetic target

5.16.1 Requirement

Presentation of AIS synthetic targets may be provided. If presentation of AIS synthetic targets is provided:

- a) the user manual shall specify the processing and display capacity of AIS synthetic targets. The processing capacity shall be at least 40 AIS synthetic targets and the display capacity shall be at least 20 AIS synthetic targets;
- b) it shall be possible to add or remove AIS synthetic targets from the display as a single layer, but not as individual objects;
- c) means may be provided to filter displayed AIS synthetic targets, for example based on range, speed, course if the information is available;
- d) AIS synthetic targets shall be displayed at the predicted position. The symbol shall be as defined in Annex A;

NOTE 1 FI = 17 VTS-generated/synthetic message includes velocity information. FI = 22 or FI = 23 Area Notices do not include velocity information.

- e) an AIS synthetic target selected for the display of its alphanumeric information shall be identified by the relevant symbol given in Annex A;
- f) for each AIS synthetic target selected for the display of its alphanumeric information, the following information shall be presented:
 - 1) when FI = 17, target identifier;
 - 2) reported position;
 - 3) calculated range from own ship to AIS synthetic target;
 - 4) calculated bearing from own ship to AIS synthetic target;
 - 5) when FI = 17, reported COG (or calculated CTW if the display is sea stabilised). In sea stabilized display, the reported COG shall at least be available on demand;
 - 6) when FI = 17, reported SOG (or calculated STW if the display is sea stabilised). In sea stabilized display, the reported SOG shall at least be available on demand;
 - 7) additional information, where available, shall be provided to the user on request;

If the received AIS synthetic target information is incomplete, then the absent information shall be clearly indicated in the related data field as missing.

The information for a selected AIS synthetic target shall be displayed and continually updated, until another target, AIS data report, AIS locating device or AIS synthetic target is selected for information display or, if applicable, until the user dialogue area is closed.

NOTE 2 Information can be displayed in a separate user dialogue area.

- g) AIS synthetic targets shall be automatically removed after 18 min from the last received report;

NOTE 3 Assumed nominal reporting interval is 6 min.

- h) if applicable, AIS synthetic targets shall be automatically removed after the end date and time specified or after receiving a cancellation message;
- i) AIS synthetic targets shall not initiate any alerts;
- j) there shall be an indication, or an alert (e.g. a caution) if specified by individual equipment standards, when the processing or display capacity for AIS synthetic targets has been exceeded.

5.16.2 Methods of test and required results

Where presentation of AIS synthetic targets is provided:

- a) confirm by observation that the user manual specifies the processing and display capacity of AIS synthetic targets and that at least the minimum capacities are provided;
- b) use the AIS simulator and confirm by observation that it is possible to add or remove AIS synthetic targets from the display as a single layer, but not as individual objects;
- c) if provided, use the AIS simulator and confirm by observation that means are provided to filter displayed AIS synthetic targets, for example based on range, speed, course;
- d) use the AIS simulator and confirm by observation that an AIS synthetic target is displayed at the predicted position and that the AIS synthetic target is not capable of being processed, for example updated by dead reckoning. Confirm by observation that the symbol is as defined in Annex A;
- e) use the AIS simulator and confirm by observation that an AIS synthetic target selected for the display of its alphanumeric information is identified by the relevant symbol given in Annex A;
- f) use the AIS simulator and confirm by observation that, for each selected AIS synthetic target, the following information is presented in alphanumeric form:
- 1) when FI = 17, target identifier;
 - 2) reported position;
 - 3) calculated range from own ship to AIS synthetic target;
 - 4) calculated bearing from own ship to AIS synthetic target;
 - 5) when FI = 17, reported COG (or calculated CTW if the display is sea stabilised). In sea stabilized display, the reported COG is at least be available on demand;
 - 6) when FI = 17, reported SOG (or calculated STW if the display is sea stabilised). In sea stabilized display, the reported SOG is at least be available on demand;
 - 7) additional information, where available on user's request;

Confirm by observation that there is a clear indication of absent information in the related data field.

Confirm by observation that information displayed for a selected AIS synthetic target is continually updated and that the information displayed for a selected AIS synthetic target remains displayed until another target, AIS data report, AIS locating device or AIS synthetic target is selected or the user dialogue is closed;

- g) use the AIS simulator and confirm by observation that an AIS synthetic target is automatically removed after 18 min from the last received report;

- h) use the AIS simulator and confirm by observation that, if applicable, an AIS synthetic target is automatically removed after the end date and time specified or after receiving a cancellation message;
- i) use the AIS simulator and confirm by observation that AIS synthetic targets do not initiate any alerts;
- j) use the AIS simulator and confirm by observation that there is an indication, or an alert (e.g. a caution) if specified by individual equipment standards, when the processing or display capacity for AIS synthetic targets has been exceeded.

5.17 Presentation of association of DSC received call with a displayed AIS object

5.17.1 Requirement

Presentation of DSC received call associations may be provided. If presentation of DSC received call associations is provided:

- a) DSC received calls shall be associated with an AIS object based on MMSI. If the equipment has no AIS object with the same MMSI, then the DSC received call shall not be presented graphically;

NOTE 1 Typical AIS objects for this association include AIS targets, AIS locating devices and AIS synthetic targets.

- b) the user manual shall specify the processing and display capacity of associations of DSC received calls. The processing capacity shall be at least 40 associations of DSC received calls and the display capacity shall be at least 20 associations of DSC received calls;
- c) it may be possible to add or remove DSC received calls from the display as a single layer, but not as individual objects;
- d) if an AIS object, for which an association of a DSC received call is available, is displayed and, where applicable, if the layer of association of DSC received calls is enabled, then the appropriate symbol 5.16 given in Annex A shall be displayed;
- e) if an AIS object, for which an association of a DSC received call is available, is selected for the display of its alphanumeric information, then the information received for the association of the DSC received call shall be readily available;

NOTE 2 The AIS object associated with the DSC received call contains itself a lot of up-to-date information which is available from the selected AIS object itself.

NOTE 3 Some examples of alphanumeric information available from DSC, DSE, ECI sentences include: type of DSC call, category of distress call, nature of distress, time of reception.

- f) it shall be possible for the user to remove an association of a DSC received call from the database;
- g) an association of a DSC received call shall be automatically removed from the database after 8 h from the last received report;

NOTE 4 The above requirement assumes reporting is just a single report.

- h) association of DSC received calls with an AIS object shall not initiate any alerts;
- i) there shall be an indication, or an alert without audible announcement (i.e. a caution) if specified by individual equipment standards, when the processing or display capacity for association of DSC received calls has been exceeded.

5.17.2 Methods of test and required results

Where presentation of association of DSC received calls is provided:

- a) use the DSC simulator and the AIS simulator to provide DSC received calls and confirm by observation that an association of DSC received call is connected to an AIS object based on MMSI. Use the simulator arrangement and confirm by observation that, if the equipment has no AIS object with same MMSI, then the association of DSC received call is ignored;
- b) confirm by observation that the user manual specifies the processing and display capacity of association of DSC received calls and that at least the minimum capacities are provided;

- c) use the DSC simulator and the AIS simulator to provide DSC received calls and confirm by observation that, if applicable, it is possible to add or remove association of DSC received calls from the display as a single layer, but not as individual objects;
- d) use the DSC simulator and the AIS simulator to provide a DSC received call and confirm by observation that if an AIS object, for which an association of DSC received call is available, is displayed and if the layer of association of DSC received call is enabled, then the symbol 5.16 given in Annex A is displayed;
- e) use the DSC simulator and the AIS simulator to provide a DSC received call and confirm by observation that, if a target for which the association of DSC received call is available, is selected for the display of its alphanumeric information, then the information received for the association of DSC received call is readily available;
- f) use the DSC simulator and the AIS simulator to provide a DSC received call and confirm by observation that user can remove the association of DSC received call from the database;
- g) use the DSC simulator and the AIS simulator to provide a DSC received call and confirm by observation that the association of DSC received call is automatically removed after 8 h from the last received report;
- h) use the DSC simulator and the AIS simulator to provide DSC received calls and confirm by observation that association of DSC received calls do not initiate any alerts;
- i) use the DSC simulator and the AIS simulator to provide DSC received calls and confirm by observation that there is an indication, or an alert without audible announcement (i.e. a caution) if specified by individual equipment standards, when the processing or display capacity for association of DSC received calls has been exceeded.

5.18 AIS ASM information extending reported AIS target information

5.18.1.1 Requirement

Presentation of AIS ASM information extending reported AIS target information may be provided. Table 8 specifies the reported AIS target information extended by AIS ASM messages and the function identifiers (FI) of AIS ASM messages which extends the reported AIS target information (see 5.5.11).

If presentation of AIS ASM information extending reported AIS target information is provided, the extended reported AIS target information of Table 8 shall be linked to the reported AIS target information (see 5.5.11) and shall be available on demand in alphanumeric form.

NOTE AIS ASM (DAC = 001, FI = 16 or FI = 24) are available to be sent by AIS equipment by internal decision or by external request. The assumed reporting rate is every 6 min.

Table 8 – Extended reported AIS target information from AIS ASM

Reported AIS target extended information (IMO SN.1/Circ.289)	AIS ASM source FI
Last Port of Call	24
Next Port of Call	24
Air Draught	24
Diesel	24
Gross tonnage	24
Heavy fuel oil	24
Ice class	24
Laden or Ballast	24
Light fuel oil	24
Lloyd's Ship type	24
Number of Persons	16,24

Reported AIS target extended information	AIS ASM
Second Port of call	24
Shaft Horse power	24
SOLAS Equipment status	24
Total amount of bunker oil in tonnes	24
VHF Working channel	24

5.18.1.2 Methods of test and required results

Where presentation of AIS ASM information extending reported AIS target information is provided, use the AIS simulation to provide each item of reported AIS target information in Table 8 and confirm by observation that the information is available on demand.

5.19 Received AIS safety related messages

5.19.1 Requirements

Presentation of received AIS safety related messages may be provided. If provided, these requirements apply unless otherwise specified by an individual equipment standard.

The received AIS safety related messages consist of AIS safety related messages sent by AIS targets, AIS base stations and AIS SAR aircraft. The presentation of AIS safety related messages is independent of the graphical presentation of the AIS target, AIS base station, or AIS SAR aircraft.

The user shall be able to tag individual safety related messages for permanent retention (retained). These messages shall not be overwritten by new messages. When no longer required, or when the storage capacity available for retained messages has been reached, the user shall be able to remove the tag on these messages which may then be overwritten in normal course.

The user manual shall specify the processing capacity of received AIS safety related messages. The processing capacity shall be at least 60 AIS safety related messages sub-divided as last 20 addressed, last 20 broadcast and 20 retained by user. AIS safety related messages sent by AIS locating devices and AIS AtoNs are processed and managed separately, see 5.14 and 5.13.

Received AIS safety related messages shall be linked to a source based on MMSI.

If an AIS target, AIS base station or AIS SAR aircraft for which an unread received AIS safety related message is available or if the content of a received AIS safety related message is selected for display is displayed, then the appropriate symbol given in Annex A (symbol 5.16) shall be displayed based on user selection. It shall not be possible to remove individual symbols associated with the received AIS safety related message sources from the presentation.

In this document, there are no requirements for synchronization of this functionality between individual equipment (e.g. between AIS and Radar).

Users shall have means (for example a list of received messages) to retrieve and individually view the field "safety related text" and the UTC time, if available, of receipt by the display equipment of at least the last 20 addressed and last 20 broadcast AIS safety related messages received and at least 20 received AIS safety related messages retained by the user. Using these means, the user shall be able to select the related AIS object based on MMSI for alphanumeric presentation of information.

Users shall have means to remove any individual or all received AIS safety related messages. After changing a single or all received AIS safety related messages in the storage to "retained" or "read" or after manual or automatic removal of a single or all unread received AIS safety related messages, the related symbol 5.16 given in Annex A shall no longer be displayed.

Received AIS safety related messages having identical source and content shall replace existing messages that they duplicate and shall maintain the status of the received AIS safety related message, retained, read or unread, as it was before. The time of receipt shall be set based on the newly received AIS safety related message.

The oldest not retained received AIS safety related message shall be automatically removed when the storage capacity for the last received messages is fully occupied and a new AIS safety related message is received.

An indication that there are unread received AIS safety related messages available shall be provided.

An indication of which received AIS safety related-messages are unread or retained shall be provided.

5.19.2 Methods of test and required results

If presentation of received AIS safety related messages from AIS targets, AIS base stations and AIS SAR aircraft is provided, apply the following tests, unless otherwise specified by an individual equipment standard:

- a) confirm by observation that the user manual specifies the processing capacity of received AIS safety related messages and that at least the minimum capacities are provided;
- b) use the AIS simulator to send the storage capacity of the equipment plus one received AIS safety related message and confirm by observation that:
 - the storage capacity for AIS safety related messages is at least the last 20 addressed and the last 20 broadcast received messages plus at least 20 retained messages;
 - the oldest received message has been automatically removed;
 - each received AIS safety related message is initially in the state of "unread";
 - there is an indication that there are "unread" received AIS safety related messages available;
 - received AIS safety related messages are linked to the sources based on MMSI;
 - duplicate received AIS safety related message having identical source and content replace existing message and maintain the status, retained, read or unread, as it was before;
 - when enabled by the user, AIS targets, AIS base stations and/or AIS SAR aircraft with linked and unread received AIS safety related messages are indicated by appropriate symbols in connection to the displayed AIS target, AIS base station and/or AIS SAR aircraft symbols;
 - when enabled by the user, an AIS target, AIS base station or AIS SAR aircraft for which the content of a received AIS safety related message is selected for display is indicated by an appropriate symbol in connection to the displayed symbol of AIS target, AIS base station or AIS SAR aircraft;
 - it is not possible to remove received AIS safety related message symbols from AIS targets, AIS base stations and AIS SAR aircraft based on individual received AIS safety related messages;
- c) confirm by observation that it is possible to remove any individual or all received AIS safety related messages;

- d) confirm by observation that a duplicate AIS safety related message replaces the existing message maintaining the status of the existing message retained, read or unread, as it was before and that the time of receipt is set based on the newly received AIS safety related message;
- e) confirm by observation that the alphanumeric content and the time of receipt of each received AIS safety related message is available for viewing together with the state (unread/read/retained) indication applicable for the individual received AIS safety related message;
- f) confirm by observation that, after changing all received AIS safety related messages in the storage to "read" or "retained", the indication of unread received AIS safety related messages available is no longer displayed;
- g) confirm by observation that, using the means provided, the user is able to select the related AIS object based on MMSI for alphanumeric presentation of information;
- h) confirm by observation that, after changing a single or all received AIS safety related messages in the storage to "retained" or "read" or after manual or automatic removal of a single or all unread received AIS safety related messages, the related symbols (5.16, see Annex A) are no longer displayed.

5.20 Sent AIS safety related messages

5.20.1 Requirements

Facilities to send AIS safety related messages may be provided. If provided, these requirements apply unless otherwise specified by an individual equipment standard.

It shall not be possible to send AIS addressed safety related messages to AIS targets which have reported the DTE indicator = 1 (not available).

NOTE The purpose of the data terminal equipment (DTE) indicator is to indicate to an application on the receiving side that, if set to available, the transmitting station conforms at least to the minimum keyboard and display requirements.

5.20.2 Methods of test and required results

If facilities to send AIS safety related messages are provided and unless otherwise specified by an individual equipment standard, confirm by observation that, when a safety related message is sent to an AIS target and the state of the addressed AIS target is DTE = 1, an indication is given that the sent AIS safety related message may not be displayed at the recipient.

6 INS, radar and chart displays

6.1 General

6.1.1 Application

NOTE See IEC 62388 for equivalent tests for Clause 6 for radar equipment.

The provisions of this Clause 6 are applicable to stand-alone displays, associated with radar systems or responsible for the presentation of electronic chart information (for example, ECDIS) and multifunction display equipment when providing a radar or chart display.

6.1.2 Multifunction displays

6.1.2.1 Requirement

(MSC191/7.1.1) *If the display equipment is capable of supporting the presentation of multiple functions or operational modes, then there shall be a clear indication of the primary function supported by the presentation (for example, radar, chart, etc.). It shall be possible to select the presentation associated with the primary function, for example, the radar presentation (see 6.2) or the chart presentation (for example, ECDIS) (see 6.3), by a simple operator action.*

6.1.2.2 Methods of test and required results

Where display equipment is capable of supporting the presentation of multiple functions:

- a) confirm by observation that the primary function of the display equipment is clearly indicated;
- b) confirm by observation that the presentation associated with the primary function can be selected by a simple operator action.

6.1.3 Simultaneous display of radar and chart data

6.1.3.1 Requirement

(MSC191/7.1.2) *If a radar video image and electronic chart information are displayed together, the chart and the radar video image shall use the same reference system and co-ordinate criteria, including, as applicable, datum, CCRP, and stabilisation mode, and shall match in scale, projection and orientation. Any user-entered offset, in addition to installation alignment (for example, to CCRP and/or heading reference), shall be indicated. The details of the offset shall be readily available to the user.*

NOTE The Performance Standards for individual navigational systems and equipment provide functional requirements for offsets.

6.1.3.2 Methods of test and required results

Where a radar video image and electronic chart information are displayed together:

- a) confirm by observation that they use the same reference system and co-ordinate criteria;
- b) confirm by observation that they use the same stabilisation mode;
- c) confirm by observation that they match in scale, projection and orientation;
- d) confirm by observation that an indication is provided for any user-entered offset to the presentation of either the radar video image or the electronic chart information;
- e) confirm by observation that the details of the user-entered offset are readily available.

6.1.4 Range scales

6.1.4.1 Requirement

(MSC191/7.1.3) *If a radar video image is displayed, range scales of 0,25, 0,5, 0,75, 1,5, 3, 6, 12 and 24 nautical miles shall be provided. Additional range scales are permitted below 0,25 NM and/or above 24 NM. The selected range scale shall be clearly and permanently or persistently indicated, as appropriate for the application.*

Metric units may also be provided. (See also 5.10.2.)

6.1.4.2 Methods of test and required results

Where a radar video image is displayed:

- a) confirm by observation that range scales of 0,25, 0,5, 0,75, 1,5, 3, 6, 12 and 24 NM are provided for user selection;
- b) where additional range scales are provided, confirm by observation that they are below 0,25 NM and/or above 24 NM;
- c) confirm by observation that the selected range scale is clearly indicated and remains visible while the radar video image is displayed.

6.1.5 Operational display area

6.1.5.1 Requirement

(MSC191/7.1.5) *No part of the operational display area shall be permanently used for the presentation of information that is not part of the navigational presentation (for example, pop up displays, drop down menus and information windows). Temporary, limited and relevant alphanumeric data, information and text may be displayed adjacent to a selected symbol, graphic or target within the operational display area.*

Any windows containing text, diagrams, etc. superimposed on the operational display area shall be temporary and movable (for example, to a less important part of the display, such as on land).

Note that display equipment should avoid the use of dialogue boxes using white backgrounds, or provide a means or method of automatically changing the background of dialogue boxes which appear on displays set for use in dusk or dark conditions.

6.1.5.2 Methods of test and required results

The methods of test and the required results are as follows:

- a) confirm by observation that any information that is not part of the navigational presentation but is superimposed on the operational display area is presented only in response to an explicit user action (for example, a menu selection, hyperlink, hot key, etc.);
- b) confirm by observation that any windows containing text, diagrams, etc. superimposed on the operational display area are movable within the operational display area or can be removed from the operational display area.

6.1.6 Motion display modes

6.1.6.1 Requirement

A clear indication of the motion mode in use shall be provided. (See also 4.10.1)

6.1.6.2 Methods of test and required results

Verify that a clear indication of the display mode in use is provided in accordance with 4.10.1.

6.1.7 Orientation modes

6.1.7.1 Requirement

A north up orientation mode shall be provided for radar and chart presentations.

A course up orientation mode shall be provided for radar presentations and may be provided for chart presentations.

A head up orientation mode may be provided for both radar and chart presentations.

A clear indication of the orientation mode in use shall be provided. (See also 4.10.1)

It shall always be possible to display the SENC information in a north-up orientation. Other orientations are permitted. When such orientations are displayed, the orientation shall be altered in steps large enough to avoid unstable display of the chart information.

6.1.7.2 Methods of test and required results

The methods of test and the required results are as follows:

- a) confirm by observation that a north up orientation mode is provided;
- b) for radar displays, confirm by observation that a course up orientation mode is provided;
- c) verify that a clear indication of the orientation mode in use is provided in accordance with 4.10.1;
- d) for each bearing stabilised orientation that may be provided, confirm by analytical evaluation that, for rates of turn between $0^{\circ}/s$ and $20^{\circ}/s$, the displayed chart symbols and text in the operational display area do not re-orient more often than twice per second and remain legible.

6.1.8 Off-centring

6.1.8.1 Requirement

If a radar video image is displayed, manual off-centring shall be provided to locate the selected antenna position (i.e. the centre of the radar video image) at any point within at least 50 % and not more than 75 % of the radius, measured from the centre of the operational display area. This limitation is only applicable for Radar or Radar-mode available in the equipment (for example, this limitation is not valid for radar overlay in an ECDIS).

If a radar video image is displayed, and an off-centred display is selected, the selected antenna position shall be capable of being located to any point on the display up to at least 50 %, and not more than 75 %, of the radius from the centre of the operational display area. A facility for automatically positioning own ship for the maximum view ahead may be provided. This limitation is only applicable for Radar or Radar-mode available in the equipment (for example, this limitation is not valid for radar overlay in an ECDIS).

If a radar video image is displayed, and an off-centred display and true motion display mode are selected, the selected antenna position shall automatically reset at least 50 %, and not more than 75 %, of the radius from the centre of the operational display area to a location giving the maximum view along own ship's course. Provision for an early reset of the selected antenna position shall be provided. This limitation is only applicable for Radar or Radar-mode available in the equipment (for example, this limitation is not valid for radar overlay in an ECDIS).

6.1.8.2 Methods of test and required results

Where a radar video image is displayed in a Radar or Radar-mode (not, for example, as a radar overlay on ECDIS):

- a) confirm by observation that manual off-centring is provided;
- b) confirm by observation that manual off-centring provides the capability to locate the selected radar antenna position at any point in the operational display area at least 50 % and not more than 75 % of the radius measured from the centre;
- c) where an off-centred display and true motion display mode is selected,
 - 1) confirm by observation that the selected radar antenna position is automatically reset at least 50 %, and not more than 75 %, of the radius from the centre of the operational display area,
 - 2) confirm by observation that the user may manually reset the selected radar antenna position.

6.1.9 Stabilisation modes

6.1.9.1 Requirement

If electronic chart information is displayed, then a ground stabilisation mode shall be provided.

Where radar information is displayed, both ground and sea stabilisation modes shall be provided.

The stabilisation mode and stabilisation source (i.e. velocity or speed source) shall be clearly indicated. (See also 4.10.1.)

NOTE Ground stabilisation requires a ground-referenced velocity (i.e. COG/SOG) from an external sensor capable of providing own ship speed measured over the ground (for example, an EPFS). Sea stabilisation requires a water-referenced velocity (i.e. CTW/STW or HDG/SPD) from an external sensor capable of providing own ship speed measured through the water (for example, an SDME).

6.1.9.2 Methods of test and required results

The methods of test and the required results are as follows:

- a) where electronic chart information is displayed, confirm by observation that a ground stabilisation mode is provided;
- b) where a radar information is displayed, confirm by observation that both ground and sea stabilisation modes are provided;
- c) confirm by observation that a clear indication of the stabilisation mode selected and its source are provided.

6.2 Radar displays

6.2.1 Application

The provisions of 6.2 are applicable to stand-alone displays associated with radar systems and multifunction displays when providing a radar display.

NOTE The functional requirements for radar are defined in the performance standards set forth in IMO Resolution MSC.192(79) and further specified in IEC 62388. The presentation requirements for radar information are defined in the performance standards for presentation set forth in IMO Resolution MSC.191(79) and further specified in this document.

6.2.2 Radar video image

6.2.2.1 Requirement

(MSC191/7.2.1.1) The *radar video image* (i.e. echoes), *tracked radar targets* and *reported AIS targets* shall *not be substantially degraded, masked or obscured by other presented information*. (See also 5.4.1.)

(MSC191/7.2.1.2) *It shall be possible to temporarily suppress all graphical information from the display, retaining only the radar video image and target trails.*

6.2.2.2 Methods of test and required results

The methods of test and the required results are as follows:

- a) confirm by analytical evaluation that the presentation of the radar video image, tracked radar targets and reported AIS targets is not degraded, masked or obscured by other presented information;
- b) confirm by observation that the user can suppress the presentation of all graphical information so that only the radar video image and target trails remain.

6.2.3 Brightness of radar information

6.2.3.1 Requirement

(MSC191/7.2.1.3) *The brightness of the radar video image (i.e. echoes) and associated graphic symbols for tracked radar targets shall be variable. It shall be possible to control the brightness of all displayed radar information. There shall be independent means to adjust the brightness of groups of displayed graphics and alphanumeric data, information and text (for example, tracked radar targets, navigation tools, etc.). The brilliance (i.e. brightness) of the heading line shall not be variable to extinction.*

6.2.3.2 Methods of test and required results

The methods of test and the required results are as follows:

- a) confirm by observation that a means or method to adjust the brightness of the radar video image is provided;
- b) confirm by observation that a separate independent means or method to adjust the brightness of tracked radar target symbols is provided;
- c) confirm by observation that a separate independent means or method to adjust the brightness of groups of other displayed graphics and alphanumeric data, information and text is also provided;
- d) confirm by observation that the brightness of the heading line cannot be adjusted to the point of extinction.

6.2.4 Display of chart information on radar

6.2.4.1 Requirement

(MSC191/7.2.2.1) *Vector format electronic chart information may be presented on a radar display. This shall be accomplished using layers (i.e. of charted objects or elements) selected from an electronic chart database. As a minimum, the elements of the ECDIS Standard Display (see IEC 61174) shall be available for individual selection by IMO display category or layer (for example, by IHO suggested viewing group, see IHO S-52), but not as individual objects. As far as practical, electronic chart information shall be presented in accordance with this document (see 4.5.1, 4.6.2 and 5.5.1) and with the ECDIS Performance Standards (IEC 61174). Raster navigational charts are not permitted for chart radar applications.*

NOTE IEC 62388 requires a subset of the ECDIS standard display, called the primary chart information set, to be made available by a primary control function.

(MSC191/7.2.2.3) *If electronic chart information is displayed on a radar presentation, then there shall be a permanent or persistent indication of its status (for example, on/off, official/unofficial data, overscale/underscale, etc.), as appropriate for the application. The source and update information shall also be available to the user on demand.*

Note that the overscale area pattern addressed in the relevant IHO standards, for example IHO S-52 and IHO ECDIS Presentation Library, may obscure or degrade the presentation of the radar video image. An alternative means or method of overscale indication (for example, the display of an overscale factor) is an acceptable alternative.

If electronic chart information is presented on a radar display, it shall be possible to temporarily remove it by a single operator action and also to switch charts on and off.

6.2.4.2 Methods of test and required results

When vector format electronic chart information is presented on a radar display:

- a) confirm by observation that the content of the electronic chart database includes all of the elements specified by the IMO for the ECDIS standard display (see IEC 61174);

- b) confirm by observation that elements of the standard display are available for selection (i.e. for display) by IMO display category and/or by layer, but not as individual chart objects;
- c) verify the presentation of vector format electronic chart information in accordance with 4.5.1, 4.6.2 and 5.5.1;
- d) confirm by observation that raster format electronic chart information cannot be presented when the radar is displayed;
- e) where electronic chart information is presented in shades of grey, confirm that they are distinguishable between respective chart features;
- f) confirm by observation that a permanent indication of the status (official/unofficial data and overscale/underscale) of the electronic chart information is provided;
- g) confirm by observation that the source of the electronic chart information and its update information are available to the user on demand;
- h) confirm by observation that the user may temporarily remove electronic chart information from the display by a single operator action and that there is a facility to switch charts on and off. The temporarily removed function may be combined with other functions;
- i) confirm by document inspection that the user manual describes all available chart functionalities;
- j) confirm by document inspection that the EUT has no functionality to use raster navigational charts;
- k) verify the testing of colours and intensity in accordance with the test methods and required results of the Annex G.

6.2.5 Priority of radar information

6.2.5.1 Requirement

(MSC191/7.2.2.2) *If electronic chart information is presented within the operational display area, the presentation of radar information (for example, the radar video image, target trails, etc.) shall have priority. The electronic chart information shall be clearly perceptible as such. The electronic chart information shall not substantially degrade, mask or obscure the radar video image, tracked radar targets or reported AIS targets.*

6.2.5.2 Methods of test and required results

When electronic chart information is presented on a radar display:

- a) confirm by observation that the radar video image and target trails have display priority over the electronic chart information;
- b) confirm by analytical evaluation that the presentation of electronic chart information cannot be confused with the display of any other information (for example radar information or AIS information);
- c) confirm by analytical evaluation that the presentation of the electronic chart information does not substantially degrade, mask or obscure the presentation of radar information in accordance with 6.2.2.

6.2.6 Display of map graphics

6.2.6.1 Requirement

(MSC191/7.2.3) User generated radar *map graphics* including monitored and/or additional planned routes *may be* presented on a radar display, *but shall not substantially degrade, mask or obscure the radar video image, target trails, tracked radar targets, reported AIS targets, or electronic chart information.*

Where a radar system provides map graphics for monitored and/or planned routes, it shall comply with the relevant clauses of IEC 61174.

Map graphics may be referenced to own ship or to a geographical position. It shall be possible to remove the display of map graphics by a simple operator action.

Map graphics may consist of lines, symbols and reference points.

The appearance and colours of map graphic lines and symbols are set forth in Annex A.

6.2.6.2 Methods of test and required results

When user generated map graphics are displayed on a radar presentation:

- a) confirm by analytical evaluation that map graphics do not substantially degrade, mask or obscure the radar video image, target trails, tracked radar targets, reported AIS targets or electronic chart information;
- b) confirm by observation that map graphics can be referenced to own ship or to a geographic position;
- c) confirm by observation that the user may remove the display of map graphics by a simple operator action;
- d) confirm by observation that the appearance and colour of the map graphics lines, symbols and reference points are in accordance with Annex A;
- e) where a radar system provides map graphics for monitored and/or planned routes, confirm by documented evidence that it complies with the relevant clauses of IEC 61174.

6.3 Chart displays

6.3.1 Application

The provisions of 6.3 are applicable to stand-alone displays responsible for the presentation of electronic chart information and multifunction displays when providing a chart display.

NOTE The functional requirements for ECDIS are defined in the performance standards set forth in IMO Resolution MSC.232(82) and further specified in IEC 61174. The presentation requirements for electronic chart information are defined in the performance standards for presentation, set forth in IMO Resolution MSC.191(79) and further specified in this document.

6.3.2 Display of chart information

6.3.2.1 Requirement

(MSC191/7.3.1.1) Electronic chart information *and all updates to it* shall be presented *without any degradation of information content*.

(MSC191/7.3.1.2) Electronic *chart information* shall *not be substantially degraded, masked or obscured by other presented information* (for example, a radar video image, tracked and/or reported targets, etc.).

6.3.2.2 Methods of test and required results

The methods of test and the required results are as follows:

- a) verify the presentation of electronic chart information in accordance with 4.5.1, 4.6.2 and 5.5.1;
- b) confirm by analytical evaluation that the electronic chart information is not substantially degraded, masked or obscured by other presented information.

6.3.3 IMO ECDIS display categories

6.3.3.1 Requirement

(MSC191/7.3.1.3) *It shall be possible to temporarily suppress all supplemental (e.g. radar, AIS and other overlays) information from the chart display, retaining only chart related information contained in the ECDIS Display Base.* This function is not required to be of single or simple operator action.

It shall be possible to remove radar information, AIS information and other navigational information including all non-charted information from the chart display by a single operator action. Chart display consists of chart itself and all automatic and manual updates for it. This removal may be permanent or momentary.

ENC and other vector format electronic chart information available for presentation on a chart display during route planning and route monitoring shall be subdivided into the following three IMO display categories:

- ECDIS display base;
- ECDIS standard display; and
- all other information.

It shall be possible to present the ECDIS standard display at any time by a single operator action. This single operator action shall not change any non-chart related user settings for the display.

When a chart display is switched on following a switch off or power failure, it shall return to the most recent settings for the display.

6.3.3.2 Methods of test and required results

The methods of test and the required results are as follows:

- a) confirm by observation that the user can suppress the presentation of all graphical information so that only the electronic chart information in the ECDIS Display Base remains;
- b) confirm by observation that, by a single operator action, the user can permanently or momentarily remove the presentation of all additional information so that only the chart display including automatic and manual updates remains;
- c) verify the subdivision of vector format electronic chart information into IMO display categories in accordance with IEC 61174;
- d) verify that the user can select the ECDIS standard display at any time by a single operator action. Confirm by observation that this single operator action does not change any other display setting than the displayed layers of the electronic charts;
- e) confirm by observation that, when the chart display is switched on, the electronic chart information is presented with the most recent display settings.

6.3.4 Adding or removing information from the display

6.3.4.1 Requirement

(MSC191/7.3.1.4) *It shall be possible to add or remove information from the chart display by layer (IHO viewing group, see for example IHO S-52), but not as individual objects. It shall not be possible to remove information contained in the ECDIS Display Base (see IEC 61174) from the display.* (See also 6.3.2.)

6.3.4.2 Methods of test and required results

The methods of test and the required results are as follows:

- a) confirm by observation that the user can add and remove information from the presentation by layer but not as individual objects;
- b) confirm by observation that the user cannot remove information contained in the ECDIS display base;
- c) confirm by observation that IHO viewing groups can be individually selected for display.

6.3.5 Safety contour

6.3.5.1 Requirement

(MSC191/7.3.1.5) *It shall be possible to select a safety contour from the depth contours provided by vector format electronic chart information. The safety contour shall be emphasized over other contours on the display in accordance with the relevant IHO standards, for example IHO S-52.*

6.3.5.2 Methods of test and required results

The methods of test and the required results are as follows:

- a) confirm by observation that the user can select a safety contour from the depth contours provided in vector format electronic chart information;
- b) confirm by observation that the presentation of the safety contour is emphasised over other depth contours.

6.3.6 Safety depth

6.3.6.1 Requirement

(MSC191/7.3.1.6) *It shall be possible to specify a safety depth. Soundings equal to or less than the safety depth shall be emphasized whenever spot soundings are selected for display.*

6.3.6.2 Methods of test and required results

The methods of test and the required results are as follows:

- a) confirm by observation that the user can specify a safety depth;
- b) confirm by observation that the presentation of spot soundings less than or equal to the safety depth are emphasized over other spot soundings.

6.3.7 Chart scale

6.3.7.1 Requirement

(MSC191/7.3.1.7) *An indication shall be provided if chart information is displayed at a larger scale than contained in the electronic chart database, or if own ship's position is covered by electronic chart information at a larger scale than the presentation.*

(MSC191/7.3.1.8) *Overscaled areas presented on the chart display shall be identified as defined in the relevant IHO standards, for example IHO ECDIS Presentation Library in IHO S-52 and its Appendices.*

6.3.7.2 Methods of test and required results

The methods of test and the required results are as follows:

- a) confirm by observation that an indication is provided when chart information is presented at a larger scale than in the electronic chart database;

- b) confirm by observation that an indication is provided when own ship's position is covered by electronic chart information at a larger scale than the presentation;
- c) confirm by observation that overscaled areas presented on the display are identified.

6.3.8 Display of radar and target information

6.3.8.1 Requirement

(MSC191/7.3.2.1) A radar video image, tracked radar and reported AIS target information may be presented on a chart display but shall not substantially degrade, mask or obscure the presentation of electronic chart information. As far as practical, the radar video image and target information shall be presented in accordance with the radar Performance Standards (see IEC 62388) and with the presentation standards set forth in this document.

(MSC191/7.3.2.2) A radar video image, tracked radar and reported AIS target information shall be clearly distinguishable from the electronic chart information. It shall be possible to remove radar and target information by a simple operator action.

6.3.8.2 Methods of test and required results

The methods of test and the required results are as follows:

- a) verify that the radar video image is presented in accordance with 5.4.1 and 5.4.2, as applicable;
- b) verify that targets are presented in accordance with 5.5.8;
- c) verify that radar and target information are clearly distinguishable from chart information in accordance with 6.3.2;
- d) confirm by observation that radar and target information can be removed from the presentation by a simple operator action.

6.3.9 Display of additional information

6.3.9.1 Requirement

(MSC191/7.3.3.1) Information from additional sources may be displayed on ECDIS but shall not substantially degrade, mask or obscure the chart information.

(MSC191/7.3.3.2) Additional information (including information for route planning, route monitoring, information overlays and supplementary navigation tasks) shall be clearly distinguishable from the electronic chart information. It shall be possible to remove additional information by a simple operator action.

6.3.9.2 Methods of test and required results

The methods of test and the required results are as follows:

- a) verify the presentation of additional information in accordance with 4.6.2;
- b) verify that the presentation of electronic chart information is not degraded, masked or obscured by the presentation of additional information in accordance with 6.3.2;
- c) verify that additional navigation-related information is clearly distinguishable from chart information in accordance with 6.3.3;
- d) confirm by observation that additional navigation-related information can be removed from the presentation by a simple operator action.

6.4 Composite task-oriented presentations

6.4.1 User-configured presentations

6.4.1.1 Requirement

(MSC191/7.4.1) *The user may configure a presentation for a specific task-at-hand. The presentation may include radar and/or electronic chart information, in combination with other navigation or ship related data or information. When not fully compliant with the relevant Performance Standards, such a presentation shall be identified as an auxiliary presentation.*

6.4.1.2 Methods of test and required results

The methods of test and the required results are as follows:

- a) if the user can configure presentations for the task-at-hand, confirm by inspection of documented evidence that all tasks configurable are noted in the manual;
- b) confirm by analytical evaluation that, for all tasks listed in the user documentation, the relevant related data and information are displayed;
- c) confirm that the display is fully compliant with the relevant performance standards either by analytical evaluation or inspection of the relevant test reports related to the task-at-hand for which test standards exists.

If the display is not fully compliant with the relevant performance standards, confirm by observation that a clear indication as an auxiliary presentation is provided.

6.4.2 Information associated with the task-at-hand

6.4.2.1 Requirement

(MSC191/7.4.2) *As far as practical, the presentation of any radar and/or chart related functions shall be compliant with the requirements of the relevant Performance Standards and of the presentation standards set forth in this document, with the exception of size requirements for the operational display area. Windows of chart or radar information may be presented along with other information associated with the task-at-hand.*

6.4.2.2 Methods of test and required results

The methods of test and the required results are as follows:

- a) confirm by inspection of test reports that the Radar and/or chart related functions are compliant with the relevant Performance Standards;
- b) confirm by analytical evaluation or inspection of the relevant test reports that the content and the physical display are compliant with the relevant parts of the presentation standards. Document the size of the operational display in use;
- c) confirm by analytical evaluation that the presentation of chart and radar information along with other information associated with the task-at-hand, if available, is in line with this document.

6.5 Single and simple operator actions

6.5.1 Applicability

The requirements of this Subclause 6.5 are from a recommendatory source for ECDIS, radar and INS. The implementation of this recommendation is optional. Manufacturers shall declare if these requirements have been implemented. The following requirements are applicable, if the manufacturer has declared implementation of Appendix 4 of MSC.1/Circ.1609.

6.5.2 Requirement

(MSC.1/Circ.1609/Appendix 4/3) *The inclusion of non-mandatory functions in the tables of Annex H does not make such functions 'mandatory' to provide. Where the functions in the tables of Annex H are included within navigation equipment, such functions shall comply with the criteria listed in the tables of Annex H.*

(MSC.1/Circ.1609/Appendix 4/1) *Where the equipment provides the functions listed in the tables of Annex H, access shall be as defined as in the tables of Annex H except where conformance is mandated by individual equipment standards. A requirement for information to be presented on single operator action may alternatively be met by a permanent indication.*

(MSC.1/Circ.1609/Appendix 4/2) *Care will need to be taken when adding single and simple operator action buttons to displays. The manufacturer/operator shall consider keeping the display area for the main function of the equipment as much as possible for user operability. It may be more useful to contain shortcut buttons under one setting menu rather than add many icons to the desktop.*

NOTE Single operator action functions available from physical controls outside of the display area are not part of the above requirements.

Manufacturers shall declare all functions available in the display area for single operator action and not listed as such in Annex H. The manufacturer's declaration shall include reasons why such functions are available as single operator action.

6.5.3 Methods of test and required results

The methods of test and the required results are as follows:

- a) confirm by observation that, if provided, functions listed in Annex H have been implemented as single or simple operator action according to Annex H;
- b) refer to manufacturer's declaration and confirm by analytical evaluation that any additional single operator action function, if available in the display area, is appropriate for being available in the highest level of the user interface.

6.6 User and default settings

6.6.1 General

The requirements of this Subclause 6.6 are from a recommendatory source for ECDIS, radar and INS. The implementation of these recommendations is optional. Manufacturers shall declare if these requirements have been implemented.

6.6.2 User-settings

6.6.2.1 Requirement

(MSC.1/Circ.1609/Appendix 5/1) *A facility shall be provided to store and recall user-specific settings to suit the conditions at hand. At least two such configurations shall be available to be stored for recall. Selection for recalling a stored configuration shall be followed by an action to confirm the selection.*

User specific settings shall include at least all settings specified for default settings, see Annex I. Manufacturers may include additional settings into the user specific settings. All settings shall be documented in the user manual.

6.6.2.2 Methods of test and required results

The methods of test and the required results are as follows:

- a) confirm by observation that user specific settings include at least all default settings, see Annex I;
- b) confirm by inspection of the user manual that all settings included into user specific settings are part of the documentation;
- c) confirm by observation that it is possible to store and recall at least two user specific settings;
- d) confirm by observation that the recall of user specific settings requires the user to confirm the selection before application of the settings.

6.6.3 Default settings

6.6.3.1 Requirement

(MSC.1/Circ.1609/Appendix 5/2) *A facility shall be provided to apply a set of default settings to return the equipment to a known default state, see Annex I. The default settings are intended to provide a basic and minimal mode of operation for the system or equipment that can be built upon by the user.*

(MSC.1/Circ.1609/Appendix 5/3) *Default settings are not intended to provide a redundant setting in the event of an equipment failure or loss of input.*

6.6.3.2 Methods of test and required results

Confirm by observation that the default settings include all settings specified in Annex I.

7 Physical requirements

7.1 General

The provisions of this Clause 7 are applicable to the physical displays associated with all navigational systems and equipment on the bridge of a ship. The equipment manufacturer may provide documented evidence to show compliance with the requirements specified in Clause 7.

Display equipment shall comply with the applicable requirements of IEC 60945. (See 4.2.2.1.)

7.2 Display adjustment

7.2.1 Contrast and brightness

7.2.1.1 Requirement

(MSC191/8.1.1) *It shall be possible to adjust the contrast and brightness of the display, as applicable to the display technology. It shall be possible to dim the display. The range of control shall permit the display to be legible under all ambient light conditions likely to be experienced on the bridge of a ship (for example, day, dusk and night). The range of adjustment shall be sufficient to maintain the user's dark adaptation at night. (See also 4.4.1.)*

(MSC191/8.1.2) *It shall be possible for the user to reset the values of contrast and/or brightness to a preset or default condition.* The manufacturer's documentation shall identify the default conditions.

If the brightness adjustment is set for night, then means shall be provided to return to such a brightness level that it is possible to continue control under daylight.

If display equipment is intended to present electronic chart information (see 4.6.2), then it shall

- provide the user with the capability to reset the values of brightness and/or contrast to a calibrated colour performance reference setting for each of the ambient light conditions defined in Table 1, and
- prevent inadvertent adjustments by the user by restricting access to controls that may cause degradation of colour performance, such as gamma and colour temperature adjustments.

7.2.1.2 Methods of test and required results

The setup for measurements of contrast, luminance and colour shall be conducted in accordance with the guidelines of IEC 61966-4 or the VESA Flat Panel Display Measurement (FPDM) standard (see VESA-2001-6). Before measurements are taken, display equipment shall be powered up and allowed to stabilize for a period identified by the manufacturer. (See also Annex G.)

The following verifications are required:

- a) confirm by observation that a manual contrast control is provided, if applicable (for example, for CRT technology);
- b) confirm by observation that a manual brightness control is provided;
- c) confirm by observation that, after dimming the equipment for use at night, when daylight ambient conditions are applied, there are means to readjust for operation under daylight;
- d) verify the adjustment of contrast and brightness in accordance with 4.4.1: (See 4.4.1.2)
 - 1) confirm by observation that the contrast and brightness controls can be reset to their default values;
 - 2) where display equipment is intended to display chart information, confirm by measurement of luminance that a means or method is provided to return the contrast and brightness controls to their calibrated setting for each ambient light condition in accordance with Table 1. (See 4.4.1)
- e) confirm by inspection of documented evidence that the default conditions for contrast and brightness controls are identified.

7.2.2 Magnetic interference

7.2.2.1 Requirement

(MSC191/8.1.3) If *magnetic fields degrade the presentation of navigation-related information*, then a *means or method to neutralise the effects of magnetic fields* shall be provided.

7.2.2.2 Methods of test and required results

Confirm by inspection of documented evidence that a means or method to neutralise the effects of magnetic fields is provided if magnetic fields degrade the presentation of navigation-related information.

7.2.3 Temporal stability

7.2.3.1 Requirement

Display equipment shall be perceptually "flicker" free in direct and peripheral vision at the nominal viewing distance identified in the manufacturer's documentation in accordance with the perception thresholds, as defined in Clause G.2.

NOTE The perception threshold of "flicker" is known to vary for observers, depending on such factors as age, fatigue, ambient lighting conditions, frequencies, the displayed image size, image brightness and image content.

7.2.3.2 Methods of test and required results

Establish by inspection of documented evidence whether the luminance persistence (response time) of the display equipment is less than or more than 1 ms. The test methods are then as follows:

- a) for display equipment with a luminance persistence of 1 ms or more (for example, CRT, LCDs, etc.), confirm by analytical evaluation or measurement that the display equipment emits less energy in the temporal frequencies than an observer will detect as "flicker" (i.e. the predicted "flicker" threshold) according to G.2.3.1 under each ambient light condition specified in Table 1;
- b) for display equipment based on technologies which have a luminance persistence much less than 1 ms (for example, EL (electro luminescent), plasma, light emitting diodes (LED), etc.), confirm by analytical evaluation or measurement that the display equipment emits less energy in the temporal frequencies than an observer will detect as "flicker" according to G.2.3.2 under each ambient light test condition specified in Table 1.

7.2.4 Physical controls and status indicators

7.2.4.1 General

Physical controls for display equipment shall be locatable by visual or tactile means. If the display equipment has more than three adjacent controls (for example, knobs or switches), then labels with adjustable illumination shall be provided for identification of these controls. Labels shall comply with the legibility/readability requirements contained in 4.4.2 and 4.4.3.

Any illuminated status indicators separate from the main display (for example, built-in to the front panel of the monitor) shall be locatable by visual means. Adjustable illumination provided for labels and status indicators shall be suitable for all ambient light conditions likely to be experienced on the bridge of a ship (day, dusk and night) and with due consideration to the night vision of the officer of the watch.

Illumination shall be dimmable to produce a maximum brightness of not more than 1 cd/m² and may be extinguishable below that point.

7.2.4.2 Method of test and required results

The methods of test and the required results are as follows:

- a) confirm by observation that physical controls for display equipment, if available, are locatable by visual or tactile means;
- b) where more than three adjacent control knobs or switches exist, confirm by observation that they have labels with adjustable illumination and that the illuminated labels comply with the legibility/readability requirements contained in 4.4.2 and 4.4.3;
- c) where illuminated status indicators exist separate from the main display, confirm by observation that they are locatable by visual means;
- d) where adjustable illumination is provided, confirm by observation that illumination is dimmable to not more than 1 cd/m² and may be extinguishable below that point;
- e) confirm by observation that a visual indication of the presence of power to the display equipment is provided;
- f) confirm by observation that a visual indication of the presence of video signals to the display equipment is provided.

7.3 Screen size

7.3.1 Requirement

(MSC191/8.2.1) *Display equipment shall be of sufficient size to support the requirements of the relevant IMO Performance Standards.*

(MSC191/8.2.2) For ECDIS, *the operational display area of the chart presentation for route monitoring shall be at least 270 mm × 270 mm.*

For ECDIS back-up arrangements, the effective size of the chart presentation shall be not less than 250 mm × 250 mm or 250 mm diameter.

(MSC191/8.2.3) For radar display equipment, *the operational display area of the radar presentation shall be at least a circle of diameter of:*

- 180 mm for ships smaller than 500 gross tonnage;
- 250 mm for ships larger than 500 gross tonnage and HSC less than 10 000 gross tonnage;
- 320 mm for ships larger than 10 000 gross tonnage.

The manufacturer's documentation shall identify the intended size of the operational display area.

7.3.2 Method of test and required results

The methods of test and the required results are as follows:

- a) for ECDIS, confirm by measurement that the dimensions of the operational display area are at least 270 mm × 270 mm;
- b) for ECDIS back-up arrangements, confirm by measurement that the dimensions of the operational display area are at least 250 mm × 250 mm, or 250 mm in diameter;
- c) for radar display equipment, confirm by measurement that the diameter of the operational display area is at least a circle of diameter of the intended size specified in the manufacturer's documentation.

7.4 Multicoloured display equipment

7.4.1 Requirement

(MSC191/8.3.1) *Multicoloured display equipment shall be used except where monochrome displays are permitted within individual IMO Performance Standards.*

(MSC191/8.3.2) *Multicoloured operational displays including multifunction displays (for example, conning displays) shall provide a minimum of 64 colours except where permitted or not required by the IMO, or when used for a single specific purpose (for example, speed log, echo-sounder).*

Monochrome displays may be provided when used for a single specific purpose (for example, speed log, echo-sounder) except where multicoloured displays are required by IMO performance standards or Code on Alerts and Indicators.

7.4.2 Method of test and required results

For multicoloured display, verify the result in accordance with Clause 4.

For monochrome display, verify the result in accordance with Clause 4 except the colour-related requirements specified in 4.5.1, 4.7.1, 4.7.2, 4.7.3 and 4.8.2.

For monochrome display, confirm by inspection of documented evidence that the manufacturer has noted the limitation of usage of the display to a single specific purpose or noted relevant IMO Performance Standard permitting use of monochrome display.

7.5 Screen resolution

7.5.1 Requirement

(MSC191/8.4) *Operational display equipment including multifunction displays (for example, conning displays) shall provide a minimum screen resolution of 1 280 pixels × 1 024 pixels, or equivalent for a different aspect ratio, except where permitted or not required by the IMO, or when used for a single specific purpose (for example, speed log, echo-sounder) or 180 mm diameter radar. For 180 mm diameter radar, a minimum screen resolution of 1 024 pixels × 768 pixels, or equivalent for a different aspect ratio, shall be provided.*

Display equipment intended to support the presentation of electronic chart information shall provide a maximum pixel pitch of 0,29 mm/m of nominal viewing distance (1 min of arc), for example, 0,36 mm at 1 237 mm viewing distance.

The manufacturer's documentation shall describe the screen resolution, pixel format and viewing distance (i.e. for measurement of pixel pitch).

7.5.2 Method of test and required results

The methods of test and the required results are as follows:

- a) confirm by inspection of documented evidence that for radar displays larger than 180 mm diameter the display equipment supports a screen resolution of at least 1 280 × 1 024 or equivalent resolution if the equipment uses a different aspect ratio. For radar displays of 180 mm or smaller diameter the requirement is at least 1 024 × 768 or equivalent resolution if the equipment uses a different aspect ratio;
alternatively, confirm by inspection of documented evidence that the display equipment supports the minimum screen resolution permitted by the applicable Performance Standards;
alternatively, if the display equipment is used for a single specific purpose (for example, speed log, echo-sounder, etc.), confirm by inspection of documented evidence that it is not required to support a minimum screen resolution;
- b) confirm by inspection of documented evidence that the display equipment provides a maximum pixel pitch of not more than 1 min of arc;
alternatively, if the display equipment is used for a single specific purpose (for example, speed log, echo-sounder, etc.), confirm by inspection of documented evidence that it is not required to support a maximum pixel pitch;
- c) confirm by inspection of documented evidence that the screen resolution, pixel format and the viewing distance used for the measurement of pixel pitch are identified.

7.6 Screen viewing angle

7.6.1 Requirement

(MSC191/8.5) *The display equipment shall support the reading of information under all ambient light conditions, simultaneously, by at least two users, from standing and sitting user positions likely to be found on the bridge of a ship.*

7.6.2 Methods of test and required results

Verify in accordance with 4.4.1.2 a) that readability requirements are satisfied from a position at the side of the operator.

Annex A (normative)

Presentation colours and symbols

A.1 Overview

Annex A specifies the harmonised symbols to be used for the presentation of navigation related information on all shipborne navigational systems and equipment in conformance with guidelines published by the IMO and provided in SN/Circ.243.

All text in Annex A whose wording is identical to text contained in IMO SN/Circ.243 is printed in *italics*. The IMO reference is made up of two parts; a prefix representing the IMO instrument, followed by the paragraph number, displayed as, for example: (SN243/1).

A.2 Purpose

(SN243/1/1) *The purpose of Annex A is to provide guidance on the appropriate use of navigation-related symbols and the use of colour to achieve a harmonized and consistent presentation on all shipborne navigational systems and equipment.*

A.3 Use

(SN243/1/2) *The use of these guidelines will ensure that the symbols used for the display of navigation-related information on all shipborne navigational systems and equipment are presented in a consistent and uniform manner.*

A.4 Application

(SN243/1/3) *The symbols listed in Table A.1 through Table A.5 shall replace symbols which are currently in existing Performance Standards for navigational systems and equipment. Where a standard symbol is not available, another symbol may be used, but this symbol shall not conflict with the symbols listed in Annex A.*

A.5 Navigation-related symbols

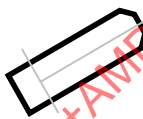
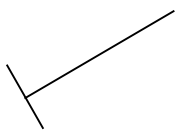
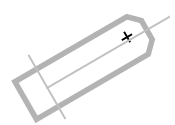
For the application of the symbols in Table A.1 through Table A.5, the following shall be considered:

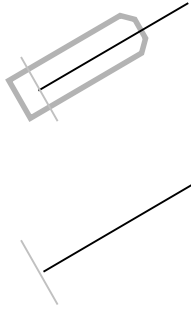
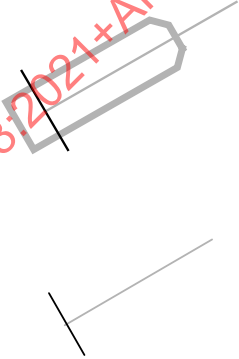
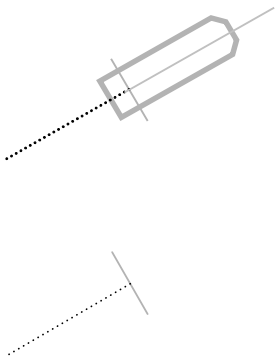
- colours are not standardised except where explicitly stated;
- colours used for the presentation of tracked radar targets and reported AIS targets (symbols from 2.1 a to symbol 2.9) shall be the same;
- colours used for the presentation of own ship symbols shall be identifiable from colours used for the presentation of targets;
- colours used for the presentation of operational information shall be discriminated from the colours used for the presentation of the radar image, target trails, additional processed radar information and electronic chart information;
- colours recommended for symbols assume that the presentation provides for lighter foreground information against a dark background;
- sizes specified for symbols assume a nominal viewing distance of 1 m (see 4.6.1.1 for requirements with viewing distances other than 1 m);

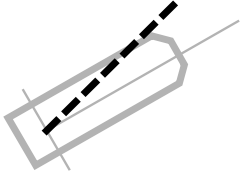
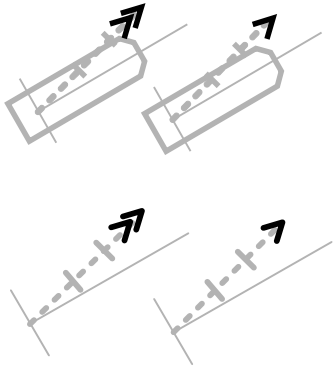
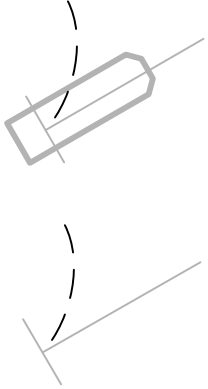
- weights specified for line styles assume that the "thick" line style is at least twice the thickness of the "thin" line style.

An example of a possible colour scheme that may be used is given in Table A.6.

Table A.1 – Own ship symbols

	Symbol name and description	Symbol graphic(s)
1.1 a	Own ship – True scaled outline The user may select to present own ship as a true scaled outline oriented in the direction of heading relative to CCRP and drawn using a thick solid line style with the same basic colour used for own ship symbols. A more detailed true scaled outline symbol, representing the physical shape of the own ship, is permitted as an alternative to the standardized symbol specified in this document. Automatic selection of the true scaled outline is permitted (see 5.2.1). The true scaled outline shall not be used when heading is unknown in a gyro/THD-stabilised mode, or when the beam of the outline is less than 3 mm. Note that a loss of heading will force the radar into head-up mode (see IEC 62388); in this case, the true scaled outline is still permitted.	 (SN243)
1.1 b	Own ship – Simplified symbol If a navigation display presents the chart mode (with or without the radar image), a simplified symbol may be used for own ship. The simplified symbol may be combined with the minimised symbol (see symbol 1.1 c). A simplified symbol shall be used when a chart is displayed in north-up presentation, without a radar image and in the absence of heading information. The outer circle shall be 6 mm in diameter. The inner circle shall be 3 mm in diameter. The circles shall be drawn using a thick solid line style, with the same basic colour used for own ship symbols. Note that for a radar mode, the simplified symbol should not be used as the symbol does not permit the minimum range requirements in IEC 62388.	 (SN243)
1.1 c	Own ship – Minimised symbol If a navigation display presents the radar mode, own ship shall be presented as a minimised symbol. The minimised symbol is comprised of the heading line (see symbol 1.3) and the beam line (see symbol 1.4). Where appropriate, the minimised symbol shall be combined with the true scaled outline of own ship. Note that a loss of heading will force the radar into head-up mode (see IEC 62388) whereby the minimised symbol should be used.	 (SN243)
1.2	Radar antenna position If a radar image is displayed and own ship is displayed as a true scaled outline, the user may select to present the radar antenna position as crossed lines centred at the physical location of the radar antenna (the source of the displayed radar image). The total extent of the crossed lines shall be at least 1 mm but not more than 2 mm in length. They shall be drawn using a thin solid line style with the same basic colour used for own ship symbols.	 (SN243)

	Symbol name and description	Symbol graphic(s)
1.3	Own ship heading line The heading line shall always be indicated (except when temporarily suppressed by the user), originating at CCRP and extending in the direction of own ship heading to the bearing scale. The line shall be drawn using a thin solid line style with the same basic colour used for own ship symbols. The heading line shall always be shown together with the beam line (see symbol 1.4).	 (SN243)
1.4	Beam line The beam line forms part of the own ship minimised symbol. Own ship beam line shall be presented as a single line, perpendicular to the heading line, passing through the CCRP and extending a minimum of 5 mm each side of the CCRP. The line shall be drawn as a thin solid line style with the same basic colour used for own ship symbols.	 (SN243)
1.5	Stern line Optionally, the user may select a stern line that shall originate at CCRP and shall extend, in the direction 180° from the heading, to the bearing scale. The line shall be drawn using a thin dotted line style with the same basic colour used for own ship symbols.	

	Symbol name and description	Symbol graphic(s)
1.6 a	Velocity vector Optionally, the user may also select to present a velocity vector originating at CCRP and extending in the direction of COG or CTW, as appropriate, for a length representing the distance own ship will travel in a user-selected time interval. The vector shall be drawn using a thick short-dashed line style with the same basic colour as used for own ship symbols. An option to select other colours may be provided, but these colours shall conform to the rules given in Clause A.5.	 (SN243)
1.6 b	Velocity vector – Time increments Optionally, the user may also select to present time increments along the velocity vector perpendicular to the vector with their midpoint on it and extending not more than 1,5 mm on either side. They shall be spaced along the vector to represent the distance own ship will travel in a user-selected increment of the time interval used for the velocity vector. The increments shall be drawn using a thick solid line style with the same basic colour used for own ship velocity vector.	 (SN243)
1.6 c	Velocity vector – Stabilisation indicator Optionally, the user may select to present a stabilisation indicator, positioned at the end of the velocity vector. The ground stabilisation indicator shall be presented as a double arrowhead. The water stabilisation indicator shall be presented as a single arrowhead. The arrowheads shall extend at least 1 mm but not more than 1,5 mm on either side of the vector (i.e. measured perpendicular to it). The arrowhead(s) shall be drawn using a thick solid line style with the same basic colour used for own ship velocity vector.	 (SN243)
1.6 d	Path predictor Optionally, the user may select to present a path predictor, either in place of a velocity vector or independently, as a curved line originating at CCRP and extending along the predicted path over ground that own ship will travel in the time interval used for the velocity vector. The path shall be drawn using a thin long-dashed line style with the same basic colour as used for own ship symbols. An option to select other colours may be provided, but these colours shall conform to the rules given in Clause A.5.	 (SN243)

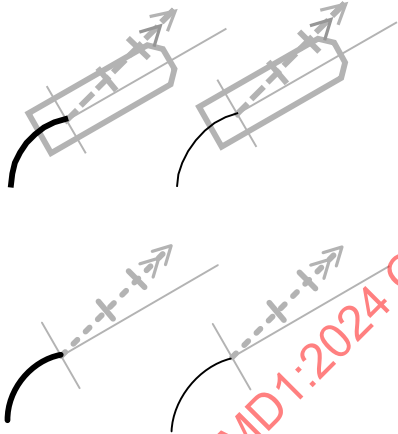
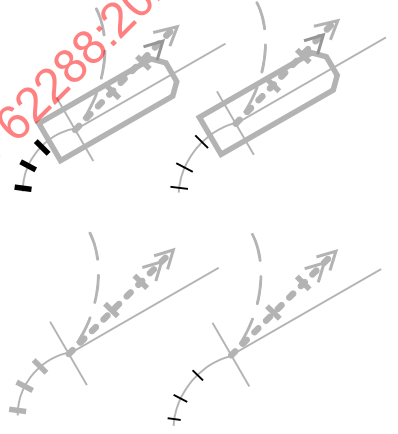
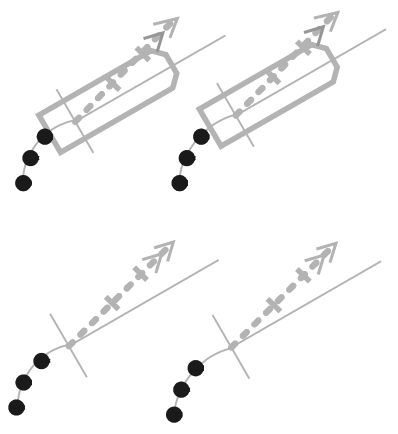
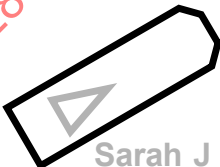
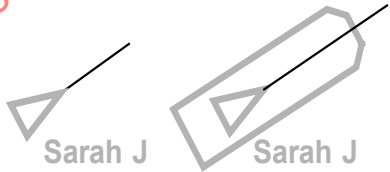
	Symbol name and description	Symbol graphic(s)
1.7 a	Past track The user may select to present a past track for the primary and/or secondary positioning sources. The past track shall be presented as line connecting own ship current and past positions. The primary past track shall be drawn using a thick solid line style with the same basic colour used for own ship symbol. The secondary past track shall be drawn using a thin solid line style with the same basic colour used for own ship symbols.	 (SN243)
1.7 b	Past track – Time increments Optionally, time increments along the past track may be shown. The time increments shall be presented as single lines perpendicular to the past track with their midpoint on it and extending at least 1 mm but not more than 1,5 mm on either side. They shall be spaced along the past track to represent the distance own ship travelled in the user-selected increment of the time interval used for the velocity vector. The time increments for the primary past track shall be drawn using a solid line style.	 (SN243)
1.7 c	Past track – Past positions Alternatively, the user may select to present past positions along the past track in place of time increments. Past positions shall be drawn as small filled circular symbols with a diameter of not more than 1,5 mm, with the same basic colour used for own ship symbols.	
The simplified symbol (1.1 b) may be used with all examples showing the minimised symbol (1.1 c) in this table.		

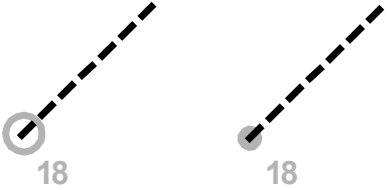
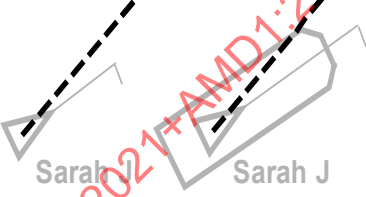
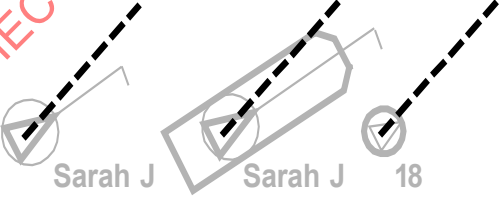
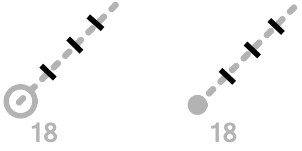
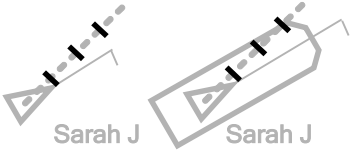
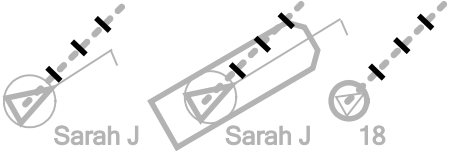
Table A.2 – Radar and AIS symbols

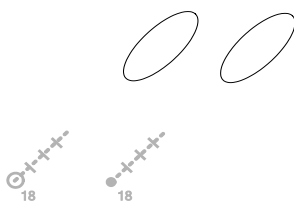
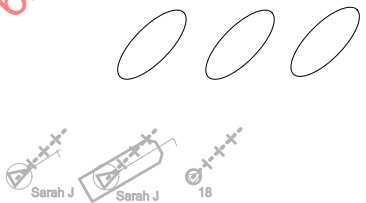
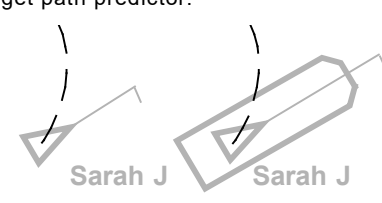
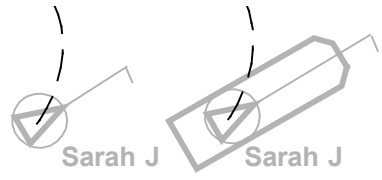
	Symbol name and description	Symbol graphic(s)
2.1 a	Radar targets in acquisition state A symbol drawn around radar targets in acquisition state shall be presented as a broken circle centred at the position of target acquisition. The circles shall be a 5 mm in diameter and shall be drawn using a thin dashed line style with the same basic colour used for target symbols.	 (SN243)
2.1 b	Radar targets in acquisition state – Automatically detected A symbol drawn around radar targets in acquisition state that are automatically detected inside an acquisition area, shall be a 5 mm in diameter and using a thick dashed line style, with the required colour red. The symbols shall flash until acknowledged by the user. Once acknowledged, the symbols shall cease flashing (even when they remain inside the acquisition area) and unless considered as dangerous, shall be drawn as a normal radar target in an acquisition state (i.e. detected outside an acquisition area) with the basic colour of other non-dangerous target symbols.	 (SN243)
2.2 a	Tracked radar targets Tracked radar targets shall be presented as circles centred at the targets' tracked position. The circles shall be 3 mm in diameter and shall be drawn using a thick solid line style. Tracked radar targets generated from a target automatically detected in an acquisition area that have not been acknowledged shall be the required red basic colour and shall continue to flash until acknowledged by the user (even when they move outside the acquisition area). Once acknowledged, the symbols shall cease flashing and unless considered as dangerous, shall be drawn as a normal radar target in an acquisition state (i.e. detected outside an acquisition area) with the basic colour of other non-dangerous target symbols. Tracked radar targets may be labelled. Alphanumeric text used to label radar targets shall be drawn with the same basic colour used for target symbols.	 18 (SN243)
2.2 b	Tracked radar targets – Alternative Alternatively, tracked radar targets may be presented as filled circles of not more than 2 mm in diameter.	 18 (SN243)

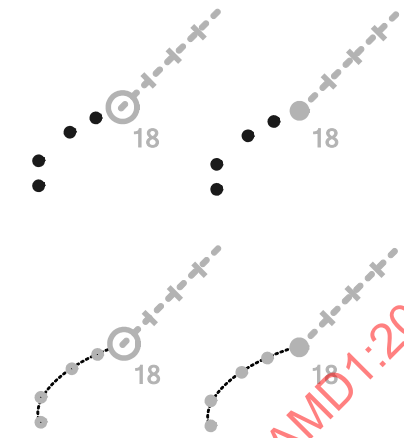
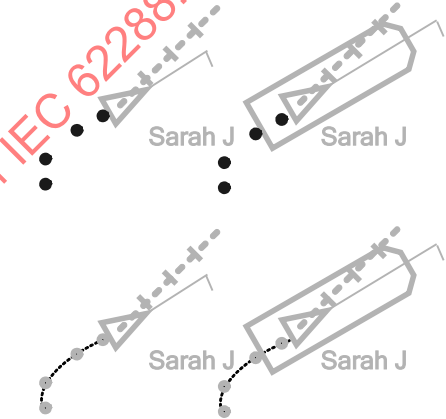
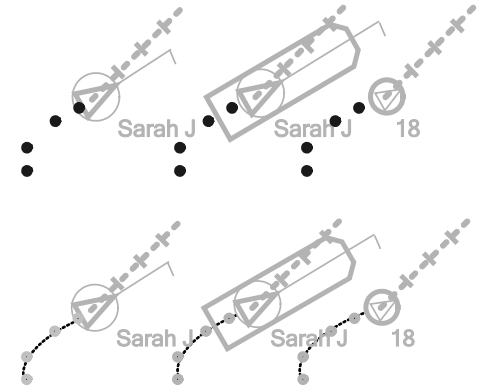
	Symbol name and description	Symbol graphic(s)
2.2 c	Tracked radar targets – Dangerous targets Tracked radar targets designated as dangerous targets may be presented using 5 mm diameter circles, and shall flash until acknowledged by the user. The required colour shall be red. Once acknowledged, the symbols shall cease flashing, but shall still be drawn with the required colour red until the target(s) cease to be a danger.	 (SN243)
2.3	Reference targets Tracked radar targets designated as reference targets shall be labelled with the letter "R" adjacent to the symbol. <i>Multiple reference targets shall be numbered as "R1", "R2", "R3", etc.</i> The reference target labels shall be drawn with the same basic colour used for target symbols.	 (SN243)
2.4	Sleeping AIS targets Sleeping AIS targets shall be presented as acute isosceles triangles oriented to the targets' reported heading (or COG if heading is not reported) and centred at the targets' predicted position. The base of the triangles shall be 3 mm and the height shall be 4,5 mm. The triangles shall be drawn using a thick solid line style with the same basic colour used for target symbols.	 (SN243)
	A sleeping AIS target with <i>neither a reported heading nor COG</i> shall be <i>oriented toward the top of the operational display area</i> and shall include <i>one diagonal line crossed through the symbol</i>. The line shall be drawn using a thick solid line style with the basic colour used for target symbols.	Sleeping AIS target with neither reported heading nor COG:  (SN243)

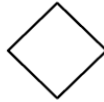
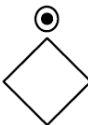
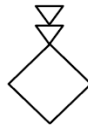
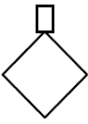
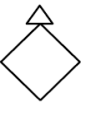
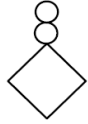
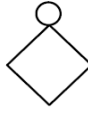
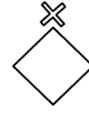
	Symbol name and description	Symbol graphic(s)
2.5 a	Activated AIS targets Activated AIS targets shall be presented as acute isosceles triangles oriented to the targets' reported heading (or COG if heading is not reported) and centred at the targets' predicted position. The base of the triangles shall be 4 mm and the height shall be 6 mm. The triangles shall be drawn using a thick solid line style with the basic colour used for target symbols. <i>An activated AIS target with neither a reported heading nor COG shall be oriented toward the top of the operational display area and shall include one diagonal line crossed through the symbol. The line shall be drawn using a thick solid line style with the basic colour used for target symbols.</i> Activated AIS targets may be labelled. Alphanumeric text used to label AIS targets shall be drawn with the same basic colour as used for target symbols.	 (SN243)
		Activated AIS target with neither reported heading nor COG:  (SN243)
2.5 b	Activated AIS targets – True scaled outlines Alternatively, when own ship is presented as a true scaled outline, the user may select to add true scaled outlines to activated AIS target symbols. True scaled outlines for activated AIS targets shall be drawn around the AIS target symbol triangles relative to the targets' predicted position according to the offsets, beam and length. The outline shall be drawn using a thick solid line style. True scaled outlines for activated AIS targets shall be drawn with the same basic colour used for target symbols. True scaled outlines for individual activated AIS targets shall not be used when a target's heading is not reported, or when the beam of the outline is less than 3 mm.	 (SN243)
2.5 c	Activated AIS targets – Dangerous targets Activated AIS targets designated as dangerous targets may be presented with larger triangles, with a base of 5 mm and a height of 7,5 mm, shall be the required colour red, drawn with a thick solid line and shall flash until acknowledged by the user. Activated AIS targets designated as dangerous targets with neither a reported heading nor COG shall be oriented toward the top of the operational display area and shall include one diagonal line crossed through the symbol. The line shall be drawn using a thick solid line style with the colour red. Once acknowledged, the symbols shall cease flashing but shall still be presented using the required colour red until no longer considered to be a dangerous target. Activated AIS targets designated as dangerous targets may be labelled. Alphanumeric text used to label AIS targets shall be drawn with the colour red, as used for target symbols. The label shall not flash – see IEC 60945:2002, 6.1.5 t).	  (SN243)
		Activated dangerous AIS target with neither a reported heading nor COG:  (SN243)

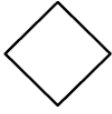
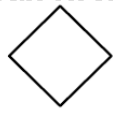
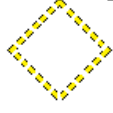
	Symbol name and description	Symbol graphic(s)
2.6	Associated targets – Alternative The user may select to present associated targets (i.e. activated AIS targets associated with tracked radar targets) as either activated AIS target symbols (see symbol 2.5) or tracked radar target symbols (see symbol 2.2). Alternatively, activated AIS target symbols representing associated targets may be modified by circumscribing a circle around the symbols' isosceles triangle. Tracked radar target symbols representing associated targets may be presented with larger diameter circles (up to 5 mm), modified by inscribing an isosceles triangle inside the symbols' circle. The circumscribed circle and inscribed triangle shall be drawn using a thin solid line style with the same basic colour used for target symbols. Associated targets may be labelled. Alphanumeric text used to label associated targets shall be drawn with the same basic colour as used for target symbols.	Associated targets represented by AIS target symbols:  (SN243) Associated targets represented by radar target symbols:  (SN243)
2.7 a	Heading lines Heading lines shall be selected for display for activated AIS targets and associated targets, represented by AIS target symbols. Heading lines shall originate at the apex of the AIS triangle and shall extend not less than 4 mm and at least 4 mm beyond the bow of the true scaled outline when it is used. They shall be drawn using a thin solid line style with the same basic colour as used for target symbols. Heading lines for dangerous AIS targets shall flash with their base symbol until acknowledged by the user. An activated target without a reported heading shall be orientated to the top of the operational display area (see 2.5 a) and when AIS heading is enabled shall not include a heading line.	 (SN243)
2.7 b	Heading lines – Turn indicators The user shall select to display turn indicators for activated AIS targets and associated targets represented by AIS target symbols. Turn indicators shall be presented as a single line extending at least 1 mm but not more than 2 mm perpendicular to the heading line in the direction of turn. The indicator shall be drawn using a thin solid line style with the same basic colour as used for their target symbols. Turn indicators for dangerous targets shall be the required colour red (until no longer dangerous) and shall flash with their symbol until acknowledged by the user.	 (SN243)

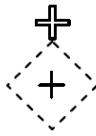
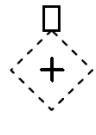
	Symbol name and description	Symbol graphic(s)
2.8 a	Velocity vectors Velocity vectors for targets shall be selected for display. Velocity vectors shall be presented as single lines originating at the targets' tracked/predicted position and extending in the direction of course CTW or COG, as appropriate, for a length representing the distance the target will travel in the time interval used for own ship's velocity vector. Vectors shall be drawn using a thick short-dashed line style with the same basic colour used for target symbols. Velocity vectors for dangerous targets shall be the required red colour and shall flash with their base target symbols until acknowledged by the user. Once acknowledged, the symbols shall cease flashing and unless considered as dangerous, shall assume the basic colour of other non-dangerous target symbols.	Radar target velocity vectors:  (SN243)
		AIS target velocity vectors:  (SN243)
		Associated target velocity vectors:  (SN243)
2.8 b	Velocity vectors – Time increments Time increments may be shown drawn across target velocity vectors. Time increments shall be presented as single lines perpendicular to the vectors with their midpoint on them and extending not more than 1,5 mm on either side. They shall be spaced along the vectors to represent the distance the target will travel in the time increment of the time interval used for own ship's velocity vector. The increments shall be drawn using a thick solid line style with the same basic colour as for target symbols. Time increments for dangerous targets shall be the required red colour and shall flash with their base target symbols until acknowledged by the user. Once acknowledged, the symbols shall cease flashing and unless considered as dangerous, shall use the basic colour of other non-dangerous target symbols.	Radar target time increments:  (SN243)
		AIS target time increments:  (SN243)
		Associated target time increments:  (SN243)

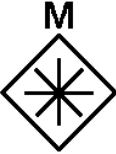
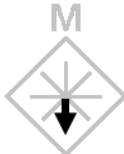
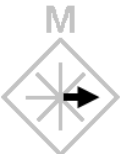
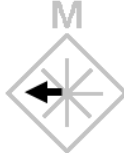
	Symbol name and description	Symbol graphic(s)
2.8 c	Predicted area of dangers Optionally, predicted area of dangers (PADs) may be shown along the path of target velocity vectors. PADs shall be presented as an outline area geographically representing a target's predicted CPA/TCPA violations. (The PAD's shape may be modified by knowledge of own ship manoeuvring characteristics, safety contour limits, etc). PADs shall be oriented in the direction of their velocity vectors. The PADs shall be drawn using a thick solid line style with the same basic colour as their target symbols. PADs for dangerous targets shall flash with their base symbols until acknowledged by the user. When a target is selected, the associated PAD may be highlighted for identification. Note that PADs are shown as an elliptical area which is typical. Presentation of more accurate shapes is not excluded.	Radar target PADs:  Not to scale AIS target PADs:  Not to scale Associated target PADs:  Not to scale
2.8 d	Path predictor Optionally, the user may select to display a path predictor in place of a velocity vector. The <i>path predictor</i> shall be represented as a <i>curved vector</i> originating at the targets' tracked/predicted position and extending along the predicted path over the ground that the target will travel, in the time interval used for the target vector. The path shall be drawn using a thin long-dashed line style with the same basic colour used for target symbols.	AIS target path predictor:  Associated target path predictor: 

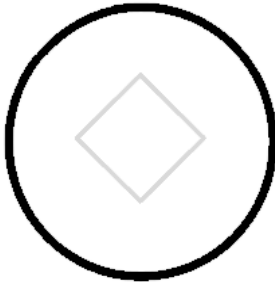
	Symbol name and description	Symbol graphic(s)
2.9	Target past positions Optionally, target past positions may be shown. Past positions shall be presented as a series of small circular symbols of 1 mm diameter. They may be connected by a line drawn from the current tracked or predicted position of the target. The line shall be drawn using a thin short-dashed line style with the same basic colour as their target symbols.	Radar target past positions:  (SN243)
		AIS target past positions:  (SN243)
		Associated target past positions:  (SN243)

	Symbol name and description	Symbol graphic(s)
2.10 a	AIS aids to navigation – Physical Source of physical AIS AtoN is: AIS Message 21, Virtual AtoN Flag = 0, except for case "Missing" MMSI identity range: 99 MID 0000 to 99 MID 9999 Physical AIS aids to navigation (AtoN) shall be presented as an open diamond centred at reported position. The sides of the diamond shall be not more than 6 mm in length. The diamond shall be drawn using a thin solid line style. The basic colour for an "on position" AIS AtoN shall not be yellow or red but may be same as for reported targets. The colour for the diamond of an "off position" AIS AtoN shall be yellow, it shall be drawn using thick solid line style and when used against light background it shall include a black one-pixel outline to improve readability. If available, on radar displays the AIS AtoN shall be drawn indicating the purpose of the AIS AtoN using the "type of aids-to navigation" from AIS Message 21. On displays containing an underlying chart, AIS AtoNs shall be drawn without indication of purpose unless the object is selected in which case, if available, the symbol shall be drawn indicating the purpose of the AIS AtoN. The purpose symbol shall be drawn using same line style and colour as the basic shape of AIS AtoN symbol. The height of the purpose symbol shall be not more than 5 mm in length. When a floating AIS AtoN is off position, this shall be indicated with the yellow text "Off Posn" (AIS AtoN Off-Position Indicator = 1) and the lights off – racon error and light error indications shall not be presented. AIS AtoNs shall indicate an extinguished light with yellow text "Unlit". AIS AtoNs shall indicate failure of Racon with yellow text "Racon err". AIS AtoNs shall indicate light error or combination of light error/off with racon error with yellow text "Error". When used against light background, the yellow text shall include a black one-pixel outline to improve readability. In case there is an indication of purpose, the error text shall be above the indication of purpose. A Synthetic AtoN physically exists, but AIS data information for it is provided remotely. An AtoN is a Synthetic AtoN when "virtual AtoN flag = 0" and "repeat indicator > 0". The absence of a physical AtoN, a state known as "Missing", may be communicated as a combined state of "virtual AtoN flag = 1" and "off position indicator = 1". This shall be indicated with yellow text "Missing" above the diamond using colour yellow. This symbol shall have no crosshair at the position centre. When used against light background the yellow text shall include a black one-pixel outline to improve readability. AIS AtoNs may be labelled with the AtoN name. Alphanumeric text used to label an AIS AtoN shall be the same basic colour as the AIS AtoN symbol. It may be user selectable for the label to include full textual content of the AtoN name or truncated version of the AtoN name, for example only last 3 characters of the AtoN name.	Physical AIS AtoN and related AIS Type of aids-to navigation code and AIS Status bits in parenthesis, where applicable:  Basic shape Default, type not specified (0); Reference point (1); Fixed structure offshore/obstruction (3); Light, without sectors (5); Light, with sectors (6); Leading light front (7); Leading light rear (8); Light vessel/LANBY/Rigs (31)  Racon (2)  Emergency wreck mark (4)  Beacon, Cardinal N (9); Floating, Cardinal Mark N (20)  Beacon, Cardinal E (10); Floating, Cardinal Mark E (21)  Beacon, Cardinal S (11); Floating, Cardinal Mark S (22)  Beacon, Cardinal W (12); Floating, Cardinal Mark W (23)  Beacon, Port hand (13); Beacon, Preferred Channel Port hand (15); Port hand mark (24); Preferred channel port hand (26)  Beacon, Starboard hand (14); Beacon, Preferred Channel Starboard hand (16); Starboard hand mark (25); Preferred channel Starboard hand (27)  Beacon, Isolated danger (17); Isolated danger (28)  Beacon, Safe water (18); Safe water (29)  Beacon, Special mark (19); Special mark (30)

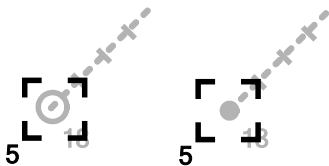
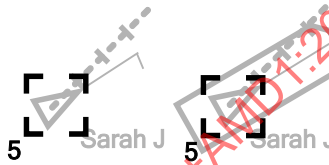
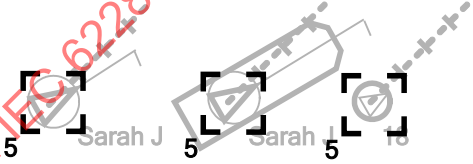
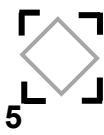
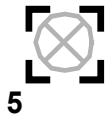
	Symbol name and description	Symbol graphic(s)		
		Off Posn  Off position including any combinations with Lights off/error and/or Racon error	Unlit  Light off (bits 11100101 or 11101101 or 11110101)	Racon err  Racon error (bits 11111001 or 11111011) (SN243)
			Error  Light error or combination of light error/off with racon error (bits 11100111 or 11101111 or 11110111 or 11111101 or 11111111)	
			Missing  Charted AtoN is missing (off position indicator = 1)	(SN243)

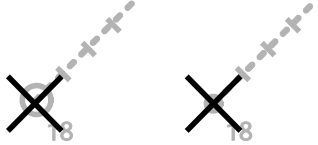
	Symbol name and description	Symbol graphic(s)
2.10 b	AIS aids to navigation – Virtual Source of virtual AIS AtoN is: AIS Message 21, Virtual AtoN Flag = 1, except for case "Missing" MMSI identity range: 99 MID 0000 to 99 MID 9999 Virtual AIS aids to navigation (AtoN) shall be presented as an open diamond with crosshair centred at reported position. The sides of the diamond shall be not more than 6 mm in length. The diamond shall be drawn using a thin dashed line style. The basic colour for a Virtual AIS AtoN is as used for the physical AIS AtoN symbols. If available, the AIS AtoN shall be drawn indicating the purpose of the AtoN using the "type of aids-to navigation" from the AIS Message 21. The purpose symbol shall be drawn using same line style and colour as the basic shape of the AIS AtoN symbol. The height of the purpose symbol shall be not more than 5 mm. AIS AtoN may be labelled with the AtoN name. Alphanumeric text used to label an AIS AtoN shall be the same basic colour as the AIS AtoN symbol. It may be user selectable for the label to include full textual content of the AtoN name or truncated version of the AtoN name, for example only last 3 characters of the AtoN name.	Virtual AIS AtoN and related AIS Type of aids-to navigation code in parenthesis:  Basic shape Default, type not specified (0); Reference point (1); Light, without sectors (5); Light, with sectors (6); Leading light front (7); Leading light rear (8)           Emergency wreck mark (4) Beacon, Cardinal N (9); Floating, Cardinal Mark N (20) Beacon, Cardinal E (10); Floating, Cardinal Mark E (21) Beacon, Cardinal S (11); Floating, Cardinal Mark S (22) Beacon, Cardinal W (12); Floating, Cardinal Mark W (23) Beacon, Port hand (13); Beacon, Preferred Channel Port hand (15); Port hand mark (24); Preferred channel port hand (26) Beacon, Starboard hand (14); Beacon, Preferred Channel Starboard hand (16); Starboard hand mark (25); Preferred channel Starboard hand (27)) Beacon, Isolated danger (17); Isolated danger (28) Beacon, Safe water (18); Safe water (29) Beacon, Special mark (19); Special mark (30)

	Symbol name and description	Symbol graphic(s)
2.10 c	AIS aids to navigation – Mobile Source of mobile AIS AtoN is: AIS Message 21 AtoN Status = Page ID = 101 MMSI identity range: 99 MID 8000 to 99 MID 9999 Mobile AIS aids to navigation (AtoN) shall be presented as an open diamond topped by letter "M" of not more than 2 mm in length or height and a compass rose inside centred at reported/predicted position. The sides of the diamond shall be not more than 6 mm in length. The diamond and the compass rose shall be drawn using a thin solid line style (Virtual AtoN Flag = 0) or a thin dashed line (Virtual AtoN flag = 1). The basic colour for a mobile AIS AtoN is as used for the physical AIS AtoN symbols. Mobile AIS AtoN with known direction of movement shall include an arrow originating from the compass rose centre oriented towards to the reported COG of the mobile AIS AtoN (see AIS AtoN Status bits when Page ID bits = 101 in Table L.1) adjusted to the orientation mode in use. The result from "adjusted to the orientation mode" shall be presented aligned with the closest line of the compass rose. Mobile AIS AtoNs may be labelled with the AtoN name. Alphanumeric text used to label a mobile AIS AtoN shall be the same basic colour as the mobile AIS AtoN symbol. It may be user selectable for the label to include full textual content of the AtoN name or truncated version of the AtoN name, for example only last 3 characters of the AtoN name.	Basic shapes:  Default  Virtual Virtual AtoN Flag = 0 Virtual AtoN Flag = 1 Basic shapes shall use the additional qualifiers below to denote how the AtoN as propelled. Self-propelled, but direction not reported or unavailable (AtoN Status bits 1010111x):   Tethered (AtoN Status bits 1010101x):  If COG information is provided, it shall be presented with an arrow pointed in coarse direction of COG within $\pm 22,5^\circ$ sectors as defined by AtoN Status bits (see Table L.1):   

	Symbol name and description	Symbol graphic(s)
2.10 d	AIS AtoN dimensions – True scaled outline The user may select to present dimensions of physical AIS AtoN type = 3 (Fixed structure offshore/obstruction) and type = 31 (Light vessel/LANBY/Rigs) as a true scaled outline drawn using a thick solid line style with the same basic colour used for AtoN symbols, with the A axis of the ABCD values of the AIS AtoN oriented to True North. Automatic selection of the true scaled outline is permitted (see 5.13.4). The true scaled outline shall only be presented when the largest of the ABCD values is at least 9 mm.	 Outline drawn as a circle when $A = B = C = D > 1$  Outline drawn as a rectangle when $A \neq B$ and $C \neq D$  Outline drawn as a rectangle when $A \neq B$, $C \neq 0$ and $D = 0$

	Symbol name and description	Symbol graphic(s)
2.11	AIS search and rescue transmitter and other devices using AIS burst transmission technology NOTE Also known collectively as "AIS locating devices". Sources of AIS locating devices are: • AIS-SART use MMSI identity range 970 00 0000 to 970 99 9999, • AIS MOB use MMSI identity range 972 00 0000 to 972 99 9999, • EPIRB-AIS use MMSI identity range 974 00 0000 to 974 99 9999. Valid MMSI for AIS locating devices are defined in ITU-R 585. Care should be taken to ensure that possible future expansions of the MMSI identity ranges do not affect the correct presentation, if such decision is taken by ITU. Such MMSI identity range expansion might be AIS-SART up to 971 99 9999, AIS MOB up to 973 99 9999, EPIRB-AIS up to 975 99 9999. Active AIS locating devices shall be presented as a 8 mm diameter circle with a cross inside drawn with a solid line. The symbol shall use the same basic colour as the AIS AtoN symbols. Test versions of AIS locating devices shall include label "TEST" in lower right-hand side of the symbol. The symbol and labels shall be drawn using a solid line style and shall use the same basic colour as the AIS AtoN symbols. AIS locating device symbol has no associated speed or course vector.	Active AIS locating device  (SN243) AIS locating device under test 

	Symbol name and description	Symbol graphic(s)
2.12	Selected object <i>Selected object symbols shall be presented as broken squares indicated by their corners, centred on the selected object symbol by the user and clearly extending beyond it. The squares shall be drawn using a dashed line.</i> If the selected symbol is presented with the addition of symbol 5.16, symbol 2.12 shall be sized to encompass both the selected symbol and symbol 5.16. Alphanumeric text used to label a selected object shall be the same basic colour as the selected object symbol. The selected object symbol can be used, for example, for selected radar targets, selected AIS targets, selected associated targets, selected AIS ATON, selected AIS locating device, selected AIS SAR aircraft, selected AIS SAR vessel, selected waypoint, etc. This selected object symbol can be used for objects based on point geometry.	Selected radar targets:  (SN243) Selected AIS targets:  (SN243) Selected associated targets:  (SN243) Selected AIS ATON:  (SN243) Selected AIS locating device:  (SN243)

	Symbol name and description	Symbol graphic(s)
2.13	Lost targets, AIS SAR vessels, AIS ATONs and AIS locating devices <i>Lost target, AIS SAR vessel, AIS ATON and AIS locating device symbols shall be presented as crossed lines centred on the target symbol and extending at least 2 mm but not more than 3 mm beyond the symbol. The cross shall have a fixed orientation. The lines shall be drawn using a thick solid line style and shall flash with the required colour red until acknowledged by the user. The triangle of AIS target symbol shall be oriented per last known value. The lost target shall be displayed without vector, heading and rate of turn indication.</i> Once acknowledged, the lost target, AIS SAR vessel, AIS AtoN or AIS locating device symbol and its target, AIS SAR vessel, AIS AtoN or AIS locating device symbol shall be removed from the display.	Lost radar targets:  (SN243)
		Lost AIS targets:  (SN243)
		Lost associated targets:  (SN243)
		Lost AIS ATON:  (SN243)
		Lost AIS locating device:  (SN243)