

INTERNATIONAL STANDARD

NORME INTERNATIONALE



**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**

**Matériels et systèmes de navigation et de radiocommunication maritimes –
Présentation des informations relatives à la navigation sur des affichages de
navigation de bord – Exigences générales, méthodes d'essai et résultats d'essai
exigés**



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

This standard supports the performance standards for the presentation of navigation-related information on shipborne navigational displays, adopted by the IMO in resolution MSC.191(79) in December 2004.

This second edition cancels and replaces the first edition published in 2008 and constitutes a technical revision.

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

- References to IBS have been removed as IMO has revoked MSC.64(67) Annex 1:1996, Performance standards for integrated bridge systems (IBS).

- Subclause 4.9 (Alerts and indicators) has been revised to align the requirements with the IMO resolutions MSC.252(83), MSC.302(87) and A.1021(26) published since MSC.191(79), together with a new Annex F for alert related icons.
- Clause 5 (Presentation of operational information) has been revised with a new requirement added for merging AIS targets from multiple sources.
- Test methods have been reviewed and further guidance on testing added to Annex D. A new normative Annex G has been added for testing of colours, intensity and flicker.
- Annex A (Presentation of colours and symbols) has been revised with AIS AtoN symbols, AIS-SART symbol and wheel over position symbol redefined, and new symbols added for AIS SAR aircraft, AIS SAR vessel, MSI and AIS application specific messages.

This bilingual version (2017-06) corresponds to the English version, published in 2014-07.

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

FDIS	Report on voting
80/733/FDIS	80/738/RVD

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

The French version of this standard has not been voted upon.

NOTE All text in this standard 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.).

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

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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 International Standard 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) and MSC.302(87).

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. 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 62065, *Maritime navigation and radiocommunication equipment and systems – Track control systems – Operational and performance requirements, methods of testing and required test results*

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

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

IHO S-52 Annex A, *IHO ECDIS presentation library*

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.1:2014, *Guidelines for the presentation of navigation related symbols, terms and abbreviations*

IMO MSC.252(83):2007, *Performance standards for integrated navigation systems (INS)*

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

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

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

3 Terms and definitions

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

3.1

activated AIS target

(MSC191/A) *target activated for the display of additional graphically presented information*

EXAMPLE Heading line, velocity vector, etc.

3.2

automatic identification system

AIS

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

3.3

AIS target (or reported AIS target)

(MSC191/A) *target generated from an AIS message*

3.4

alarm

(MSC.302/A) *a high-priority alert. Condition requiring immediate attention and action by the bridge team, to maintain the safe navigation of the ship*

3.5

alert

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

3.6

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*

3.7

brilliance

adjustment of luminance of a display for ambient light

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

3.8

caution

(MSC.302/A) *lowest priority of an alert. 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*

3.9**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.

3.10**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

3.11**dangerous target**

(MSC191/A) *tracked radar or reported AIS target with a predicted CPA and TCPA that violates values preset by the user. The respective target is marked by a “dangerous target” symbol*

3.12**dead-reckoned position****DR**

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

3.13**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. It is not intended to be sufficient for safe navigation*

3.14**display equipment**

device capable of representing information visually

3.15**doubtful integrity**

state when integrity cannot be verified

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

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

3.17**electronic chart information**

one or more electronic chart databases

EXAMPLE ENC.

3.18**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*

3.19

emergency alarm

(MSC.302/A) *highest priority of an alert. Alarms which indicate immediate danger to human life or to the ship and its machinery exists and require immediate action*

3.20

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 selected by the operator

3.21

fix

position of own ship determined, without reference to any former position, by the common intersection of two or more LOPs

3.22

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*

3.23

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.

3.24

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.

3.25

indication

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

3.26

integrated navigation system

INS

system which complies with the requirements set forth in IMO Resolution MSC.252(83)

3.27

integrity

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

3.28

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

3.29**lost target**

(MSC191/A) tracked radar or reported AIS *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.

3.30**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

3.31**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.

3.32**operational display area**

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

3.33**past positions**

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

3.34**permanent**

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

3.35**persistent**

property of information as existing continuously

3.36**radar**

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

3.37**radar echo**

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

3.38**radar video image**

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

Note 1 to entry: For example, scan-to-scan correlation.

3.39**readily available**

property of information as being directly accessible

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

3.40

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. The target is represented by a "selected target" symbol*

3.41

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*

3.42

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*

3.43

sleeping AIS target

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

3.44

standard display

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

3.45

target tracking system

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

3.46

task-at-hand

specific navigation-related activity performed by a user

Note 1 to entry: For example, route planning, route monitoring, target tracking, collision avoidance, etc.

3.47

tracked radar target

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

3.48

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*

3.49

user-added electronic chart information

electronic chart information manually entered by the user for presentation

Note 1 to entry: For example, navigational notes, safety zones of interest, local notices to mariners, etc.

3.50**user-configured presentation**

(MSC191/A) auxiliary presentation configured by the user for a specific task-at-hand. The presentation may include radar and/or electronic chart information, in combination with other navigational or ship related data

3.51**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

3.52**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

3.53**warning**

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

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.

(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 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 standard are equal.

(MSC191/2) IMO resolution MSC.191(79) 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 standard 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 standard 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 standard *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 Clauses 4 and 7, respectively, of this standard 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 62388, etc.). Where a requirement in this standard 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 standard.

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 standard, 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

4.3.1.1 Requirement

(MSC191/5.1.1) *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. 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.*

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 Natural daylight is preferred for the day and dusk conditions.	

NOTE 1 The “Day” colour table provided in the IHO ECDIS Presentation Library uses a white background that may not support readability under all light conditions and may be a risk to safety of navigation for some navigational systems and equipment, including radar. Readability may 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 and

$L_{\max}$ 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.

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 standard. 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 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 cd/m² 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:

- a) confirm by observation that alphanumeric data and text is presented using non-italic, sans-serif font;
- b) 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.

4.4.3 Presentation of text

4.4.3.1 Requirement

(MSC191/5.2.3) *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.*

4.4.3.2 Methods of test and required results

The methods of test and the required results 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;
- c) confirm by inspection of documented evidence that another terminology or abbreviation, if used, are explained in the operator's manual.

4.4.4 Icons

4.4.4.1 Requirement

(MSC191/5.2.4) *When icons are used, their purpose shall be intuitively recognized by appearance, placement, and grouping.* (See also ISO 80416-4).

Icons used for data and control functions shall be presented according to Annex E. Icons used for the presentation of alerts shall be presented according to Annex F.

4.4.4.2 Methods of test and required results

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

- a) confirm by analytical evaluation that icons and their purpose can be intuitively recognized by appearance, placement, and grouping;
- b) confirm by observation that icons used for data and control function are presented according to Annex E;
- c) 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 for the IHO ECDIS Presentation Library in IHO S-52 and its Appendices, or an equivalent set of colour tables, as far as practical.

NOTE The “Day” colour table provided in the IHO ECDIS Presentation Library uses a white background that may not support readability under all light conditions and may be a risk to safety of navigation for some navigational systems and equipment, including radar. Readability may 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 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 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.

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, 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.

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 vector format electronic chart information shall comply with or be based upon the symbols specified for the IHO ECDIS Presentation Library in IHO S-52 and its Appendices, or an equivalent symbol set, as far as practical.*

NOTE Some symbols provided in the IHO ECDIS Presentation Library may not be 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 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 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 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 chart information are presented in accordance with IHO S-52 and its Appendices;
- b) where symbols deviate from the IHO 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 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 ECDIS Presentation Library symbols.

4.7 Colour coding of information

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).

4.7.2.2 Methods of test and required results

Confirm by inspection of documented evidence that the colour red is used to indicate an alarm or emergency alarm condition unless otherwise specified by the IMO.

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:

- a) confirm by inspection of documented evidence that the colour coding is always combined with another symbol attribute;
- b) 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 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 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):*

(MSC 302/7.6.2) *An unacknowledged warning shall be:*

- 1) *repeated as a warning after a limited time period not exceeding 5 min; or*
- 2) *changed to alarm priority after a limited time period not exceeding 5 min; or*
- 3) *changed to alarm priority after a user selectable time not more than 5 min, if provided; or*
- 4) *changed to alarm priority, as required by specific requirements for the individual equipment and system.*

Table 2 – Operational status

Status	Visual Indication	Audible Signal
Emergency alarm	As specified in Table 7.1.1 of the Code on Alerts and Indications 2009 (IMO resolution A.1021(26))	As specified in Tables 7.1.1 and 7.2 of the Code on Alerts and Indications 2009 (IMO resolution A.1021(26))
Alarm, not acknowledged	Red, Flashing	Accompanied by an audible signal, as 3 short audible signals repeated every 7 s to 10 s
Alarm, silenced	Red, Flashing	Silent
Alarm, acknowledged	Red	Suppression of audible signal (= silent)
Invalid information	Yellowish orange	Silent
Information with low integrity	Yellow	Silent
Warnings, not acknowledged	Yellowish orange, Flashing	Accompanied by an audible signal, as 2 short audible signals, to be repeated at least once per 5 min or be replaced by an alarm.
Warnings, silenced	Yellowish orange, Flashing	Silent
Warnings, acknowledged	Yellowish orange	Silent
Caution	Yellow	Silent
Important Indications	Yellow	Silent
Indication	No special requirement	Silent
Normal State	Optionally Green	Silent

NOTE Code on Alerts and Indications 2009 (IMO resolution A.1021(26)) specifies frequency range (in 5.11) and sound pressure level (in 5.13) for audible signal.

4.9.1.2 Method of test and required results

Confirm by inspection of documented evidence that alerts and indications are presented in accordance with Table 2.

NOTE Alert management for integrated navigation systems is described in detail in IEC 61924-2.

4.9.2 List of alerts

4.9.2.1 Requirement

(MSC191/5.7.2) *A list of alerts shall be provided based on the sequence of occurrence. Additional indication of priority, as set by the user, shall be provided on displays that present alerts from multiple sources. Alerts that have been acknowledged and are no longer relevant shall be deleted from the list of alerts, but may be retained in an alert history list.*

4.9.2.2 Methods of test and required results

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

- a) confirm by observation that the display equipment provides a sequential list of alerts;
- b) where display equipment supports the presentation of alerts from multiple sources (for example, from multiple navigational systems and equipment):
 - 1) confirm by observation that there is the capability for the user to set a priority for the alerts;
 - 2) confirm by observation that an indication of priority is included in the list of alerts;

- c) confirm by analytical evaluation that acknowledged alerts which are no longer relevant are deleted from the list of alerts.

4.9.3 Alert related information from multiple sources

4.9.3.1 Requirement

(MSC191/5.7.3) *If a single display is used to present alert related information from multiple navigational systems and equipment, then the presentation of alerts and indications shall be consistent for the display of:*

- *the time of alert occurrence,*
- *the cause of the alert,*
- *the source of the alert, and*
- *the status of the alert (for example, acknowledged, not acknowledged).*

4.9.3.2 Methods of test and required results

Where display equipment supports the presentation of alerts and indications from multiple navigational systems and equipment, confirm by observation that the presentation of alert related information is consistent with respect to the time of alert occurrence, the cause of the alert, the source of the alert, and the status of the alert.

4.9.4 Speech output for alarms and warnings

4.9.4.1 Requirement

(MSC 302/7.3.2.3) *An unacknowledged alarm condition may be accompanied by speech output presented at least in English, using harmonized alert voice messages according to the regulations of the Organization.*

(MSC 302/7.4.2.3) *An unacknowledged warning condition may be accompanied by speech output presented at least in English, using harmonized alert voice messages according to the regulations of the Organization.*

(MSC 252/20.2.2) *The visual announcement and speech output shall occur simultaneously. The audio signal shall be announced before the speech output.*

NOTE IEC 60945:2002, 4.2.1.6 contains generic requirements for voice announcements.

The speech output shall only announce the visually indicated unacknowledged alert(s) which will be acknowledged by the next operation of the alert acknowledge. The speech output may announce them individually or may announce that multiple alerts are present.

The speech output shall be followed by at least a 2 s pause before repetition or new announcement. For alarms the speech output shall be repeated for every second cycle.

If a new higher priority alert arrives during speech output of a lower priority alert then the lower priority alert shall be interrupted to allow audio signal as defined in Table 2 to occur before the speech output of the new higher priority alert.

The speech output shall be interrupted when the associated alert is acknowledged.

The speech output shall use plain language using marine terminology as defined in SMCP (see IMO A.918(22)), as appropriate. The speech output shall be clearly understandable.

The volume shall be adjustable from 85 dB(A) at 1 m to extinction without affecting the sound pressure level of the audible alert signal.

Failure of the speech output shall not degrade operation of visual indication. Failure of the speech output shall not degrade operation of audible alert signal except when common components are used for both audible signals and speech output.

4.9.4.2 Methods of test and required results

If speech output is provided, confirm by observation that:

- the audio signal as defined in Table 2 occurs before the speech output;
- for alarms the same speech is repeated as long as the alarm is unacknowledged;
- for warnings the same speech is repeated only when repeating the warning based on requirement 4.9.1.1;
- the speech output only announce visually indicated unacknowledged alerts which can be acknowledged by the next operation of the alert acknowledge;
- the speech output has at least a 2 s pause before repetition or a new announcement and the speech output for alarms is repeated for every second cycle;
- the speech output of a lower priority alert is interrupted when a new higher priority alert arrives;
- the speech output is interrupted when the associated alert is acknowledged;
- it is possible to adjust the speech volume to extinction without affecting the audible signal.

If speech output is provided, confirm by analytic evaluation that:

- speech output is at least in plain English language, using marine terminology conforming with the SMCP (see IMO A.918(22)) where appropriate;
- announcements are clearly understandable at the maximum loudness level.

If speech output is provided, follow manufacturer's instructions and cause failure of the speech output. Confirm by observation that visual indication and audible signal remain as defined in Table 2.

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.).

NOTE The indication of chart projection is only required when electronic chart information is presented. It may 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 system or 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 this clause are applicable to displays on the bridge of a ship that provide functionality as described in the following subclauses.

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 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, 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, 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 chart 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 or 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, as far as is practicable.*

(MSC191/6.2.2) *The presentation of proprietary electronic chart information shall comply with or 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, as far as practical. 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 or 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, as far as practical.*

NOTE Some colours and symbols provided in the IHO ECDIS Presentation Library or otherwise specified by IHO in S-52 and its Appendices may not be 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 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) verify by observation that the presentation of official and user-added electronic chart information, as applicable, is in accordance with 4.5.1 and 4.6.2;

- b) where the presentation of proprietary electronic chart information is not in accordance with 4.5.2, confirm by observation 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 The colour tables specified by IHO and provided in IHO ECDIS Presentation Library include a “Day” table based on a white background that may not support readability under daylight conditions and may be a risk to safety of navigation for some navigational systems and equipment, including radar. Readability under daylight conditions may 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.

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 should comply with 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.

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.

If display equipment provides facilities for radar target detection and tracking that are independent of a shipborne radar system, then the facilities should comply with 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.

An AIS target may be repeated or VTS-generated (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.

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.*

(MSC191/6.4.2.2) *There shall be an indication when the target tracking and/or reported target processing/display capacity have been exceeded.*

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

5.5.3.2 Methods of test and required results

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 measurement that it provides an indication 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 measurement that it provides an indication that the tracked radar target display capacity has been exceeded when the number of tracked radar targets presented exceeds 100 % of the display capacity.
- b) Where display equipment provides the capability to connect to an AIS:
 - 1) confirm by measurement that it provides an indication 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 measurement that it provides an indication that the reported AIS target display capacity has been exceeded when the number of reported AIS targets presented exceeds 100 % of the display capacity.

5.5.4 Merging AIS targets from multiple source

5.5.4.1 Requirement

AIS Base Stations may relay or 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 relayed and direct AIS reports are received for the same target, the relayed reports shall not be processed for display of AIS target or information.

An AIS target may be VTS-generated (AIS ASM(17)) as described in IMO SN.1/Circ.289. If both VTS-generated and direct AIS reports are received for the same target (MMSI, IMO-number, call sign), the VTS-generated reports shall not be processed for display of AIS target or information.

If both VTS-generated and relayed AIS reports are received for the same target, the relayed reports shall not be processed for display of AIS target or information.

If multiple relayed AIS reports are received for the same target, the report with the highest repeat count shall not be processed for display of AIS target or information.

If direct and VTS-generated AIS target information are both available as not merged by MMSI, IMO-number or Call sign AIS information and where the direct and VTS-generated targets are considered as one target, then the direct AIS target shall be automatically used and displayed as set forth in Annex A.

5.5.4.2 Methods of test and required results

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

- a) confirm by analytical evaluation and using the AIS simulator to produce AIS reports for a nearby AIS target moving at 24 kn and relayed 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 relayed data is not displayed;
- b) confirm by analytical evaluation and using the AIS simulator to produce AIS reports for a nearby AIS target moving at 24 kn and VTS-generated AIS reports with equal MMSI for this target, that the VTS-generated data is not displayed;
- c) confirm by analytical evaluation and using the AIS simulator to produce VTS-generated AIS reports with equal MMSI for a nearby AIS target moving at 24 kn and relayed 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 relayed data is not displayed;
- d) confirm by analytical evaluation and using the AIS simulator to produce two or more relayed VTS-generated AIS reports with equal MMSI for a nearby AIS target moving at 24 kn and two or more relayed AIS reports for this 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;
- e) confirm by analytical evaluation and using the AIS simulator to produce AIS reports for a nearby AIS target moving at 24 kn and VTS-generated AIS reports with target identifier set as 3 (other) for this target, that the VTS-generated data is not 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 or AIS target class A/B, 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.

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

It shall be possible to filter the presentation of AIS data reports other than sleeping AIS targets (for example, AIS AtoN (aids to navigation), AIS Base Station, AIS-SART, AIS SAR Aircraft).

(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;
- b) confirm by observation that the user can filter the presentation of AIS data reports;
- c) confirm by observation that an indication is provided when sleeping targets are filtered from the presentation;
- d) confirm by observation that the indication remains while the filter is active;
- e) confirm by analytical evaluation that the filter criteria in use is readily available;
- f) 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).*

If display equipment provides facilities for the calculation of CPA/TCPA that are independent of a shipborne radar target tracking system, then the facilities should comply with 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 sleeping AIS targets entering a zone are activated;
- d) confirm by observation that sleeping AIS targets 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 either as sleeping or activated.*

(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. If the heading information is not received, the orientation of the AIS symbol shall be aligned to the reported course over ground (COG). 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.*

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 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 aligning to the reported COG;
- i) confirm by observation that the turn or rate of turn (ROT) flag and/or the path prediction 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.

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).

If display equipment provides facilities for the calculation of CPA/TCPA that are independent of a shipborne radar target tracking system, then the facilities should comply with 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, VTS-generated, etc.);
- *target identification* (for example, MMSI, call sign, ship's name, etc.);
- *reported position and where available its quality;*
- *calculated range of target;*
- *calculated bearing of target;*
- *calculated CPA;*
- *calculated TCPA;*
- *reported COG (or calculated course of target if the sea is stabilised);*
- *reported SOG (or calculated speed of target if the sea is stabilised);*
- *reported navigational status.*

Target heading and reported rate of turn (ROT) shall also be made available. All additional target information, where available from the same MMSI source (including for example most recent AIS safety messages), 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, 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.*

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

5.5.11.2 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;

- b) confirm by observation that additional 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.

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 is selected for information display or, if applicable, until the user dialogue area is closed.*

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 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.*

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.)*

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 Annex F.

5.6.1.2 Methods of test and required results

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

Confirm by observation that if icons are additionally provided that they conform to Annex F (see also 4.4.4.2).

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.*

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

5.6.2.2 Methods of test and required results

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

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.

Other navigational systems and equipment that provide remote presentation of tracked radar targets shall not provide warnings and indications associated with acquisition zones.

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

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 should comply with 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) verify that the zones are presented with their relevant symbology in accordance with 5.5.7;
- 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 the IEC 61162 series of standards.

- c) confirm by observation that radar targets in acquisition state are presented in accordance with Annex A;
- d) verify 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 reported/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.*

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 is lost, a warning is given and the last reported/predicted position is clearly marked by the lost target symbol in accordance with Annex A;
- b) 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;
- c) confirm by observation that a means or method is provided to enable/disable the lost target warning function;
- d) 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;
- e) 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 Target association

5.7.1.1 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.*

If the radar target tracking system distributes tracked radar target data that identifies associated targets including the MMSI for the associated AIS target, then other navigational systems and equipment displaying these targets may display them as a single target according to Annex A. Where these systems and equipment also receive reported targets directly from AIS, they shall filter the display of the reported AIS targets using the MMSI to avoid duplicated targets.

(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.*

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 should comply with the relevant clauses of IEC 62388.

5.7.1.2 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;
- c) where the equipment also receives reported targets directly from an AIS, confirm by observation that it filters the display of reported AIS targets to avoid duplicated targets.

5.7.2 AIS presentation status

5.7.2.1 Requirement

(MSC191/6.4.9) *The AIS presentation status shall be indicated as follows in Table 3.*

Table 3 – AIS status

<i>Function</i>	<i>Cases to be Presented</i>		<i>Presentation</i>
AIS ON/OFF	<i>AIS processing switched ON/ graphical presentation switched OFF</i>	<i>AIS processing switched ON/ graphical presentation switched ON</i>	<i>Alphanumeric or graphical</i>
<i>Filtering of sleeping AIS targets (See 5.5.5.)</i>	Indicate whether the <i>filter status</i> for sleeping AIS targets is switched ON	Indicate whether the <i>filter status</i> for sleeping AIS targets is switched ON	Indications may be <i>alphanumeric or graphical</i>
<i>Activation of targets (See 5.5.6)</i>		Indicate the <i>activation criteria</i> is for AIS targets, including automatic activation zones	Indications shall be <i>graphical</i>
<i>CPA/TCPA alarm (See 5.6.2)</i>	Indicate whether the CPA/TCPA Alarm <i>function</i> is switched ON/OFF Indicate the <i>CPA/TCPA Criteria</i> Indicate whether <i>Sleeping AIS targets</i> are <i>included</i> or excluded from CPA/TCPA processing	Indicate whether the CPA/TCPA Alarm <i>function</i> is switched ON/OFF Indicate the <i>CPA/TCPA Criteria</i> Indicate whether <i>Sleeping AIS targets</i> are <i>included</i> or excluded from CPA/TCPA processing	Indications shall be <i>alphanumeric and graphical</i>
<i>Lost target warning (See 5.6.4)</i>	Indicate whether the Lost Target Warning <i>function</i> is switched ON/OFF Indicate the <i>Lost target Filter Criteria</i>	Indicate whether the Lost Target Warning <i>function</i> is switched ON/OFF Indicate the <i>Lost target Filter Criteria</i>	Indications shall be <i>alphanumeric and graphical</i>
<i>Target association (See 5.7.1)</i>	Indicate whether the Target Association <i>function</i> is switched ON/OFF Indicate the <i>Association Criteria</i> Indicate the <i>Default Target Priority</i>	Indicate whether the Target Association <i>function</i> is switched ON/OFF Indicate the <i>Association Criteria</i> Indicate the <i>Default Target Priority</i>	Indications shall be <i>Alphanumeric</i>
This table is a simplified matrix for the presentation of indications associated with AIS functions.			

5.7.2.2 Methods of test and required results

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

- a) verify the filtering of sleeping AIS targets in accordance with 5.5.6;
- b) verify the activation of AIS targets in accordance with 5.5.7;
- c) verify CPA/TCPA alarm functionality in accordance with 5.6.2;
- d) verify lost target warning functionality in accordance with 5.6.4;
- e) verify the association of AIS targets to tracked radar targets in accordance with 5.7.1.

5.7.3 Trial manoeuvre

5.7.3.1 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.*

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

5.7.3.2 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.

5.8 Measurement

5.8.1 Measurement from own ship

5.8.1.1 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.

5.8.1.2 Methods of test and required results

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

- a) confirm by observation that the 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 that displayed data is changing accordingly but data transmitted via the interface remains referenced to the CCRP.

5.8.2 Bearing and range measurements

5.8.2.1 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.

5.8.2.2 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.

5.9 Navigation tools

5.9.1 General requirements

This subclause 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.

5.9.2 Range rings

5.9.2.1 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.)

5.9.2.2 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.

5.9.3 Variable range marker (VRM)

5.9.3.1 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.

5.9.3.2 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.

5.9.4 Bearing scale

5.9.4.1 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.

5.9.4.2 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.

5.9.5 Electronic bearing line (EBL)

5.9.5.1 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).

5.9.5.2 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.

5.9.6 Parallel index lines (PI)

5.9.6.1 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.

5.9.6.2 Methods of test and required results

Where parallel index lines are provided:

- confirm by observation that parallel index lines are presented in accordance with Annex A;
- confirm by observation that a means or method is provided to truncate the length of each PI line;
- confirm by observation that PI lines are selectable for display on/off individually and as a group including all PI lines;
- confirm by measurement that a means or method is provided to set the bearing or range of a parallel index line within 5 s;
- confirm by observation that means are provided to display the bearing and range for any parallel index line on demand;
- 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.

5.9.7 Offset measurement of range and bearing

5.9.7.1 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° 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.