



BSI Standards Publication

**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**

National foreword

This British Standard is the UK implementation of EN IEC 62288:2022+A1:2024. It is identical to IEC 62288:2021, incorporating amendment 1:2024. It supersedes BS EN IEC 62288:2022, which will be withdrawn on 31 Dcember 2027.

The start and finish of text introduced or altered by amendment is indicated in the text by tags. Tags indicating changes to IEC text carry the number of the IEC amendment. For example, text altered by IEC amendment 1 is indicated by A1 A1.

The UK participation in its preparation was entrusted to Technical Committee EPL/80, Maritime navigation and radiocommunication equipment and systems.

A list of organizations represented on this committee can be obtained on request to its committee manager.

Contractual and legal considerations

This publication has been prepared in good faith, however no representation, warranty, assurance or undertaking (express or implied) is or will be made, and no responsibility or liability is or will be accepted by BSI in relation to the adequacy, accuracy, completeness or reasonableness of this publication. All and any such responsibility and liability is expressly disclaimed to the full extent permitted by the law.

This publication is provided as is, and is to be used at the recipient’s own risk.

The recipient is advised to consider seeking professional guidance with respect to its use of this publication.

This publication is not intended to constitute a contract. Users are responsible for its correct application.

© The British Standards Institution 2024
Published by BSI Standards Limited 2024

ISBN 978 0 539 31335 2
ICS 47.020.70

Compliance with a British Standard cannot confer immunity from legal obligations.

This British Standard was published under the authority of the Standards Policy and Strategy Committee on 31 March 2022.

Amendments/corrigenda issued since publication

Date	Text affected
31 December 2024	Implementation of IEC amendment 1:2024 with CENELEC endorsement A1:2024

English Version

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
(IEC 62288:2021)

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
(IEC 62288:2021)

Navigations- und Funkkommunikationsgeräte und -systeme
für die Seeschifffahrt - Darstellung von
navigationsbezogenen Informationen auf
Navigationsanzeigen für Schiffe - Allgemeine
Anforderungen, Prüfverfahren und geforderte
Prüfergebnisse
(IEC 62288:2021)

This European Standard was approved by CENELEC on 2022-01-24. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.



European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

European foreword

The text of document 80/1013/FDIS, future edition 3 of IEC 62288, prepared by IEC/TC 80 "Maritime navigation and radiocommunication equipment and systems" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN IEC 62288:2022.

The following dates are fixed:

- latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2022-10-24
- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2025-01-24

This document supersedes EN 62288:2014 and all of its amendments and corrigenda (if any).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CENELEC shall not be held responsible for identifying any or all such patent rights.

Any feedback and questions on this document should be directed to the users' national committee. A complete listing of these bodies can be found on the CENELEC website.

Endorsement notice

The text of the International Standard IEC 62288:2021 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following notes have to be added for the standards indicated:

61162 (series)	E Harmonized as EN IEC 61162-460 (series)
61924-2	E Harmonized as EN IEC 61924-2
61993-2	E Harmonized as EN IEC 61993-2
62065	E Harmonized as EN 62065

European foreword to Amendment 1

The text of document 80/1117/CDV, future edition 3 of IEC 62288/AMD1, prepared by TC 80 "Maritime navigation and radiocommunication equipment and systems" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN IEC 62288:2022/A1:2024.

The following dates are fixed:

- latest date by which the document has to be implemented at national (dop) 2025-12-31 level by publication of an identical national standard or by endorsement
- latest date by which the national standards conflicting with the (dow) 2027-12-31 document have to be withdrawn

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CENELEC shall not be held responsible for identifying any or all such patent rights.

Any feedback and questions on this document should be directed to the users' national committee. A complete listing of these bodies can be found on the CENELEC website.

Endorsement notice

The text of the International Standard IEC 62288:2021/AMD1:2024 was approved by CENELEC as a European Standard without any modification.

Annex ZA
(normative)

Normative references to international publications
with their corresponding European publications

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

NOTE 1 Where an International Publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

NOTE 2 Up-to-date information on the latest versions of the European Standards listed in this annex is available here: www.cenelec.eu.

Publication		D
60945	Time navigation and communication equipment and systems - General requirements - Methods of testing and required test results	60945
61174	Time navigation and communication equipment and systems - Electronic chart display and information system (ECDIS) - Operational and performance requirements, methods of testing and required test results	61174
61966-4	Media systems and equipment - Part 4: Equipment using liquid crystal display panels	61966-4
62388	Time navigation and communication equipment and systems - Shipborne radar - Performance requirements, methods of testing and required test results	62388
62923-1	Time navigation and communication equipment and systems - Bridge alert management - Part 1: Operational performance requirements, methods of testing and required test results	IEC 62923-1
3-52	Recommendations for chart content and display aspects of ECDIS Seafarers' Training, Certification and Document Keeping Code (STCW Code)	

IMO A.694(17)	General requirements for shipborne radio equipment forming part of the global maritime distress and safety system (GMDSS) and for electronic navigational aids	-
IMO MSC.191(79)	Performance standards for the presentation of navigation-related information on shipborne navigational displays	-
IMO MSC.192(79)	Performance standards for radar equipment	-
IMO MSC.232(82)	Revised performance standards for electronic chart display and information systems (ECDIS)	-
IMO SN.1/Circ.24	Guidelines for the presentation of navigation related symbols, text and abbreviations	-
+ Corr.1		-
IMO SN.1/Circ.28	Guidance on the use of AIS at specific messages	--
IMO MSC.302(87)	Performance standards for Bridge Management (BAM)	-
IMO MSC.1/Circ.	Guidelines for the standardization of user interface design for navigational equipment	-
IMO A.1021(26)	Code on Alerts and Indications	-
VESA-2001-6	Flat Panel Display Measurement Method (FPDM)	-

CONTENTS

FOREWORD.....	9
INTRODUCTION to Amendment 1	11
1 Scope.....	12
2 Normative references	12
3 Terms, definitions and abbreviated terms	13
3.1 Terms and definitions.....	13
3.2 Abbreviated terms.....	20
4 General requirements for all displays on the bridge of a ship	20
4.1 Relationship to IMO standards	20
4.2 Application of IEC 60945.....	22
4.2.1 Remark.....	22
4.2.2 General requirements	22
4.3 Arrangement of information.....	22
4.3.1 Consistency of layout and logical grouping	22
4.3.2 Consistent presentation of information	23
4.3.3 Separation of operational display area	23
4.4 Readability.....	23
4.4.1 Readability under all ambient light conditions	23
4.4.2 Legibility of alphanumeric data and text	26
4.4.3 Presentation of text and icons.....	26
4.5 Colours and intensity	27
4.5.1 Discrimination of colours – Requirement.....	27
4.5.2 Methods of test and required results	28
4.6 Symbols.....	28
4.6.1 Operational information	28
4.6.2 Electronic chart information	29
4.7 Colour coding	30
4.7.1 Colour coding for discrimination.....	30
4.7.2 Colour coding of information	30
4.7.3 Colour coding in combination with other attributes	30
4.7.4 Flashing of information	30
4.8 Integrity marking	31
4.8.1 Indication of source, validity and integrity status	31
4.8.2 Colour coding of validity and integrity	31
4.8.3 Indication of presentation failure	31
4.9 Alerts and indications.....	32
4.9.1 Operational status	32
4.9.2 List of alerts.....	32
4.9.3 Alert related information from multiple sources	32
4.9.4 Speech output for alarms and warnings	32
4.10 Presentation mode.....	32
4.10.1 Requirement.....	32
4.10.2 Methods of test and required results	33
4.11 User manuals, instructions and reference guides	33
4.11.1 Requirement.....	33
4.11.2 Methods of test and required results	33
5 Presentation of operational information	33

5.1	Application	33
5.2	Presentation of own ship information	33
5.2.1	Graphical representation of own ship – Requirement	33
5.2.2	Methods of test and required results	34
5.3	Presentation of chart information	34
5.3.1	Alteration of chart information	34
5.3.2	Colours and symbols for charted information	34
5.4	Presentation of radar information	35
5.4.1	Radar video images	35
5.4.2	Target trails	36
5.5	Presentation of target information	36
5.5.1	Providing target information	36
5.5.2	Consistent user interface for target information	37
5.5.3	Indication of exceeding target capacity	37
5.5.4	Presentation of repeated AIS reports	38
5.5.5	Filtering sleeping AIS targets	39
5.5.6	Activation of AIS targets	39
5.5.7	Graphical presentation of targets	40
5.5.8	Target selection	41
5.5.9	Indication of target derivation	42
5.5.10	Presentation of tracked radar target information	42
5.5.11	Presentation of reported AIS target information	43
5.5.12	Continual update of target information	44
5.5.13	Own ship's AIS information	44
5.5.14	Obscuring the operational display area	45
5.6	Operational alerts	45
5.6.1	Alert status	45
5.6.2	CPA/TCPA alarms	45
5.6.3	Acquisition/activation zones warnings	46
5.6.4	Lost target warnings	46
5.7	AIS and radar target association	47
5.7.1	Requirement	47
5.7.2	Methods of test and required results	47
5.8	AIS presentation user selectors and their status indications	48
5.8.1	Requirement	48
5.8.2	Methods of test and required results	49
5.9	Trial manoeuvre	50
5.9.1	Requirement	50
5.9.2	Methods of test and required results	50
5.10	Measurement	50
5.10.1	Measurement from own ship	50
5.10.2	Bearing and range measurements	50
5.11	Navigation tools	51
5.11.1	General requirements	51
5.11.2	Range rings	51
5.11.3	Variable range marker (VRM)	51
5.11.4	Bearing scale	52
5.11.5	Electronic bearing line (EBL)	53
5.11.6	Parallel index lines (PI)	53

5.11.7	Offset measurement of range and bearing	55
5.11.8	User cursor.....	56
5.12	AIS data link message processing capacity	57
5.12.1	General	57
5.12.2	Requirements	57
5.12.3	Methods of test and required results	57
5.13	AIS data report	57
5.13.1	General	57
5.13.2	AIS data report capacity	57
5.13.3	AIS data report display	58
5.13.4	Graphical presentation of AIS AtoN dimensions	61
5.14	AIS locating device	61
5.14.1	General	61
5.14.2	AIS locating device capacity	62
5.14.3	AIS locating device display	62
5.15	AIS ASM	64
5.15.1	General	64
5.15.2	Categories	65
5.15.3	AIS ASM capacity	67
5.15.4	AIS ASM display	69
5.16	Presentation of AIS synthetic target	71
5.16.1	Requirement	71
5.16.2	Methods of test and required results	72
5.17	Presentation of association of DSC received call with a displayed AIS object.....	73
5.17.1	Requirement	73
5.17.2	Methods of test and required results	73
5.18	AIS ASM information extending reported AIS target information	74
5.19	Received AIS safety related messages	75
5.19.1	Requirements	75
5.19.2	Methods of test and required results	76
5.20	Sent AIS safety related messages.....	77
5.20.1	Requirements	77
5.20.2	Methods of test and required results	77
6	INS, radar and chart displays	77
6.1	General.....	77
6.1.1	Application.....	77
6.1.2	Multifunction displays	77
6.1.3	Simultaneous display of radar and chart data	78
6.1.4	Range scales.....	78
6.1.5	Operational display area	79
6.1.6	Motion display modes	79
6.1.7	Orientation modes	79
6.1.8	Off-centring	80
6.1.9	Stabilisation modes	80
6.2	Radar displays	81
6.2.1	Application.....	81
6.2.2	Radar video image.....	81
6.2.3	Brightness of radar information	82
6.2.4	Display of chart information on radar	82

6.2.5	Priority of radar information	83
6.2.6	Display of map graphics	83
6.3	Chart displays	84
6.3.1	Application	84
6.3.2	Display of chart information	84
6.3.3	IMO ECDIS display categories	85
6.3.4	Adding or removing information from the display	85
6.3.5	Safety contour	86
6.3.6	Safety depth	86
6.3.7	Chart scale	86
6.3.8	Display of radar and target information	87
6.3.9	Display of additional information	87
6.4	Composite task-oriented presentations	88
6.4.1	User-configured presentations	88
6.4.2	Information associated with the task-at-hand	88
6.5	Single and simple operator actions	88
6.5.1	Applicability	88
6.5.2	Requirement	89
6.5.3	Methods of test and required results	89
6.6	User and default settings	89
6.6.1	General	89
6.6.2	User-settings	89
6.6.3	Default settings	90
7	Physical requirements	90
7.1	General	90
7.2	Display adjustment	90
7.2.1	Contrast and brightness	90
7.2.2	Magnetic interference	91
7.2.3	Temporal stability	91
7.2.4	Physical controls and status indicators	92
7.3	Screen size	92
7.3.1	Requirement	92
7.3.2	Method of test and required results	93
7.4	Multicoloured display equipment	93
7.4.1	Requirement	93
7.4.2	Method of test and required results	93
7.5	Screen resolution	94
7.5.1	Requirement	94
7.5.2	Method of test and required results	94
7.6	Screen viewing angle	94
7.6.1	Requirement	94
7.6.2	Methods of test and required results	94
Annex A (normative)	Presentation colours and symbols	95
A.1	Overview	95
A.2	Purpose	95
A.3	Use	95
A.4	Application	95
A.5	Navigation-related symbols	95

Annex B (normative) Guidelines for the presentation of navigation-related terminology and abbreviations	131
B.1 Overview.....	131
B.2 Purpose	131
B.3 Use of these guidelines.....	131
B.4 Application	131
B.5 Navigation related terminology and abbreviations	131
Annex C (informative) Guidance on display and dialogue design in IMO MSC/Circ.982.....	138
C.1 Overview.....	138
C.2 General.....	138
C.3 Requirements in IMO MSC/Circ.982 related to the display design	138
Annex D (informative) Guidance on testing	140
D.1 Methods of test	140
D.1.1 General	140
D.1.2 Observation	140
D.1.3 Inspection of documented evidence	140
D.1.4 Measurement.....	141
D.1.5 Analytical evaluation.....	141
D.2 Application of IEC 60945.....	141
D.2.1 Display equipment category.....	141
D.2.2 Technical performance	141
D.2.3 Pre-conditioning for environmental tests	142
D.2.4 Methods of test applied for IEC 60945	142
D.3 Compliance with requirements	143
D.4 Simulation.....	144
D.5 Electronic chart data	144
Annex E (normative) Operational controls and logical grouping.....	145
E.1 Overview.....	145
E.2 Logical grouping of data and control functions	145
E.3 Navigation related terminology and icons for common function controls (hot keys and shortcuts).....	147
Annex F (normative) Icons for presentation of the state of an alert.....	161
Annex G (normative) Testing for colours, intensity and flicker	162
G.1 Testing for colours and intensity	162
G.1.1 General	162
G.1.2 Test personnel.....	163
G.1.3 Method of test.....	163
G.2 Testing for flicker	164
G.2.1 Overview	164
G.2.2 Analytic model	164
G.2.3 Decision criteria.....	166
Annex H (normative) Single and simple operator actions	168
H.1 General.....	168
H.2 Tables for single and simple operator actions	168
Annex I (normative) Default settings	170
I.1 General.....	170
I.2 ECDIS default settings.....	170
I.3 Radar default settings	172

Annex J (normative) Implementation details of AIS ASM	173
J.1 General.....	173
J.2 AIS ASM	173
Annex K (informative) Overview of AIS Messages	182
K.1 General.....	182
K.2 Use case guidance on AIS ASM.....	184
Annex L (informative) Overview of the use AIS AtoN status field bits	185
Bibliography.....	186
Table 1 – Ambient light conditions	24
Table 2 – Operational status of indications	32
Table 3 – User selectors for AIS presentation	48
Table 4 – AIS status indications.....	49
Table 5 – AIS data report capacity	58
Table 6 – AIS locating devices capacity	62
Table 7 – AIS ASM object capacity	67
Table 8 – Extended reported AIS target information from AIS ASM	74
Table A.1 – Own ship symbols	96
Table A.2 – Radar and AIS symbols.....	100
Table A.3 – Navigation symbols.....	116
Table A.4 – Navigation tools	121
Table A.5 – Other symbols.....	122
Table A.6 – Example of possible colour scheme	130
Table B.1 – List of standard terms and abbreviations	132
Table B.2 – List of standard units of measurement and abbreviations	137
Table C.1 – Paragraphs in MSC/Circ.982 associated with IEC 60945 requirements	138
Table C.2 – Other paragraphs in MSC/Circ.982 related to display design.....	139
Table C.3 – Other paragraphs in MSC/Circ.982 partially related to display design	139
Table D.1 – Methods of test applied for IEC 60945	142
Table E.1 – Logical grouping for radar, ECDIS and INS applications (based on MSC.1/Circ.1609).....	146
Table E.2 – Examples of logical grouping for voluntary implementation.....	147
Table E.3 – General controls	148
Table E.4 – General navigation functions (based on MSC.1/Circ.1609).....	149
Table E.5 – Radar specific controls.....	152
Table E.6 – Control of chart display functions (based on MSC.1/Circ.1609)	153
Table E.7 – Control of chart functionality (based on MSC.1/Circ.1609)	158
Table E.8 – Database functions (based on MSC.1/Circ.1609)	158
Table E.9 – Route plan and monitoring functions (based on MSC.1/Circ.1609)	159
Table E.10 – Groups of functions (based on MSC.1/Circ.1609).....	159
Table G.1 – Values of predicted energy and special coefficients	167
Table H.1 – Access to functions, as defined before June 2019 (based on MSC.1/Circ.1609).....	168
Table H.2 – Access to functions (based on MSC.1/Circ.1609).....	169

Table H.3 – Access to group of functions (based on MSC.1/Circ.1609)	169
Table I.1 – ECDIS settings configured in response to "Default" selection (based on MSC.1/Circ.1609)	170
Table I.2 – Radar control settings configured in response to "Default" selection (based on MSC.1/Circ.1609)	172
Table J.1 – Details of AIS ASM	173
Table K.1 – AIS Messages	182
Table K.2 – AIS ASM Messages	183
Table L.1 – AIS AtoN status field	185

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

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

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

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

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

- a) Clause 4 has been revised to remove requirements for indications of alerts which are now given in IEC 62923-1;
- b) Clause 5 has been extensively revised to add new requirements for AIS, ASM and DSC presentation together with three new supporting annexes, Annex J, Annex K, Annex L;
- c) Annex A and Annex B have been revised to incorporate changes to IMO circular SN.1/Circ.243;

- d) Annex E has been revised to incorporate changes to IMO resolution MSC.191(79) and renamed as "Operational controls and logical grouping".
- e) two new annexes have been added, Annex H on operator actions and Annex I on default settings in support of IMO circular MSC.1/Circ.1609.

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

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

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

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

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

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

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

IMPORTANT – The "colour inside" logo on the cover page of this document indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

INTRODUCTION to Amendment 1

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

MARITIME NAVIGATION AND RADIOCOMMUNICATION EQUIPMENT AND SYSTEMS – PRESENTATION OF NAVIGATION-RELATED INFORMATION ON SHIPBORNE NAVIGATIONAL DISPLAYS – GENERAL REQUIREMENTS, METHODS OF TESTING AND REQUIRED TEST RESULTS

1 Scope

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

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

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

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

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

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

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

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

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

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

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

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

IMO A.694(17):1991, *General requirements for shipborne radio equipment forming part of the global maritime distress and safety system (GMDSS) and for electronic navigational aids*

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

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

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

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

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

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

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

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

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

3 Terms, definitions and abbreviated terms

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

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

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

3.1 Terms and definitions

3.1.1

activated AIS target

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

3.1.2

automatic identification system

AIS

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

3.1.3

AIS Application Specific Message

AIS ASM

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

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

Note 2 to entry: See Annex J.

3.1.4

AIS ASM object

information constructed from one or more AIS ASMs

Note 1 to entry: See Annex J.

3.1.5

AIS data report

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

Note 1 to entry: See Annex J.

3.1.6

AIS locating devices

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

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

3.1.7

AIS safety related messages

AIS Messages 12 or 14

3.1.8

AIS synthetic target

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

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

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

3.1.9

AIS target

reported AIS target

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

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

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

3.1.10 alarm

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

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

3.1.11 alert

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

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

3.1.12 associated target

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

3.1.13 brilliance

adjustment of luminance of a display for ambient light

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

3.1.14 caution

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

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

3.1.15 consistent common reference point CCRP

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

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

3.1.16 composite presentation

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

3.1.17 dangerous target

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

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

3.1.18

dead reckoned position

DR

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

3.1.19

display base

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

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

3.1.20

display equipment

device capable of representing information visually

3.1.21

doubtful integrity

state when integrity cannot be verified

3.1.22

DSC received call

information generated from a received DSC message

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

3.1.23

electronic chart display and information system

ECDIS

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

3.1.24

electronic chart information

electronic chart database(s)

EXAMPLE ENC.

3.1.25

electronic navigational chart

ENC

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

3.1.26

emergency alarm

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

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

3.1.27

estimated position

EP

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

3.1.28

fix

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

3.1.29

heading

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

3.1.30

icon

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

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

3.1.31

important indication

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

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

3.1.32

indication

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

3.1.33

integrated navigation system

INS

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

3.1.34

integrity

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

3.1.35

line of position

LOP

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

3.1.36

lost target

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

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

3.1.37

maritime safety information

MSI

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

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

3.1.38

menu

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

3.1.39

multifunction display

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

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

3.1.40

operational display area

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

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

3.1.41

past positions

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

3.1.42

permanent

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

3.1.43

persistent

property of information as existing continuously

3.1.44

radar

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

3.1.45

radar echo

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

3.1.46

radar video image

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

3.1.47

readily available

<information> directly accessible

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

3.1.48

selected target

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

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

3.1.49**simple operator action**

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

3.1.50**single operator action**

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

3.1.51**sleeping AIS target**

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

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

3.1.52**standard display**

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

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

3.1.53**target tracking system**

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

3.1.54**task-at-hand**

specific navigation-related activity performed by a user

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

3.1.55**tracked radar target**

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

3.1.56**trial manoeuvre**

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

3.1.57**user-added electronic chart information**

electronic chart information manually entered by the user for presentation

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

3.1.58**user-configured presentation**

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

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

3.1.59

user dialogue area

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

3.1.60

validity

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

3.1.61

warning

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

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

3.2 Abbreviated terms

DAC designated area code

FI function identifier

MID maritime identity digits

VTs vessel traffic services

4 General requirements for all displays on the bridge of a ship

4.1 Relationship to IMO standards

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

- AIS synthetic targets.

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

- "AIS AtoNs" in this document.

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

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

4.2 Application of IEC 60945

4.2.1 Remark

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

4.2.2 General requirements

4.2.2.1 Requirement

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

4.2.2.2 Methods of test and required results

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

4.3 Arrangement of information

4.3.1 Consistency of layout and logical grouping

4.3.1.1 Requirement

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

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

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

4.3.1.2 Methods of test and required results

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

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

4.3.2 Consistent presentation of information

4.3.2.1 Requirement

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

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

(See also IEC 60945:2002, 4.2.1.5)

4.3.2.2 Methods of test and required results

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

4.3.3 Separation of operational display area

4.3.3.1 Requirement

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

4.3.3.2 Methods of test and required results

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

4.4 Readability

4.4.1 Readability under all ambient light conditions

4.4.1.1 Requirement

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

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

Table 1 – Ambient light conditions

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

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

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

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

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

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

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

NOTE 3 Variance is determined by the equation:

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

where

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

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

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

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

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

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

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

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

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

4.4.1.2 Methods of test and required results

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

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

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

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

- i) If dimming below 0,8 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;
- c) confirm by inspection of manufacturer's documentation that the nominal viewing distance for the display equipment is identified in the manufacturer's documentation.

4.4.3 Presentation of text and icons

4.4.3.1 Requirement

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

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

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

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

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

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

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

4.4.3.2 Methods of test and required results

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

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

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

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

4.5 Colours and intensity

4.5.1 Discrimination of colours – Requirement

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

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

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

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

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

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

4.5.2 Methods of test and required results

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

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

4.6 Symbols

4.6.1 Operational information

4.6.1.1 Requirement

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

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

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

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

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

4.6.1.2 Methods of test and required results

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

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

4.6.2 Electronic chart information

4.6.2.1 Requirement

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

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

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

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

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

4.6.2.2 Methods of test and required results

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

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

4.7 Colour coding

4.7.1 Colour coding for discrimination

4.7.1.1 Requirement

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

4.7.1.2 Methods of test and required results

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

4.7.2 Colour coding of information

4.7.2.1 Requirement

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

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

4.7.2.2 Methods of test and required results

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

4.7.3 Colour coding in combination with other attributes

4.7.3.1 Requirement

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

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

4.7.3.2 Methods of test and required results

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

- a) confirm by inspection of documented evidence or by observation 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 indicating the state of unacknowledged alerts*.

4.7.4.2 Methods of test and required results

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

4.8 Integrity marking

4.8.1 Indication of source, validity and integrity status

4.8.1.1 Requirement

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

4.8.1.2 Methods of test and required results

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

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

4.8.2 Colour coding of validity and integrity

4.8.2.1 Requirement

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

4.8.2.2 Methods of test and required results

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

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

4.8.3 Indication of presentation failure

4.8.3.1 Requirement

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

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

4.8.3.2 Methods of test and required results

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

4.9 Alerts and indications

4.9.1 Operational status

4.9.1.1 Requirement

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

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

Table 2 – Operational status of indications

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

4.9.1.2 Method of test and required results

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

4.9.2 List of alerts

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

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

4.9.3 Alert related information from multiple sources

See IEC 62923-1 for the requirements and tests.

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

4.9.4 Speech output for alarms and warnings

See IEC 62923-1 for the requirements and tests.

4.10 Presentation mode

4.10.1 Requirement

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

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

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

4.10.2 Methods of test and required results

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

4.11 User manuals, instructions and reference guides

4.11.1 Requirement

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

4.11.2 Methods of test and required results

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

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

5 Presentation of operational information

5.1 Application

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

5.2 Presentation of own ship information

5.2.1 Graphical representation of own ship – Requirement

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

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

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

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

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

5.2.2 Methods of test and required results

Where display equipment provides a graphical representation of own ship:

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

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

5.3 Presentation of chart information

5.3.1 Alteration of chart information

5.3.1.1 Requirement

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

5.3.1.2 Methods of test and required results

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

5.3.2 Colours and symbols for charted information

5.3.2.1 Requirement

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

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

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

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

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

5.3.2.2 Methods of test and required results

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

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

5.4 Presentation of radar information

5.4.1 Radar video images

5.4.1.1 Requirement

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

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

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

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

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

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

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

5.4.1.2 Methods of test and required results

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

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

5.4.2 Target trails

5.4.2.1 Requirement

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

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

5.4.2.2 Methods of test and required results

Where target trails are provided:

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

5.5 Presentation of target information

5.5.1 Providing target information

5.5.1.1 Requirement

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

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

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

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

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

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

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

5.5.1.2 Methods of test and required results

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

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

5.5.2 Consistent user interface for target information

5.5.2.1 Requirement

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

5.5.2.2 Methods of test and required results

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

5.5.3 Indication of exceeding target capacity

5.5.3.1 Requirement

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

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

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

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

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

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

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

5.5.3.2 Methods of test and required results

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

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

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

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

5.5.4 Presentation of repeated AIS reports

5.5.4.1 Requirement

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

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

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

5.5.4.2 Methods of test and required results

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

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

5.5.5 Filtering sleeping AIS targets

5.5.5.1 Requirement

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

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

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

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

5.5.5.2 Methods of test and required results

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

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

5.5.6 Activation of AIS targets

5.5.6.1 Requirement

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

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

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

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

5.5.6.2 Methods of test and required results

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

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

5.5.7 Graphical presentation of targets

5.5.7.1 Requirement

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

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

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

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

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

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

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

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

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

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

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

5.5.7.2 Methods of test and required results

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

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

5.5.8 Target selection

5.5.8.1 Requirement

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

5.5.8.2 Methods of test and required results

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

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

5.5.9 Indication of target derivation

5.5.9.1 Requirement

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

5.5.9.2 Methods of test and required results

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

5.5.10 Presentation of tracked radar target information

5.5.10.1 Requirement

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

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

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

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

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

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

5.5.10.2 Methods of test and required results

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

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

5.5.11 Presentation of reported AIS target information

5.5.11.1 Requirement

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

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

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

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

Further target information may be presented as well.

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

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

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

5.5.11.2 Methods of test and required results

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

Select a reported AIS target and:

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

5.5.12 Continual update of target information

5.5.12.1 Requirement

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

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

5.5.12.2 Methods of test and required results

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

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

5.5.13 Own ship's AIS information

5.5.13.1 Requirement

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

Own ship AIS data includes:

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