

This is a preview - click here to buy the full publication



IEC 61174

Edition 4.0 2015-08
REDLINE VERSION

INTERNATIONAL STANDARD



**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**

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

ICS 47.020.70

ISBN 978-2-8322-2865-4

Warning! Make sure that you obtained this publication from an authorized distributor.

CONTENTS

| | |
|---|----|
| FOREWORD..... | 12 |
| 1 Scope..... | 14 |
| 2 Normative references | 14 |
| 3 Terms, definitions and abbreviations | 16 |
| 3.1 Terms and definitions..... | 16 |
| 3.2 Abbreviations..... | 22 |
| 4 Minimum operational and performance requirements | 23 |
| 4.1 General..... | 23 |
| 4.2 ECDIS definitions..... | 24 |
| 4.3 Display of SENC information..... | 24 |
| 4.3.1 SENC | 24 |
| 4.3.2 Warning Indication about use of non-HO source | 24 |
| 4.3.3 Categories of display | 24 |
| 4.3.4 Safety contour | 26 |
| 4.3.5 Safety depth | 26 |
| 4.3.6 Information content..... | 26 |
| 4.3.7 Verification and updates | 26 |
| 4.3.8 Information about chart objects..... | 26 |
| 4.3.9 Display scale | 26 |
| 4.4 Provision and updating of chart information | 26 |
| 4.4.1 Contents of the SENC..... | 26 |
| 4.4.2 Updates..... | 27 |
| 4.5 Scale | 28 |
| 4.6 Display of other navigational information..... | 28 |
| 4.6.1 Common reference system General for all overlays | 28 |
| 4.6.2 Radar and plotting information | 28 |
| 4.6.3 AIS information | 31 |
| 4.6.4 AIS target data | 34 |
| 4.6.5 AIS voyage-related data | 34 |
| 4.6.6 AIS CPA/TCPA alarms..... | 35 |
| 4.6.7 AIS lost target warning..... | 35 |
| 4.6.8 Anchor watch..... | 36 |
| 4.7 Display mode and generation of the neighbouring area..... | 36 |
| 4.8 Colours and symbols | 37 |
| 4.9 Display requirements | 37 |
| 4.9.1 Route planning and monitoring | 37 |
| 4.9.2 Chart presentation size..... | 37 |
| 4.9.3 Colour and resolution..... | 37 |
| 4.9.4 Presentation | 38 |
| 4.9.5 Removal of information categories..... | 38 |
| 4.10 Route planning, monitoring and voyage recording..... | 38 |
| 4.10.1 General | 38 |
| 4.10.2 Route planning | 38 |
| 4.10.3 Route monitoring | 40 |
| 4.10.4 Position integration | 42 |
| 4.10.5 Object information | 42 |

| | | |
|------------------|---|---------------|
| 4.10.6 | LOP position fix | 42 |
| 4.10.7 | Voyage recording..... | 43 |
| 4.11 | Calculations and accuracy | 43 |
| 4.12 | Connections with other equipment (interfaces)..... | 44 |
| 4.12.1 | Connection with navigation equipment..... | 44 |
| 4.12.2 | Connection with BAM..... | 44 |
| 4.12.3 | Connection with VDR..... | 45 |
| 4.12.4 | Connection with BNWAS..... | 46 |
| 4.12.5 | Connection for SENC information | 46 |
| 4.12.6 | Connection with NAVTEX or SafetyNET for MSI | 46 |
| 4.12.7 | Connection for transfer of route information | 47 |
| 4.12.8 | Connection with INS | 47 |
| 4.13 | Performance tests, malfunction alarms alerts and indications | 47 |
| 4.14 | Back-up arrangements | 48 |
| 4.15 | Power supply | 48 |
| 4.16 | Software maintenance | 48 |
| 4.17 | Quality management requirements..... | 48 |
| 4.18 | Default control setting and saved user control settings..... | 49 |
| 5 | Requirements contained in IHO special publications..... | 52 |
| 5.1 | Content and structure of chart data | 52 |
| 5.1 | Priority of chart display | 52 |
| 5.2 | Display of chart information | 52 |
| 5.2.1 | Scale and navigation purpose | 52 |
| 5.2.2 | Text..... | 53 |
| 5.2.2 | Units and legend..... | 53 |
| 5.2.3 | Terminology..... | 54 |
| 5.3 | Display functions | 54 |
| 5.3.1 | Object information Cursor pick | 54 |
| 5.3.2 | Navigational information | 55 |
| 5.3.2 | Safety contour | 55 |
| 5.3.3 | Navigational calculations | 55 |
| 5.3.3 | Date-dependant ENC objects..... | 55 |
| 5.4 | Supplementary display functions..... | 56 |
| 5.4.1 | Additional mariner's information..... | 56 |
| 5.4.2 | Additional non-HO information | 56 |
| 5.4.3 | Tidal adjustment | 57 |
| 5.5 | Use of the presentation library | 57 |
| 5.5.1 | Presentation library..... | 57 |
| 5.5.2 | Test diagrams..... | 58 |
| 5.6 | Display characteristics | 58 |
| 5.6.1 | Display base..... | 58 |
| 5.6.2 | Navigators notes..... | 58 |
| 5.7 | Performance requirements..... | 58 |
| 5.7.1 | Redraw | 58 |
| 5.7.2 | Resolution | 59 |
| 5.7.3 | Symbols..... | 59 |
| 5.7.4 | Number of colours | 59 |
| 5.7.5 | Brightness and contrast | 59 |
| 5.8 | Ergonomic requirements | 60 |

| | | |
|------------------|--|---------------|
| 5.8.1 | Mode and orientation | 60 |
| 5.8.2 | Windows | 60 |
| 5.8.3 | Mariner's information panel | 60 |
| 5.9 | Update of chart information | 60 |
| 5.9.1 | General | 60 |
| 5.9.2 | Manual update | 62 |
| 5.9.3 | Semi-automatic update | 63 |
| 5.9.4 | Reception of updates | 63 |
| 5.9.5 | Sequence check | 63 |
| 5.9.6 | Consistency check | 63 |
| 5.9.7 | Geographic applicability | 64 |
| 5.9.8 | Summary report | 64 |
| 5.9.9 | Review of ENC updates | 64 |
| 5.9.10 | Modification of updates | 64 |
| 5.10 | Operational area | 64 |
| 5.11 | External removable media | 65 |
| 6 | Methods of testing and required test results | 65 |
| 6.1 | EUT installation, technical documentation, and test requirements | 65 |
| 6.2 | Interfaces | 65 |
| 6.2.1 | General | 65 |
| 6.2.2 | BAM interface | 66 |
| 6.2.3 | VDR interface | 67 |
| 6.2.4 | BNWAS interface | 68 |
| 6.3 | General requirements and presentation requirements | 68 |
| 6.3.1 | General requirements | 68 |
| 6.3.2 | Presentation requirements | 68 |
| 6.4 | Preparation | 69 |
| 6.4.1 | Power-up | 69 |
| 6.4.2 | Initial ship parameters | 69 |
| 6.4.3 | Required test items | 69 |
| 6.5 | Initial data tests Requirements related to ENC chart | 70 |
| 6.5.1 | General | 70 |
| 6.5.2 | Presentation library | 71 |
| 6.5.3 | ENC | 71 |
| 6.5.4 | Encrypted ENC | 71 |
| 6.6 | Accuracy | 72 |
| 6.7 | Visual requirements | 72 |
| 6.7.1 | Symbols | 72 |
| 6.7.2 | Terminology, units and legend | 73 |
| 6.7.3 | Colour table | 73 |
| 6.7.4 | Resolution | 74 |
| 6.7.5 | Display characteristics | 74 |
| 6.8 | Functional requirements | 74 |
| 6.8.1 | Methods of testing | 74 |
| 6.8.2 | Standard display | 75 |
| 6.8.3 | Display base | 75 |
| 6.8.4 | All other information | 75 |
| 6.8.5 | Viewing group layers and text group layers | 75 |
| 6.8.6 | Display priorities | 76 |

| | | |
|---------------------|--|-----|
| 6.8.7 | Additional display functions..... | 76 |
| 6.8.8 | Scale and navigation purpose..... | 77 |
| 6.8.9 | Mode and orientation..... | 77 |
| 6.8.10 | Safety contour..... | 78 |
| 6.8.11 | Safety depth..... | 78 |
| 6.8.12 | Object information Cursor pick..... | 80 |
| 6.8.13 | Navigation related functions..... | 81 |
| 6.8.14 | Position integration..... | 81 |
| 6.8.15 | Radar and plotting other navigational information..... | 81 |
| 6.8.16 | Loading of corrupted data..... | 84 |
| 6.8.17 | Automatic updates..... | 84 |
| 6.8.18 | Manual updates..... | 86 |
| 6.8.19 | Self-tests of major functions..... | 86 |
| 6.8.20 | Operational area..... | 87 |
| 6.8.21 | External removable media..... | 88 |
| 6.9 | Operational requirements..... | 88 |
| 6.9.1 | Ergonomic principles..... | 88 |
| 6.9.2 | Route planning..... | 88 |
| 6.9.3 | Route monitoring..... | 90 |
| 6.9.4 | Twelve-hour log..... | 91 |
| 6.9.5 | Voyage record..... | 92 |
| 6.9.6 | Power supply..... | 92 |
| 6.9.7 | LOP position fix..... | 92 |
| 6.10 | Software maintenance..... | 93 |
| 6.11 | Quality management..... | 93 |
| 6.12 | Default control setting and saved operator control settings..... | 93 |
| 6.13 | AIS information and AIS target data..... | 94 |
| 6.13.1 | General..... | 94 |
| 6.13.2 | AIS targets and data report capacity..... | 94 |
| 6.13.3 | AIS target filtering..... | 94 |
| 6.13.4 | Activation and deactivation of AIS targets..... | 95 |
| 6.13.5 | AIS functionality and presentation..... | 95 |
| 6.13.6 | AIS target data..... | 96 |
| 6.13.7 | AIS CPA/TCPA alarm..... | 97 |
| 6.13.8 | AIS lost target warning..... | 97 |
| 6.14 | AIS Voyage-related data..... | 98 |
| 6.15 | Anchor watch..... | 98 |
| 6.16 | NAVTEX and SafetyNET for MSI..... | 98 |
| 6.17 | Interface for transfer of route information..... | 99 |
| 6.18 | Interface with INS..... | 100 |
| Annex A (normative) | SENC information to be displayed during route planning and route monitoring..... | 101 |
| Annex B (normative) | Navigational elements and parameters..... | 102 |
| Annex C (normative) | Areas for which special conditions exist..... | 103 |
| Annex D (normative) | Alarms and indicators Alerts and indications..... | 104 |
| Annex E (normative) | ENC test data set Mandatory terminology and abbreviations..... | 109 |
| Annex F (normative) | Back-up arrangements..... | 115 |
| F.1 | Introduction Overview..... | 115 |

| | | |
|---------------------|--|-----|
| F.2 | Purpose | 115 |
| F.3 | Functional requirements | 115 |
| F.3.1 | Required functions and their availability | 115 |
| F.3.2 | Reliability and accuracy | 119 |
| F.3.3 | Malfunctions, warnings, alarms alerts and indications | 119 |
| F.4 | Operational requirements | 119 |
| F.4.1 | Ergonomics | 119 |
| F.4.2 | Presentation of information | 119 |
| F.5 | Power supply | 120 |
| F.6 | Connections with other equipment Other requirement | 120 |
| F.6.1 | Back-up Connection with other systems | 120 |
| F.6.2 | Route transfer interface | 121 |
| F.6.3 | Radar as back-up system | 121 |
| F.6.4 | Operational area | 121 |
| F.6.5 | Software maintenance | 122 |
| F.6.6 | Quality management | 122 |
| F.6.7 | Default Control Settings and Saved User Control Settings | 122 |
| F.6.8 | External removable media | 122 |
| F.7 | Methods of testing and required test results | 122 |
| F.7.1 | EUT installation and technical documentation | 122 |
| F.7.2 | Interfaces | 122 |
| F.7.3 | General requirements and presentation requirements | 122 |
| F.7.4 | Preparation | 122 |
| F.7.5 | Initial data tests – Chart | 123 |
| F.7.6 | Accuracy | 123 |
| F.7.7 | Visual requirements | 124 |
| F.7.8 | Functional requirements | 124 |
| F.7.9 | Operational requirements | 126 |
| Annex G (normative) | ECDIS in the RCDS mode of operation | 130 |
| G.1 | Introduction Overview | 130 |
| G.2 | RCDS definitions | 130 |
| G.3 | Display of SRNC information | 131 |
| G.3.1 | SRNC | 131 |
| G.3.2 | Categories of display | 131 |
| G.3.3 | Power failure | 131 |
| G.3.4 | Information content | 131 |
| G.3.5 | Verification and updates | 131 |
| G.3.6 | Indication | 132 |
| G.4 | Provision and updating of chart information | 132 |
| G.4.1 | Contents of the RNC | 132 |
| G.4.2 | Updates | 132 |
| G.5 | Scale | 133 |
| G.6 | Display of other navigational information | 133 |
| G.6.1 | Common reference system General for all overlays | 133 |
| G.6.2 | Radar and plotting information | 133 |
| G.6.3 | AS information | 134 |
| G.6.4 | AIS Target Data | 134 |
| G.6.5 | AIS Voyage Related Data | 134 |
| G.6.6 | AIS CPA/TCPA alarms | 134 |

| | | |
|----------------------------------|--|-----|
| G.6.7 | AIS lost target warning..... | 134 |
| G.6.8 | Anchor watch..... | 134 |
| G.7 | Display mode and generation of the neighbouring area..... | 134 |
| G.8 | Colours and symbols..... | 135 |
| G.9 | Display requirements..... | 135 |
| G.9.1 | Route planning and monitoring..... | 135 |
| G.9.2 | Display characteristics..... | 135 |
| G.9.3 | Chart notes..... | 136 |
| G.10 | Route planning, monitoring and voyage recording..... | 136 |
| G.10.1 | General..... | 136 |
| G.10.2 | Route planning..... | 136 |
| G.10.3 | Route monitoring..... | 136 |
| G.10.4 | Position integration..... | 137 |
| G.10.5 | Object information..... | 138 |
| G.10.6 | LOP position fix..... | 138 |
| G.10.7 | Voyage recording..... | 139 |
| G.11 | Calculations and accuracy..... | 139 |
| G.12 | Connections with other equipment (interfaces)..... | 139 |
| G.13 | Performance tests, malfunction alarms alerts and indications..... | 140 |
| G.14 | Back-up arrangements for RCDS mode of operation..... | 140 |
| G.15 | Power supply for RCDS mode of operation..... | 140 |
| G.16 | Requirements contained in IHO special publications..... | 141 |
| G.16.1 | Structure of RNC data..... | 141 |
| G.16.2 | RNC data resolution and accuracy..... | 141 |
| G.16.3 | RNC meta-data..... | 141 |
| G.16.4 | RNC colours..... | 141 |
| G.16.5 | RNC notes, diagrams, etc..... | 142 |
| G.16.6 | Operational area..... | 142 |
| G.16.7 | External removable media..... | 142 |
| G.17 | Methods of testing and required test results..... | 142 |
| G.17.1 | Preparation– Required test items..... | 142 |
| G.17.2 | Initial data tests..... | 143 |
| G.17.3 | Accuracy..... | 144 |
| G.17.4 | Visual requirements..... | 144 |
| G.17.5 | Functional requirements..... | 145 |
| G.17.6 | Operational requirement..... | 151 |
| G.18 | RNC test data set..... | 154 |
| Annex H (normative) | Alarms and indicators Alerts and indications in the RCDS mode of operation..... | 155 |
| Annex I (normative) | Scenario definitions and plots..... | 156 |
| I.1 | Overview..... | 156 |
| I.2 | Scenario 1:..... | 157 |
| I.3 | Scenario 2:..... | 160 |
| I.4 | Scenario 3:..... | 163 |
| I.5 | Scenario 4:..... | 166 |
| Annex J (informative) | Tests required for encrypted ENC..... | |
| Annex J (informative) | Guidance on geodetic calculations..... | 172 |
| J.1 | Overview..... | 172 |

| | | |
|--|---|-----|
| J.2 | Distance deviations between Great Circle (orthodrome) and Rhumb Line (loxodrome) | 172 |
| J.3 | Bearing deviations at start point between Great Circle (orthodrome) and Rhumb Line (loxodrome)..... | 173 |
| Annex K (informative) | Guidance for testing | 175 |
| K.1 | Methods of test derived from ISO 9241-12 | 175 |
| K.2 | Observation | 175 |
| K.3 | Inspection of documented evidence | 175 |
| K.4 | Measurement..... | 175 |
| K.5 | Analytical evaluation | 176 |
| Annex L (normative) Testing for colours and intensity | | |
| Annex L (informative) | Examples of ENC Update Status Report | 180 |
| L.1 | Overview | 180 |
| L.2 | ENC Update Status Report – Summary..... | 180 |
| L.3 | ENC Update Status Report – Full..... | 181 |
| L.4 | ENC Management Report – Route Filtered | 183 |
| Annex M (informative normative) | Elements of an electronic chart database | 184 |
| M.1 | General..... | 184 |
| M.2 | ECDIS implementation | 184 |
| M.3 | Display base category..... | 185 |
| M.3.1 | Coastline layer..... | 185 |
| M.3.2 | Safety contour layer..... | 186 |
| M.3.3 | Isolated underwater dangers layer | 186 |
| M.3.4 | Isolated above-water dangers layer | 186 |
| M.4 | Standard display category..... | 187 |
| M.4.1 | Display base layer | 187 |
| M.4.2 | Additional aids to navigation and fixed structures layer | 187 |
| M.4.3 | Fairways layer | 188 |
| M.4.4 | Conspicuous features layer..... | 188 |
| M.4.5 | Prohibited and restricted areas layer..... | 188 |
| M.4.6 | Ferry routes layer | 188 |
| M.4.7 | Archipelagic sea lanes layer | 188 |
| M.4.8 | Buoys and beacons layer | 188 |
| M.4.9 | Traffic routeing layer..... | 189 |
| M.5 | All other information category | 189 |
| M.5.1 | Information about the chart display layer..... | 189 |
| M.5.2 | Natural and man-made features, Port features layer | 189 |
| M.5.3 | Depth, currents, etc. layer..... | 191 |
| M.5.4 | Seabed, obstructions, pipelines layer..... | 191 |
| M.5.5 | Traffic routes layer..... | 192 |
| M.5.6 | Special areas layer | 192 |
| M.5.7 | Service and small craft facilities layer | 192 |
| M.6 | Text grouping..... | 192 |
| M.6.1 | Important Text group layer | 192 |
| M.6.2 | Other Text group layer | 192 |
| Annex N (informative) Cross-references between IEC 61174 editions and MSC.232(82) | | |
| Annex N (informative) | Use cases for safety contour and safety depth | 196 |
| Annex O (informative) | Guidelines on use of electronic chart systems in polar waters | 198 |

| | | |
|-----------------------|--|-----|
| O.1 | Projection and coordinate system | 198 |
| O.2 | Consistency | 199 |
| Annex P (normative) | Scenarios for polar areas above 85° North | 200 |
| Annex Q (normative) | IEC 61162 interfaces | 206 |
| Q.1 | General..... | 206 |
| Q.2 | VDR interface | 208 |
| Q.3 | AIS interface and interrogation..... | 209 |
| Q.4 | Route transfer interface | 209 |
| Q.5 | BAM interface | 209 |
| Annex R (informative) | Conversion between IEC 61162-1 sentences and IEC 61162-3 parameter group numbers..... | 214 |
| Annex S (normative) | Route plan exchange format – RTZ | 216 |
| S.1 | General..... | 216 |
| S.2 | RTP Data container | 217 |
| S.3 | High-level description of the RTZ format | 218 |
| S.4 | Adaptation to third-party extensions | 218 |
| S.4.1 | Generic idea | 218 |
| S.4.2 | Unique identification of a waypoint..... | 218 |
| S.4.3 | Creation of new waypoints | 219 |
| S.4.4 | Change of geographic data for a waypoint | 219 |
| S.4.5 | Waypoint removal | 219 |
| S.5 | Detailed RTZ format description..... | 219 |
| S.5.1 | File components | 219 |
| S.5.2 | Route node description | 219 |
| S.5.3 | RouteInfo node description | 220 |
| S.5.4 | Waypoints node description | 221 |
| S.5.5 | DefaultWaypoint node description..... | 221 |
| S.5.6 | Waypoint node description..... | 222 |
| S.5.7 | Storing date and time for legs | 223 |
| S.5.8 | Schedules node description | 223 |
| S.5.9 | Schedule node description..... | 223 |
| S.5.10 | Extensions node description | 225 |
| S.5.11 | Extension node description | 226 |
| S.6 | XML schema to be met by RTZ route files..... | 226 |
| S.7 | Basic RTZ route example | 238 |
| S.8 | Example of the RTZ route with embedded extensions | 239 |
| S.9 | UML model of the Route exchange format | 240 |
| Annex T (normative) | Interface for reporting route transfer..... | 242 |
| T.1 | Route encapsulation format for transmitting RTZ over IEC 61162-450 | 242 |
| T.2 | RRT – Report route transfer..... | 243 |
| Annex U (normative) | Sentences used by SafetyNET | 244 |
| U.1 | General..... | 244 |
| U.2 | SM1 – SafetyNET Message, All Ships/NavArea | 244 |
| U.3 | SM2 – SafetyNET Message, Coastal Warning Area | 246 |
| U.4 | SM3 – SafetyNET Message, Circular Area Address | 248 |
| U.5 | SM4 – SafetyNET Message, Rectangular Area Address..... | 250 |
| U.6 | SMB – IMO SafetyNET Message Body..... | 253 |
| U.7 | An example of use | 254 |

| | |
|--|------------------|
| Annex V (normative) Extension of TTD sentence, Protocol version 1 | 255 |
| V.1 General..... | 255 |
| V.2 TTD – Tracked target data, Protocol version 1 | 255 |
| Annex W (normative) Symbols | 256 |
| Bibliography..... | 257 |
| | |
| Figure F.1 – Backup system logical interfaces | 121 |
| Figure I.1 – Definition of elements of route | 156 |
| Figure I.2 – Route for scenario 1..... | 159 |
| Figure I.3 – Route for scenario 2..... | 162 |
| Figure I.4 – Route for scenario 3..... | 165 |
| Figure I.5 – Route for scenario 4..... | 168 |
| Figure J.1 – Distance deviations between Great Circle and Rhumb Line | 172 |
| Figure J.2 – Bearing deviations at start point between Great Circle and Rhumb Line | 174 |
| Figure N.1 – Original situation | 196 |
| Figure N.2 – New situation..... | 197 |
| Figure P.1 – Examples of use of the tables | 200 |
| Figure Q.1 – ECDIS logical interfaces..... | 206 |
| Figure Q.2 – Alert reporting by ECDIS without escalation of a warning | 210 |
| Figure Q.3 – Alert reporting by ECDIS with escalation of a warning as alarm | 210 |
| Figure Q.4 – Alert reporting by ECDIS in case of remote acknowledge | 211 |
| Figure Q.5 – Alert reporting by ECDIS in case of remote silence..... | 212 |
| Figure Q.6 – Alert reporting by ECDIS in case of remote silence..... | 213 |
| Figure Q.7 – Alert reporting by ECDIS in case of remote silence..... | 213 |
| Figure S.1 – Description of route plan – Distance between WP 2 and WP 3..... | 217 |
| Figure S.2 – Description of route plan – Leg parameters belonging to WP 3 | 217 |
| Figure S.3 – UML diagram | 241 |
| Figure T.1 – Examples of timing for route transfer..... | 242 |
| | |
| Table 1 – Mandatory IEC 61162-1..... | |
| Table 1 – Tracked target display capacity | 29 |
| Table 2 – Area, line and point objects..... | |
| Table 2 – AIS display capacity..... | 32 |
| Table 3 – Control settings configured in response to ‘Default’ selection | 50 |
| Table D.1 – Alerts and indications resulting from IMO requirements..... | 104 |
| Table D.2 – Alerts and indications defined in this standard | 105 |
| Table E.1 – Chart display terminology..... | 109 |
| Table E.2 – Main function terminology | 111 |
| Table E.3 – Database terminology | 112 |
| Table E.4 – Route, route monitoring or route plan related terminology | 113 |
| Table H.1 – Alerts and indications in the RCDS mode of operation | 155 |
| Table J.1 – Rhumb Line distances | 173 |
| Table J.2 – Deviations from Great Circle distances | 174 |

| | |
|---|-----|
| Table L.1 – Ambient light conditions | |
| Table M.1 – Minimum ECDIS mariner viewing group layer selectors | 185 |
| Table M.2 – Minimum ECDIS mariner text group layer selectors | 185 |
| Table P.1 – Spatial control points from 85°N, 0°E as origin | 201 |
| Table P.2 – Spatial control points from 87°N, 0°E as origin | 202 |
| Table P.3 – Spatial control points from 89°N, 0°E as origin | 203 |
| Table P.4 – Spatial control points from 90°N, 0°E as origin, 180°E as origin of relative bearings | 204 |
| Table Q.1 – Mandatory sentences received by ECDIS | 207 |
| Table Q.2 – Optional sentences received by ECDIS | 207 |
| Table Q.3 – Mandatory sentences transmitted by the ECDIS | 208 |
| Table Q.4 – Optional sentences transmitted by the ECDIS | 208 |
| Table Q.5 – Mandatory information transmitted to the VDR | 208 |
| Table Q.6 – Information between the ECDIS and an ECDIS backup system | 209 |
| Table R.1 – Conversion from IEC 61162-1 to IEC 61162-3 | 214 |
| Table R.2 – Conversion from IEC 61162-3 to IEC 61162-1 | 215 |
| Table W.1 – Anchor watch symbol | 256 |

INTERNATIONAL ELECTROTECHNICAL COMMISSION

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

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.

This redline version of the official IEC Standard allows the user to identify the changes made to the previous edition. A vertical bar appears in the margin wherever a change has been made. Additions are in green text, deletions are in strikethrough red text.

International Standard IEC 61174 has been prepared by IEC technical committee 80: Maritime navigation and radiocommunication equipment and systems.

This fourth edition of IEC 61174 cancels and replaces the third edition published in 2008, of which it constitutes a technical revision.

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

- updated references are provided to IHO publications and test methods are updated to IHO test data sets;
- requirements have been added for display of radar and AIS information;
- new interface requirements have been added for BNWAS, VDR, BAM, MSI, INS and route transfer;
- a requirement for an anchor watch has been added;
- additional test methods are specified for operation of ECDIS beyond the normal range between 85 degrees South latitude and 85 degrees North latitude.

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

| | |
|-------------|------------------|
| FDIS | Report on voting |
| 80/761/FDIS | 80/767/RVD |

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

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

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

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

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

IMPORTANT – The 'colour inside' logo on the cover page of this publication 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.

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

1 Scope

This International Standard specifies the performance requirements, methods of testing and required test results of equipment conforming to performance standards not inferior to those adopted by the IMO in resolution MSC.232(82).

This standard is based upon the performance standards of IMO resolution MSC.232(82), and is also associated with IMO resolution A.694(17) and IEC 60945. Reference is made, where appropriate, to IMO resolution MSC.232(82), and all subclauses whose wording is identical to that in the resolution are printed in italics.

In association with the above IMO resolution MSC.232(82), are the International Hydrographic Organization (IHO) ~~special~~ publications¹ IHO S-32, IHO S-52, IHO S-57, IHO S-61, IHO S-63 and IHO S-64. This standard has included extracts from the above publications where they are applicable to this equipment. Where reference is made, all subclauses whose wording is identical to that in the publications, are printed in italics.

(232/A2.1) These performance standards should apply to all ECDIS equipment carried on all ships as follows:

- *dedicated standalone workstation.*
- *a multifunction workstation as part of an INS.*

(232/A2.2) These performance standards apply to ECDIS mode of operation, ECDIS in RCDS mode of operation as specified in Annex G and ECDIS backup arrangements as specified in Annex F.

(232/A2.3) Requirements for structure and format of the chart data, encryption of chart data as well as the presentation of chart data are within the scope of relevant IHO standards, including those listed in the normative references.

The requirements of this standard are not intended to prevent the use of new techniques in equipment and systems, provided the facilities offered are not inferior to those stated.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

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

¹ IHO publications are available from <http://www.iho.int>, together with any supplementary information.

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

IEC 61162-1, *Maritime navigation and radiocommunication equipment and systems – Digital interfaces – Part 1: Single talker and multiple listeners*

IEC 61162-450:2011 *Maritime navigation and radiocommunication equipment and systems – Digital interfaces – Part 450: Multiple talkers and multiple listeners – Ethernet interconnection*

IEC 61924-2:2012, *Maritime navigation and radiocommunication equipment and systems – Integrated navigation systems – Part 2: Modular structure for INS – Operational and performance requirements, methods of testing and required test results*

IEC 61996-1:2013, *Maritime navigation and radiocommunication equipment and systems – Shipborne voyage data recorder (VDR) – Part 1: Performance requirements, methods of testing and required test results*

IEC 62288:2014, *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 62388:2013, *Maritime navigation and radiocommunication equipment and systems – Shipborne radar – Performance requirements – Methods of testing and required test results*

ISO 8601, *Data elements and interchange formats – Information interchange – Representation of dates and times*

IHO M-3:2007, *Resolutions of the IHO, Chapter A, Section 3, Technical Resolution 3.11*

IHO S-52:2014, *Specifications for chart content and display aspects of ECDIS edition 6.1*

IHO S-52, appendix 1:2012, *Guidance on Updating the Electronic Navigational Chart edition 4.0*

IHO S-52, Annex A:2014, *Presentation library edition 4.0*

IHO S-57, *IHO transfer standard for digital hydrographic data*

IHO S-57, appendix B.1, *ENC product specification*

IHO S-61:1999, *Product specification for raster navigational charts (RNC)*

IHO S-63, *IHO data protection scheme*

IHO S-64, *Test data sets for ECDIS*

IMO, *International Convention for the safety of life at sea (SOLAS) 1974 (as amended)*

~~IMO A.424(XI):1979, Performance standards for gyro-compasses~~

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 A.821(19):1995, Performance standards for gyro-compasses for high-speed craft~~

~~IMO A.823(19):1995, Performance standards for automatic radar plotting aids~~

~~IMO A.824(19):1995, Performance standards for devices to indicate speed and distance~~

~~IMO A.830(19):1995, Code on Alarms and Indicators~~

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

~~IMO MSC.192(79), Revised performance standards for radar equipment~~

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

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

IMO MSC/Circ.982:2000, Guidelines on ergonomic criteria for bridge equipment and layout

~~IMO SN/Circ.243 (2004), Guidelines for the Presentation of Navigation-related Symbols, Terms and Abbreviations~~

IMO SN.1/Circ.266:2007, Maintenance of electronic chart display and information system (ECDIS) software

~~IHO M-3:2007, Resolutions of the IHO, Chapter A, Section 3, Technical Resolution 3.11~~

~~IHO S-32, appendix 1, Hydrographic dictionary—Glossary of ECDIS related terms~~

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

~~IHO S-52, appendix 1:1996, Guidance on updating the electronic navigational chart~~

~~IHO S-52, appendix 2:2004 Colour and symbol specifications for ECDIS~~

~~IHO S-57, appendix B.1: 2000, ENC product specification~~

~~IHO S-61:1999, Product specification for raster navigational charts (RNC)~~

~~IHO S-63:2008, IHO data protection scheme~~

~~IHO S-64, Test data sets for ECDIS~~

INTERNATIONAL STANDARD



**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**



CONTENTS

| | |
|--|----|
| FOREWORD | 12 |
| 1 Scope | 14 |
| 2 Normative references | 14 |
| 3 Terms, definitions and abbreviations | 16 |
| 3.1 Terms and definitions..... | 16 |
| 3.2 Abbreviations..... | 21 |
| 4 Minimum operational and performance requirements | 22 |
| 4.1 General..... | 22 |
| 4.2 ECDIS definitions..... | 23 |
| 4.3 Display of SENC information..... | 23 |
| 4.3.1 SENC | 23 |
| 4.3.2 Indication about use of non-HO source | 23 |
| 4.3.3 Categories of display | 23 |
| 4.3.4 Safety contour | 24 |
| 4.3.5 Safety depth | 25 |
| 4.3.6 Information content | 25 |
| 4.3.7 Verification and updates | 25 |
| 4.3.8 Information about chart objects..... | 25 |
| 4.3.9 Display scale | 25 |
| 4.4 Provision and updating of chart information | 25 |
| 4.4.1 Contents of the SENC..... | 25 |
| 4.4.2 Updates | 26 |
| 4.5 Scale | 26 |
| 4.6 Display of other navigational information..... | 26 |
| 4.6.1 General for all overlays..... | 26 |
| 4.6.2 Radar information | 27 |
| 4.6.3 AIS information | 30 |
| 4.6.4 AIS target data..... | 32 |
| 4.6.5 AIS voyage-related data | 33 |
| 4.6.6 AIS CPA/TCPA alarms..... | 33 |
| 4.6.7 AIS lost target warning..... | 34 |
| 4.6.8 Anchor watch..... | 34 |
| 4.7 Display mode and generation of the neighbouring area | 35 |
| 4.8 Colours and symbols..... | 35 |
| 4.9 Display requirements | 36 |
| 4.9.1 Route planning and monitoring | 36 |
| 4.9.2 Chart presentation size..... | 36 |
| 4.9.3 Colour and resolution..... | 36 |
| 4.9.4 Presentation | 36 |
| 4.9.5 Removal of information categories..... | 36 |
| 4.10 Route planning, monitoring and voyage recording..... | 36 |
| 4.10.1 General..... | 36 |
| 4.10.2 Route planning | 37 |
| 4.10.3 Route monitoring | 38 |
| 4.10.4 Position integration | 40 |
| 4.10.5 Object information..... | 41 |

| | | |
|--------|--|----|
| 4.10.6 | LOP position fix | 41 |
| 4.10.7 | Voyage recording..... | 41 |
| 4.11 | Calculations and accuracy | 42 |
| 4.12 | Connections with other equipment (interfaces)..... | 42 |
| 4.12.1 | Connection with navigation equipment..... | 42 |
| 4.12.2 | Connection with BAM..... | 42 |
| 4.12.3 | Connection with VDR..... | 43 |
| 4.12.4 | Connection with BNWAS..... | 44 |
| 4.12.5 | Connection for SENC information | 44 |
| 4.12.6 | Connection with NAVTEX or SafetyNET for MSI | 44 |
| 4.12.7 | Connection for transfer of route information | 45 |
| 4.12.8 | Connection with INS | 46 |
| 4.13 | Performance tests, malfunction alerts and indications | 46 |
| 4.14 | Back-up arrangements | 46 |
| 4.15 | Power supply | 46 |
| 4.16 | Software maintenance | 46 |
| 4.17 | Quality management requirements..... | 47 |
| 4.18 | Default control setting and saved user control settings..... | 47 |
| 5 | Requirements contained in IHO publications..... | 49 |
| 5.1 | Priority of chart display | 49 |
| 5.2 | Display of chart information | 50 |
| 5.2.1 | Scale and navigation purpose | 50 |
| 5.2.2 | Units and legend..... | 50 |
| 5.2.3 | Terminology..... | 51 |
| 5.3 | Display functions | 51 |
| 5.3.1 | Cursor pick | 51 |
| 5.3.2 | Navigational information | 51 |
| 5.3.3 | Date-dependant ENC objects..... | 52 |
| 5.4 | Supplementary display functions..... | 52 |
| 5.4.1 | Additional mariner's information..... | 52 |
| 5.4.2 | Additional non-HO information | 52 |
| 5.4.3 | Tidal adjustment | 53 |
| 5.5 | Use of the presentation library | 53 |
| 5.5.1 | Presentation library..... | 53 |
| 5.5.2 | Test diagrams..... | 53 |
| 5.6 | Display characteristics | 53 |
| 5.7 | Performance requirements..... | 54 |
| 5.7.1 | Redraw | 54 |
| 5.7.2 | Resolution | 54 |
| 5.7.3 | Symbols..... | 54 |
| 5.7.4 | Number of colours | 55 |
| 5.7.5 | Brightness and contrast | 55 |
| 5.8 | Ergonomic requirements | 55 |
| 5.8.1 | Mode and orientation | 55 |
| 5.8.2 | Windows | 55 |
| 5.9 | Update of chart information..... | 56 |
| 5.9.1 | General..... | 56 |
| 5.9.2 | Manual update | 57 |
| 5.9.3 | Semi-automatic update | 58 |

| | | |
|--------|--|----|
| 5.9.4 | Reception of updates | 58 |
| 5.9.5 | Sequence check | 58 |
| 5.9.6 | Consistency check | 59 |
| 5.9.7 | Geographic applicability | 59 |
| 5.9.8 | Summary report | 59 |
| 5.9.9 | Review of ENC updates | 59 |
| 5.9.10 | Modification of updates | 59 |
| 5.10 | Operational area | 59 |
| 5.11 | External removable media | 60 |
| 6 | Methods of testing and required test results | 60 |
| 6.1 | EUT installation, technical documentation, and test requirements | 60 |
| 6.2 | Interfaces | 60 |
| 6.2.1 | General | 60 |
| 6.2.2 | BAM interface | 61 |
| 6.2.3 | VDR interface | 62 |
| 6.2.4 | BNWAS interface | 63 |
| 6.3 | General requirements and presentation requirements | 63 |
| 6.3.1 | General requirements | 63 |
| 6.3.2 | Presentation requirements | 63 |
| 6.4 | Preparation | 63 |
| 6.4.1 | Power-up | 63 |
| 6.4.2 | Initial ship parameters | 64 |
| 6.4.3 | Required test items | 64 |
| 6.5 | Requirements related to ENC chart | 64 |
| 6.5.1 | General | 64 |
| 6.5.2 | Presentation library | 65 |
| 6.5.3 | ENC | 65 |
| 6.5.4 | Encrypted ENC | 65 |
| 6.6 | Accuracy | 65 |
| 6.7 | Visual requirements | 65 |
| 6.7.1 | Symbols | 65 |
| 6.7.2 | Terminology, units and legend | 65 |
| 6.7.3 | Colour table | 65 |
| 6.7.4 | Resolution | 66 |
| 6.7.5 | Display characteristics | 66 |
| 6.8 | Functional requirements | 66 |
| 6.8.1 | Methods of testing | 66 |
| 6.8.2 | Standard display | 66 |
| 6.8.3 | Display base | 66 |
| 6.8.4 | All other information | 67 |
| 6.8.5 | Viewing group layers and text group layers | 67 |
| 6.8.6 | Display priorities | 67 |
| 6.8.7 | Additional display functions | 67 |
| 6.8.8 | Scale and navigation purpose | 67 |
| 6.8.9 | Mode and orientation | 68 |
| 6.8.10 | Safety contour | 68 |
| 6.8.11 | Safety depth | 68 |
| 6.8.12 | Cursor pick | 68 |
| 6.8.13 | Navigation related functions | 68 |

| | | |
|---------------------|---|-----|
| 6.8.14 | Position integration | 69 |
| 6.8.15 | Radar and other navigational information | 69 |
| 6.8.16 | Loading of corrupted data | 72 |
| 6.8.17 | Automatic updates | 72 |
| 6.8.18 | Manual updates | 73 |
| 6.8.19 | Self-tests of major functions..... | 73 |
| 6.8.20 | Operational area | 73 |
| 6.8.21 | External removable media..... | 74 |
| 6.9 | Operational requirements | 74 |
| 6.9.1 | Ergonomic principles..... | 74 |
| 6.9.2 | Route planning | 74 |
| 6.9.3 | Route monitoring | 76 |
| 6.9.4 | Twelve hour log | 78 |
| 6.9.5 | Voyage record | 78 |
| 6.9.6 | Power supply | 78 |
| 6.9.7 | LOP position fix | 78 |
| 6.10 | Software maintenance | 79 |
| 6.11 | Quality management | 79 |
| 6.12 | Default control setting and saved operator control settings | 80 |
| 6.13 | AIS information and AIS target data | 80 |
| 6.13.1 | General..... | 80 |
| 6.13.2 | AIS targets and data report capacity | 80 |
| 6.13.3 | AIS target filtering | 80 |
| 6.13.4 | Activation and deactivation of AIS targets | 81 |
| 6.13.5 | AIS functionality and presentation..... | 81 |
| 6.13.6 | AIS target data..... | 82 |
| 6.13.7 | AIS CPA/TCPA alarm..... | 83 |
| 6.13.8 | AIS lost target warning..... | 83 |
| 6.14 | AIS Voyage-related data | 84 |
| 6.15 | Anchor watch | 84 |
| 6.16 | NAVTEX and SafetyNET for MSI..... | 85 |
| 6.17 | Interface for transfer of route information | 85 |
| 6.18 | Interface with INS | 86 |
| Annex A (normative) | SENC information to be displayed during route planning and route monitoring | 87 |
| Annex B (normative) | Navigational elements and parameters..... | 88 |
| Annex C (normative) | Areas for which special conditions exist | 89 |
| Annex D (normative) | Alerts and indications..... | 90 |
| Annex E (normative) | Mandatory terminology and abbreviations | 92 |
| Annex F (normative) | Back-up arrangements | 98 |
| F.1 | Overview..... | 98 |
| F.2 | Purpose | 98 |
| F.3 | Functional requirements..... | 98 |
| F.3.1 | Required functions and their availability..... | 98 |
| F.3.2 | Reliability and accuracy | 102 |
| F.3.3 | Malfunctions, warnings, alerts and indications | 102 |
| F.4 | Operational requirements | 102 |
| F.4.1 | Ergonomics..... | 102 |

| | | |
|---------------------|--|-----|
| F.4.2 | Presentation of information | 102 |
| F.5 | Power supply | 103 |
| F.6 | Other requirement..... | 103 |
| F.6.1 | Connection with other systems | 103 |
| F.6.2 | Route transfer interface | 104 |
| F.6.3 | Radar as back-up system..... | 104 |
| F.6.4 | Operational area | 104 |
| F.6.5 | Software maintenance | 104 |
| F.6.6 | Quality management | 104 |
| F.6.7 | Default Control Settings and Saved User Control Settings | 104 |
| F.6.8 | External removable media..... | 104 |
| F.7 | Methods of testing and required test results | 105 |
| F.7.1 | EUT installation and technical documentation | 105 |
| F.7.2 | Interfaces | 105 |
| F.7.3 | General requirements and presentation requirements | 105 |
| F.7.4 | Preparation..... | 105 |
| F.7.5 | Initial data tests – Chart..... | 106 |
| F.7.6 | Accuracy..... | 106 |
| F.7.7 | Visual requirements | 106 |
| F.7.8 | Functional requirements | 106 |
| F.7.9 | Operational requirements..... | 108 |
| Annex G (normative) | ECDIS in the RCDS mode of operation | 111 |
| G.1 | Overview..... | 111 |
| G.2 | RCDS definitions | 111 |
| G.3 | Display of SRNC information..... | 112 |
| G.3.1 | SRNC | 112 |
| G.3.2 | Categories of display | 112 |
| G.3.3 | Power failure | 112 |
| G.3.4 | Information content | 112 |
| G.3.5 | Verification and updates | 112 |
| G.3.6 | Indication..... | 113 |
| G.4 | Provision and updating of chart information | 113 |
| G.4.1 | Contents of the RNC | 113 |
| G.4.2 | Updates | 113 |
| G.5 | Scale | 114 |
| G.6 | Display of other navigational information..... | 114 |
| G.6.1 | General for all overlays..... | 114 |
| G.6.2 | Radar information | 114 |
| G.6.3 | AS information | 115 |
| G.6.4 | AIS Target Data..... | 115 |
| G.6.5 | AIS Voyage Related Data | 115 |
| G.6.6 | AIS CPA/TCPA alarms..... | 115 |
| G.6.7 | AIS lost target warning..... | 115 |
| G.6.8 | Anchor watch..... | 115 |
| G.7 | Display mode and generation of the neighbouring area | 115 |
| G.8 | Colours and symbols..... | 116 |
| G.9 | Display requirements | 116 |
| G.9.1 | Route planning and monitoring | 116 |
| G.9.2 | Display characteristics | 116 |

| | | |
|-----------------------|---|-----|
| G.9.3 | Chart notes | 117 |
| G.10 | Route planning, monitoring and voyage recording | 117 |
| G.10.1 | General..... | 117 |
| G.10.2 | Route planning | 117 |
| G.10.3 | Route monitoring | 117 |
| G.10.4 | Position integration | 118 |
| G.10.5 | Object information..... | 119 |
| G.10.6 | LOP position fix | 119 |
| G.10.7 | Voyage recording..... | 119 |
| G.11 | Calculations and accuracy | 120 |
| G.12 | Connections with other equipment (interfaces)..... | 120 |
| G.13 | Performance tests, malfunction alerts and indications | 121 |
| G.14 | Back-up arrangements for RCDS mode of operation | 121 |
| G.15 | Power supply for RCDS mode of operation | 121 |
| G.16 | Requirements contained in IHO publications | 122 |
| G.16.1 | Structure of RNC data..... | 122 |
| G.16.2 | RNC data resolution and accuracy | 122 |
| G.16.3 | RNC meta-data | 122 |
| G.16.4 | RNC colours | 122 |
| G.16.5 | RNC notes, diagrams, etc | 123 |
| G.16.6 | Operational area | 123 |
| G.16.7 | External removable media..... | 123 |
| G.17 | Methods of testing and required test results | 123 |
| G.17.1 | Preparation – Required test items | 123 |
| G.17.2 | Initial data tests | 124 |
| G.17.3 | Accuracy..... | 124 |
| G.17.4 | Visual requirements | 125 |
| G.17.5 | Functional requirements | 126 |
| G.17.6 | Operational requirement | 131 |
| G.18 | RNC test data set | 134 |
| Annex H (normative) | Alerts and indications in the RCDS mode of operation | 135 |
| Annex I (normative) | Scenario definitions and plots..... | 136 |
| I.1 | Overview..... | 136 |
| I.2 | Scenario 1: | 137 |
| I.3 | Scenario 2: | 138 |
| I.4 | Scenario 3: | 140 |
| I.5 | Scenario 4: | 141 |
| Annex J (informative) | Guidance on geodetic calculations..... | 144 |
| J.1 | Overview..... | 144 |
| J.2 | Distance deviations between Great Circle (orthodrome) and Rhumb Line (loxodrome) | 144 |
| J.3 | Bearing deviations at start point between Great Circle (orthodrome) and Rhumb Line (loxodrome)..... | 145 |
| Annex K (informative) | Guidance for testing | 147 |
| K.1 | Methods of test derived from ISO 9241-12 | 147 |
| K.2 | Observation | 147 |
| K.3 | Inspection of documented evidence | 147 |
| K.4 | Measurement..... | 147 |
| K.5 | Analytical evaluation | 148 |

| | |
|--|-----|
| Annex L (informative) Examples of ENC Update Status Report | 149 |
| L.1 Overview..... | 149 |
| L.2 ENC Update Status Report – Summary..... | 149 |
| L.3 ENC Update Status Report – Full..... | 150 |
| L.4 ENC Management Report – Route Filtered | 152 |
| Annex M (normative) Elements of an electronic chart database | 153 |
| M.1 General..... | 153 |
| M.2 ECDIS implementation | 153 |
| M.3 Display base category..... | 154 |
| M.3.1 Coastline layer..... | 154 |
| M.3.2 Safety contour layer..... | 155 |
| M.3.3 Isolated underwater dangers layer | 155 |
| M.3.4 Isolated above-water dangers layer | 155 |
| M.4 Standard display category..... | 156 |
| M.4.1 Display base layer | 156 |
| M.4.2 Additional aids to navigation and fixed structures layer | 156 |
| M.4.3 Fairways layer | 156 |
| M.4.4 Conspicuous features layer..... | 156 |
| M.4.5 Prohibited and restricted areas layer..... | 157 |
| M.4.6 Ferry routes layer | 157 |
| M.4.7 Archipelagic sea lanes layer | 157 |
| M.4.8 Buoys and beacons layer | 157 |
| M.4.9 Traffic routeing layer..... | 157 |
| M.5 All other information category | 158 |
| M.5.1 Information about the chart display layer..... | 158 |
| M.5.2 Natural and man-made features, Port features layer | 158 |
| M.5.3 Depth, currents, etc. layer..... | 159 |
| M.5.4 Seabed, obstructions, pipelines layer..... | 160 |
| M.5.5 Traffic routes layer | 160 |
| M.5.6 Special areas layer | 160 |
| M.5.7 Service and small craft facilities layer | 161 |
| M.6 Text grouping..... | 161 |
| M.6.1 Important Text group layer | 161 |
| M.6.2 Other Text group layer | 161 |
| Annex N (informative) Use cases for safety contour and safety depth | 163 |
| Annex O (informative) Guidelines on use of electronic chart systems in polar waters | 165 |
| O.1 Projection and coordinate system | 165 |
| O.2 Consistency | 166 |
| Annex P (normative) Scenarios for polar areas above 85° North | 167 |
| Annex Q (normative) IEC 61162 interfaces | 173 |
| Q.1 General..... | 173 |
| Q.2 VDR interface | 176 |
| Q.3 AIS interface and interrogation..... | 176 |
| Q.4 Route transfer interface | 177 |
| Q.5 BAM interface | 177 |
| Annex R (informative) Conversion between IEC 61162-1 sentences and IEC 61162-3 parameter group numbers..... | 181 |
| Annex S (normative) Route plan exchange format – RTZ | 183 |

| | | |
|---------------------|--|-----|
| S.1 | General..... | 183 |
| S.2 | RTP Data container | 184 |
| S.3 | High-level description of the RTZ format | 185 |
| S.4 | Adaptation to third-party extensions | 185 |
| S.4.1 | Generic idea | 185 |
| S.4.2 | Unique identification of a waypoint..... | 185 |
| S.4.3 | Creation of new waypoints | 186 |
| S.4.4 | Change of geographic data for a waypoint | 186 |
| S.4.5 | Waypoint removal | 186 |
| S.5 | Detailed RTZ format description..... | 186 |
| S.5.1 | File components | 186 |
| S.5.2 | Route node description | 186 |
| S.5.3 | RouteInfo node description | 187 |
| S.5.4 | Waypoints node description | 188 |
| S.5.5 | DefaultWaypoint node description..... | 188 |
| S.5.6 | Waypoint node description..... | 189 |
| S.5.7 | Storing date and time for legs | 190 |
| S.5.8 | Schedules node description | 190 |
| S.5.9 | Schedule node description | 190 |
| S.5.10 | Extensions node description | 192 |
| S.5.11 | Extension node description | 193 |
| S.6 | XML schema to be met by RTZ route files..... | 193 |
| S.7 | Basic RTZ route example..... | 205 |
| S.8 | Example of the RTZ route with embedded extensions | 206 |
| S.9 | UML model of the Route exchange format..... | 207 |
| Annex T (normative) | Interface for reporting route transfer | 209 |
| T.1 | Route encapsulation format for transmitting RTZ over IEC 61162-450 | 209 |
| T.2 | RRT – Report route transfer..... | 210 |
| Annex U (normative) | Sentences used by SafetyNET | 211 |
| U.1 | General..... | 211 |
| U.2 | SM1 – SafetyNET Message, All Ships/NavArea | 211 |
| U.3 | SM2 – SafetyNET Message, Coastal Warning Area | 213 |
| U.4 | SM3 – SafetyNET Message, Circular Area Address | 215 |
| U.5 | SM4 – SafetyNET Message, Rectangular Area Address..... | 217 |
| U.6 | SMB – IMO SafetyNET Message Body..... | 220 |
| U.7 | An example of use | 221 |
| Annex V (normative) | Extension of TTD sentence, Protocol version 1 | 222 |
| V.1 | General..... | 222 |
| V.2 | TTD – Tracked target data, Protocol version 1 | 222 |
| Annex W (normative) | Symbols | 223 |
| Bibliography..... | | 224 |
| Figure F.1 | – Backup system logical interfaces | 103 |
| Figure I.1 | – Definition of elements of route | 136 |
| Figure I.2 | – Route for scenario 1..... | 138 |
| Figure I.3 | – Route for scenario 2..... | 139 |
| Figure I.4 | – Route for scenario 3..... | 140 |

| | |
|--|-----|
| Figure I.5 – Route for scenario 4..... | 143 |
| Figure J.1 – Distance deviations between Great Circle and Rhumb Line | 144 |
| Figure J.2 – Bearing deviations at start point between Great Circle and Rhumb Line | 146 |
| Figure N.1 – Original situation | 163 |
| Figure N.2 – New situation..... | 164 |
| Figure P.1 – Examples of use of the tables | 167 |
| Figure Q.1 – ECDIS logical interfaces..... | 173 |
| Figure Q.2 – Alert reporting by ECDIS without escalation of a warning | 177 |
| Figure Q.3 – Alert reporting by ECDIS with escalation of a warning as alarm | 178 |
| Figure Q.4 – Alert reporting by ECDIS in case of remote acknowledge | 178 |
| Figure Q.5 – Alert reporting by ECDIS in case of remote silence..... | 179 |
| Figure Q.6 – Alert reporting by ECDIS in case of remote silence..... | 180 |
| Figure Q.7 – Alert reporting by ECDIS in case of remote silence..... | 180 |
| Figure S.1 – Description of route plan – Distance between WP 2 and WP 3 | 184 |
| Figure S.2 – Description of route plan – Leg parameters belonging to WP 3 | 184 |
| Figure S.3 – UML diagram | 208 |
| Figure T.1 – Examples of timing for route transfer..... | 209 |
| | |
| Table 1 – Tracked target display capacity | 28 |
| Table 2 – AIS display capacity | 30 |
| Table 3 – Control settings configured in response to ‘Default’ selection | 47 |
| Table D.1 – Alerts and indications resulting from IMO requirements..... | 90 |
| Table D.2 – Alerts and indications defined in this standard | 91 |
| Table E.1 – Chart display terminology..... | 92 |
| Table E.2 – Main function terminology | 94 |
| Table E.3 – Database terminology | 95 |
| Table E.4 – Route, route monitoring or route plan related terminology | 96 |
| Table H.1 – Alerts and indications in the RCDS mode of operation | 135 |
| Table J.1 – Rhumb Line distances | 145 |
| Table J.2 – Deviations from Great Circle distances | 146 |
| Table M.1 – Minimum ECDIS mariner viewing group layer selectors | 153 |
| Table M.2 – Minimum ECDIS mariner text group layer selectors | 154 |
| Table P.1 – Spatial control points from 85°N, 0°E as origin..... | 168 |
| Table P.2 – Spatial control points from 87°N, 0°E as origin | 169 |
| Table P.3 – Spatial control points from 89°N, 0°E as origin..... | 170 |
| Table P.4 – Spatial control points from 90°N, 0°E as origin, 180°E as origin of relative bearings..... | 171 |
| Table Q.1 – Mandatory sentences received by ECDIS | 174 |
| Table Q.2 – Optional sentences received by ECDIS..... | 175 |
| Table Q.3 – Mandatory sentences transmitted by the ECDIS | 175 |
| Table Q.4 – Optional sentences transmitted by the ECDIS..... | 176 |
| Table Q.5 – Mandatory information transmitted to the VDR..... | 176 |
| Table Q.6 – Information between the ECDIS and an ECDIS backup system..... | 177 |

| | |
|---|-----|
| Table R.1 – Conversion from IEC 61162-1 to IEC 61162-3..... | 181 |
| Table R.2 – Conversion from IEC 61162-3 to IEC 61162-1..... | 182 |
| Table W.1 – Anchor watch symbol | 223 |

INTERNATIONAL ELECTROTECHNICAL COMMISSION

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

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.

International Standard IEC 61174 has been prepared by IEC technical committee 80: Maritime navigation and radiocommunication equipment and systems.

This fourth edition of IEC 61174 cancels and replaces the third edition published in 2008, of which it constitutes a technical revision.

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

- updated references are provided to IHO publications and test methods are updated to IHO test data sets;
- requirements have been added for display of radar and AIS information;

- new interface requirements have been added for BNWAS, VDR, BAM, MSI, INS and route transfer;
- a requirement for an anchor watch has been added;
- additional test methods are specified for operation of ECDIS beyond the normal range between 85 degrees South latitude and 85 degrees North latitude.

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

| | |
|-------------|------------------|
| FDIS | Report on voting |
| 80/761/FDIS | 80/767/RVD |

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

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

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

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

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

IMPORTANT – The 'colour inside' logo on the cover page of this publication 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.

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

1 Scope

This International Standard specifies the performance requirements, methods of testing and required test results of equipment conforming to performance standards not inferior to those adopted by the IMO in resolution MSC.232(82).

This standard is based upon the performance standards of IMO resolution MSC.232(82), and is also associated with IMO resolution A.694(17) and IEC 60945. Reference is made, where appropriate, to IMO resolution MSC.232(82), and all subclauses whose wording is identical to that in the resolution are printed in italics.

In association with the above IMO resolution MSC.232(82), are the International Hydrographic Organization (IHO) publications¹. IHO S-32, IHO S-52, IHO S-57, IHO S-61, IHO S-63 and IHO S-64. This standard has included extracts from the above publications where they are applicable to this equipment. Where reference is made, all subclauses whose wording is identical to that in the publications, are printed in italics.

(232/A2.1) These performance standards should apply to all ECDIS equipment carried on all ships as follows:

- *dedicated standalone workstation.*
- *a multifunction workstation as part of an INS.*

(232/A2.2) These performance standards apply to ECDIS mode of operation, ECDIS in RCDS mode of operation as specified in Annex G and ECDIS backup arrangements as specified in Annex F.

(232/A2.3) Requirements for structure and format of the chart data, encryption of chart data as well as the presentation of chart data are within the scope of relevant IHO standards, including those listed in the normative references.

The requirements of this standard are not intended to prevent the use of new techniques in equipment and systems, provided the facilities offered are not inferior to those stated.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

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

¹ IHO publications are available from <http://www.iho.int>, together with any supplementary information.

IEC 61162-1, *Maritime navigation and radiocommunication equipment and systems – Digital interfaces – Part 1: Single talker and multiple listeners*

IEC 61162-450:2011 *Maritime navigation and radiocommunication equipment and systems – Digital interfaces – Part 450: Multiple talkers and multiple listeners – Ethernet interconnection*

IEC 61924-2:2012, *Maritime navigation and radiocommunication equipment and systems – Integrated navigation systems – Part 2: Modular structure for INS – Operational and performance requirements, methods of testing and required test results*

IEC 61996-1:2013, *Maritime navigation and radiocommunication equipment and systems – Shipborne voyage data recorder (VDR) – Part 1: Performance requirements, methods of testing and required test results*

IEC 62288:2014, *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 62388:2013, *Maritime navigation and radiocommunication equipment and systems – Shipborne radar – Performance requirements – Methods of testing and required test results*

ISO 8601, *Data elements and interchange formats – Information interchange – Representation of dates and times*

IHO M-3:2007, *Resolutions of the IHO, Chapter A, Section 3, Technical Resolution 3.11*

IHO S-52:2014, *Specifications for chart content and display aspects of ECDIS edition 6.1*

IHO S-52, appendix 1:2012, *Guidance on Updating the Electronic Navigational Chart edition 4.0*

IHO S-52, Annex A:2014, *Presentation library edition 4.0*

IHO S-57, *IHO transfer standard for digital hydrographic data*

IHO S-57, appendix B.1, *ENC product specification*

IHO S-61:1999, *Product specification for raster navigational charts (RNC)*

IHO S-63, *IHO data protection scheme*

IHO S-64, *Test data sets for ECDIS*

IMO, *International Convention for the safety of life at sea (SOLAS) 1974 (as amended)*

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

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

IMO MSC/Circ.982:2000, *Guidelines on ergonomic criteria for bridge equipment and layout*

IMO SN.1/Circ.266:2007, *Maintenance of electronic chart display and information system (ECDIS) software*