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INTERNATIONAL STANDARD

Maritime navigation and radiocommunication equipment and systems – Electronic chart system (ECS) – Operational and performance requirements, methods of testing and required test results

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FOREWORD

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IEC 62376 has been prepared by IEC technical committee 80: Maritime navigation and radiocommunication equipment and systems.

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

FDIS	Report on voting
80/598/FDIS	80/604/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 stability date indicated on the IEC web site under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

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- withdrawn,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

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

MARITIME NAVIGATION AND RADIOCOMMUNICATION EQUIPMENT AND SYSTEMS –

Electronic chart system (ECS) – Operational and performance requirements, methods of testing and required test results

1 Scope

This International Standard specifies the minimum operational and performance requirements and methods of testing for ECS. ECSs are designed or adapted for use as navigation information systems on vessels not required to comply with Chapter V of the International Convention for the Safety of Life at Sea (SOLAS).

Different types of vessels, for example, a non-SOLAS passenger vessel, a small fishing vessel or a recreational vessel, which operate in different environments, need to be equipped with navigational systems providing functionality to meet their needs. If the full functionality of ECDIS according to IEC 61174 is considered to be unnecessary, ECS may be suitable for a navigation information system for these vessels. Governments may consider requiring the carriage of ECS for these vessels under local arrangements.

In order to provide a standard that can be used to apply different levels of navigational functionality, three classes of ECS are defined.

- Class “A” ECS are designed or adapted for use as a primary navigation information system.
- Class “B” ECS are designed or adapted for use as a navigation information system where less navigational functionality is required than Class “A”.
- Class “C” ECS are designed or adapted for use as a navigation information system with minimal functionality intended to plot and monitor a vessel’s position.

Within this International Standard, the beginning of each paragraph indicates the applicability to ECS Class(es). Paragraphs marked “(A B C)” apply to all Classes; paragraphs marked “(A B)” or “(B C)” apply only to those specific combinations of Classes; and paragraphs marked “(A)”, “(B)” or “(C)” apply only to those individual Classes.

For a Class “A” and Class “B” ECS, adequate back-up arrangements may be required to ensure safe navigation in the event of an ECS failure. For a Class “A” ECS, an additional Class “A” ECS may be used as the back-up. Alternatively, Class “B” ECS are intended to meet the minimum requirements for adequate back-up arrangements for Class “A” ECS. For a Class “B” ECS, an additional Class “B” ECS may be used as the back-up. Class “C” ECS are not intended to meet the minimum requirements for adequate back-up arrangements for Class “A” or Class “B” ECS.

Guidance for testing ECS is given in Annex A.

2 Normative references

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

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

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

IEC 61162-3, *Maritime navigation and radiocommunication equipment and systems – Digital interfaces – Part 3: Serial data instrument network*

IEC 61174:2008, *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 62288:2008, *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 62388:2007, *Maritime navigation and radiocommunication equipment and systems – Shipborne radar – Performance requirements, methods of testing and required test results*

IHO S-52 Annex A:2008, *IHO ECDIS Presentation Library*

IHO S-60:2003 (as amended through 2008), *User's handbook on datum transformation involving WGS 84*

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

3 Terms and definitions

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

3.1
automatic identification system
AIS
system which complies with the requirements set forth in Annex 3 to IMO resolution MSC.74(69) and further specified in IEC 61993-2 (i.e. for AIS Class-A) or IEC 62287-1 (i.e. for AIS Class-B "CS")

3.2
consistent common reference point
CCRP
location on own ship to which measurements such as own ship position, heading, attitude, 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 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.

3.3
electronic chart display and information system
ECDIS
navigation information system which, with adequate back-up arrangements, can be accepted as complying with the up-to-date chart required by regulations V/19 and V/27 of the 1974 SOLAS Convention, as amended, by displaying selected information from a system electronic navigational chart (SENC) with positional information from navigation sensors to assist the mariner in route planning and route monitoring, and, if required, display additional navigation-

related information as set forth in IMO resolution MSC.232(82) and further specified in IEC 61174

3.4
ECDIS display base
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 It is not intended to be sufficient for safe navigation.

3.5
ECDIS standard display
level of information that should be shown when a chart is first displayed on ECDIS

NOTE 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.

3.6
electronic chart system
ECS
navigation information system which complies with the requirements specified in this standard but does not comply with all of the requirements specified for ECDIS

3.7
electronic chart database
standards-compliant electronic chart database derived from Nautical Charts and Nautical Publications (for example, ENCs, RNCs, and ISO 19379 ECS databases)

3.8
electronic navigational chart
ENC
database standardised as to content, structure and format according to IHO S-57 Appendix B.1 and issued by, or on the authority of, a government

3.9
electronic position fixing system
EPFS
receiver for a radio navigation system capable of automatically and continuously updating own ship’s position

3.10
inland electronic navigational chart
inland ENC
database standardised as to content, structure and format according to IHO S-57 Appendix B.1 and further specified in the Product Specification for Inland ENC published by the Inland ENC Harmonization Group (IEHG) and issued by, or on the authority of, a government for use onboard vessels transiting inland waterways

3.11
nautical chart and/or nautical publication
special-purpose map or book, or a specially compiled database from which such a map or book is derived, issued by, or on the authority of, a government and designed to meet the requirements of marine navigation

3.12
notice to mariners
NtM
periodic publication, issued by, or on the authority of, a government, providing information used to update nautical charts and/or nautical publications

3.13
radar
system which complies with the requirements set forth in IMO resolution MSC.192(79) and further specified in IEC 62388; or as specified in IEC 62252 (i.e. for non SOLAS radars)

3.14
raster navigational chart
RNC
facsimile of a single paper chart or a collection of paper charts produced as raster format electronic chart database, standardized as to content, issued by or on the authority of, a government and conforming to relevant IHO standards (e.g. IHO S-61), and designed to meet the requirements of marine navigation

3.15
system electronic navigational chart
SENC
ENC, converted to a manufacturer's internal format, resulting from the lossless transformation of the ENC and its updates

NOTE The SENC may also contain information added by the mariner and information from other sources.

3.16
SENC distribution option
distribution option where a government may allow the distribution of their ENC data in a SENC format

4 General requirements

4.1 Application of IEC 60945

4.1.1 Requirements

4.1.1.1 General requirements for electronic navigational aids

(A B C) The ECS shall meet the applicable general requirements for electronic navigational aids specified in IEC 60945 as identified in Table 1 and clarified by 4.1.1.2 through 4.1.1.8 and 5.4.

Table 1 – IEC 60945 requirements

IEC 60945, Clause/Subclause		ECS class		
		A	B	C
4	Minimum performance requirements			
4.1	General			
4.1.1	Introduction			
4.1.2	General requirements	X	X	X
4.2	Design and operation			
4.2.1	Ergonomics and HMI (Human machine interface)			
4.2.1.1	General	X	X	X
4.2.1.2	Arrangement	X	-	-
4.2.1.3	Operation	X	X	-
4.2.1.4	Identification (See also 4.1.1.2)	X	-	-
4.2.1.5	Screen displays and indications (See also 4.1.1.3)	X	X	-
4.2.1.6	Voice announcement (See also 4.1.1.4)	-	-	-

IEC 60945, Clause/Subclause		ECS class		
		A	B	C
4.2.1.7	Safety of operation	X	X	X
4.2.1.8	Distress alert (See also 4.1.1.5.)	N/A	N/A	N/A
4.2.2	Hardware			
4.2.2.1	General	X	X	-
4.2.2.2	Alarms and indicators (See also 4.1.1.6)	X	X	-
4.2.2.3	Illumination	X	X	-
4.2.3	Software			
4.2.3.1	General	X	X	X
4.2.3.2	Safety of operation	X	X	-
4.2.3.3	Monitoring	X	X	-
4.2.3.4	Operation	X	X	-
4.2.4	Inter-unit connection (See also 5.4)	X	X	X
4.3	Power supply			
4.3.1	Extreme power supply	X	X	X
4.3.2	Excessive conditions	X	X	X
4.3.3	Power supply short-term variation and power supply failure (See also 4.1.1.7)	X	X	-
4.4	Durability and resistance to environmental conditions	X	X	-
4.5	Interference			
4.5.1	Electromagnetic compatibility	X	X	X
4.5.2	Acoustic noise	X	X	X
4.5.3	Compass safe distance	X	X	X
4.6	Safety precautions			
4.6.1	Protection against accidental access to dangerous voltages	X	X	X
4.6.2	Electromagnetic radio frequency radiation	X	X	X
4.6.3	X-radiation	X	X	-
4.7	Maintenance			
4.7.1	Maintenance of hardware	X	X	-
4.7.2	Maintenance of software	X	X	-
4.8	Equipment manuals (See also 4.1.1.8)	X	X	X
4.9	Marking and identification	X	X	-

Legend:

"X" denotes a required capability (as clarified by 4.1.1.2 through 4.1.1.8 and 5.4).

"-" denotes a capability that is not required but may be implemented, and if implemented shall be implemented as if it is a required capability.

NOTE Where screen size and/or resolution are issues, the presentation may be adjusted.

"N/A" denotes a capability that does not apply and shall not be implemented.

4.1.1.2 Identification

(C) The requirements in IEC 60945 regarding use of the English language do not apply.

4.1.1.3 Screen displays and indications

(C) The requirements in IEC 60945 regarding use of the English language do not apply.

4.1.1.4 Voice announcement

(C) The requirements in IEC 60945 regarding use of the English language do not apply.

4.1.1.5 Distress alert

(A B C) The ECS shall not provide the distress alert and dedicated distress button specified in IEC 60945, 4.2.1.8.

4.1.1.6 Alarms and indicators

(B C) The ECS may provide the capability to adjust its audible alarm signals below the acoustic level specified in IEC 60945, 4.2.2.2.

4.1.1.7 Power supply short-term variation and power supply failure

(A B) When power is restored to the ECS after an interruption, the ECS shall resume operation and return to the most recently selected settings for display without requiring user intervention.

4.1.1.8 Equipment manuals

(C) The user manual, instructions and reference guides may be exclusively available in any language determined by the manufacturer.

4.1.2 Methods of test and required results

4.1.2.1 General requirements for electronic navigational aids

(A B C) Verify that the ECS meets the applicable general requirements for electronic navigational aids specified in IEC 60945 as identified in Table 1 and clarified by 4.1.1.2 through 4.1.1.8 and 5.4 using the methods of testing specified in IEC 60945 as identified in Table 2 and clarified by 4.1.2.2 through 4.1.2.10.

Table 2 – IEC 60945 methods of testing

IEC 60945, Clause/Subclause		ECS class		
		A	B	C
5	Methods of testing and required test results			
5.1	General	X	X	X
5.2	Test conditions			
5.2.1	Normal test conditions	X	X	X
5.2.2	Extreme test conditions	X	X	-
5.2.3	Excessive conditions	X	X	-
5.3	Test results	X	X	X
6	Operational checks			
6.1	Ergonomics and HMI (Human machine interface)			
6.1.1	General	X	X	X
6.1.2	Arrangement	X	-	-
6.1.3	Operation	X	X	-
6.1.4	Identification (See also 4.1.2.2)	X	-	-
6.1.5	Screen display and indicators (See also 4.1.2.3)	X	X	-
6.1.6	Voice announcement (if provided) (See also 4.1.2.4)	-	-	-
6.1.7	Safety of operation	X	X	X

IEC 60945, Clause/Subclause		ECS class		
		A	B	C
6.1.8	Distress alert (See also 4.1.2.5)	N/A	N/A	N/A
6.2	Hardware			
6.2.1	General	X	X	-
6.2.2	Alarms and indicators	X	X	-
6.2.3	Illumination	X	X	-
6.3	Software			
6.3.1	General	X	X	X
6.3.2	Safety of operation	X	X	-
6.3.3	Monitoring	X	X	-
6.3.4	Operation	X	X	-
6.4	Inter-unit connection (See also 5.4)	X	X	X
7	Power supply			
7.1	Extreme power supply	X	X	X
7.2	Excessive conditions	X	X	-
7.3	Power supply short-term variation	X	X	-
7.4	Power supply failure (See also 4.1.2.6)	X	X	-
8	Durability and resistance to environmental conditions			
8.1	General	X	X	-
8.2	Dry heat			
8.2.1	Storage test	-	-	-
8.2.2	Functional test	X	X	-
8.3	Damp heat			
8.3.1	Functional test	X	X	-
8.4	Low temperature			
8.4.1	Storage test	-	-	-
8.4.2	Functional tests	X	X	-
8.5	Thermal shock	-	-	-
8.6	Drop	X	X	-
8.7	Vibration	X	X	-
8.8	Rain and spray	X	X	-
8.9	Immersion	X	X	-
8.10	Solar radiation	X	X	-
8.11	Oil resistance	X	X	-
8.12	Corrosion (See also 4.1.2.7)	X	X	-
9	Electromagnetic emission			
9.1	General	X	X	X
9.2	Conducted emissions	X	X	X
9.3	Radiated emissions from enclosure port	X	X	X
10	Immunity to electromagnetic environment			
10.1	General	X	X	X
10.2	Radio receiver equipment	X	X	X
10.3	Immunity to conducted radio frequency disturbance	X	X	X
10.4	Immunity to radiated radiofrequencies	X	X	X

IEC 60945, Clause/Subclause		ECS class		
		A	B	C
10.5	Immunity to fast transients on a.c. power, signal and control lines	X	X	-
10.6	Immunity to surges on a.c. power lines	X	X	-
10.7	Immunity to power supply short-term variation	X	X	X
10.8	Immunity to power supply failure	X	X	-
10.9	Immunity to electrostatic discharge	X	X	X
11	Special purpose tests			
11.1	Acoustic noise and signals	X	X	-
11.2	Compass safe distance	X	X	X
12	Safety precautions			
12.1	Protection against accidental access to dangerous voltages	X	X	-
12.2	Electromagnetic radio frequency radiation	-	-	-
12.3	Emission from visual display unit (See also 4.1.2.8)	X	X	-
12.4	X-radiation (See also 4.1.2.9)	X	X	-
13	Maintenance	X	X	-
14	Equipment manuals (See also 4.1.2.10)	X	X	X
15	Marking and identification	X	X	X
Legend: "X" denotes a required test (as clarified by 4.1.2.2 through 4.1.2.10 and 5.4). "-" denotes a test that is not required but may be implemented, and if implemented shall be implemented as if it is a required test. NOTE Where screen size and/or resolution are issues, the presentation may be adjusted. "N/A" denotes a capability that does not apply and shall not be implemented.				

4.1.2.2 Identification

(C) The requirements in IEC 60945 regarding use of the English language do not apply.

4.1.2.3 Screen displays and indications

(C) The requirements in IEC 60945 regarding use of the English language do not apply.

4.1.2.4 Voice announcement

(C) The requirements in IEC 60945 regarding use of the English language do not apply.

4.1.2.5 Distress alert

(A B C) Confirm by observation that the ECS does not provide the distress alert or dedicated distress button specified in IEC 60945, 4.2.1.8.

4.1.2.6 Power supply short-term variation and immunity to power supply failure

(A B) Verify by observation that when power is restored to the ECS after an interruption, the ECS resumes operation and returns to the most recently selected settings for display.

4.1.2.7 Durability and resistance to environmental conditions

(A B) Verify by inspection of the manufacturer's provided information that the components, materials and finishes employed in the equipment would satisfy the corrosion test specified in IEC 60945, 8.12.

4.1.2.8 Emissions from a visual display unit

(A B) Verify by inspection of the manufacturer's provided information that the requirements of the safety test for emissions from a visual display unit (VDU) in IEC 60945, 12.3 are satisfied.

4.1.2.9 X-radiation

(A B) Verify by inspection of the manufacturer's provided information that the requirements of the safety test for X-radiation in IEC 60945, 12.4 are satisfied.

4.1.2.10 Equipment manuals

(C) The user manual, instructions and reference guides may be exclusively available in any language determined by the manufacturer.

4.2 Application of IEC 62288

4.2.1 Requirements

4.2.1.1 Presentation of navigation-related information on navigational displays

(A B C) Except where clarified by 4.2.1.2 through 4.2.1.13, the ECS shall meet the applicable presentation requirements specified in IEC 62288 as listed in Table 3.

Table 3 – IEC 62288 requirements

IEC 62288, Clause/Subclause		ECS class		
		A	B	C
4	General requirements for all displays			
4.1	Application of IEC 60945			
4.1.1	General requirements (See also 4.1.1, Table 1)	X	X	X
4.2	Arrangement of information			
4.2.1	Consistency of layout	X	X	-
4.2.2	Consistent presentation of information (See also 4.2.1.2)	X	X	X
4.2.3	Separation of operational display area	X	X	-
4.3	Readability			
4.3.1	Readability under all ambient light conditions	X	X	-
4.3.2	Legibility of alphanumeric data and text	X	X	-
4.3.3	Presentation of text (See also 4.2.1.3)	X	X	X
4.3.4	Icons	X	X	-
4.4	Colours and intensity			
4.4.1	Discrimination of colours	X	X	-
4.5	Symbols			
4.5.1	Operational information	X	X	-
4.5.2	Electronic chart information (See also 4.2.1.4)	X	X	X
4.6	Colour coding of information			
4.6.1	Colour coding for discrimination	X	X	X

IEC 62288, Clause/Subclause		ECS class		
		A	B	C
4.6.2	Colour coding of information	X	X	X
4.6.3	Colour coding in combination with other attributes	X	X	-
4.6.4	Flashing of information	X	X	-
4.7	Integrity marking			
4.7.1	Indication of source, validity, and integrity status	X	X	-
4.7.2	Colour coding of validity and integrity	X	X	-
4.7.3	Indication of presentation failure	X	X	-
4.8	Alarms and indications			
4.8.1	Operational status	X	X	-
4.8.2	List of alarms	X	X	-
4.8.3	Alarm related information from multiple sources	X	-	-
4.9	Presentation mode			
4.9.1	Indication of presentation mode in use	X	X	-
4.10	Manuals			
4.10.1	User manuals, instructions and reference guides	X	X	X
5	Presentation of operational information			
5.1	Presentation of own ship information			
5.1.1	Graphical representation of own ship (See also 4.2.1.5)	X	X	-
5.2	Presentation of chart information			
5.2.1	Alteration of chart information	X	X	X
5.2.2	Colours and symbols for charted information	X	X	-
5.3	Presentation of radar information			
5.3.1	Radar video images	-	-	-
5.3.2	Target trails	-	-	-
5.4	Presentation of target information			
5.4.1	Providing target information	-	-	-
5.4.2	Consistent user interface for target information	-	-	-
5.4.3	Indication of exceeding target capacity	-	-	-
5.4.4	Filtering sleeping AIS targets	-	-	-
5.4.5	Activation of AIS targets	-	-	-
5.4.6	Graphical presentation of targets	-	-	-
5.4.7	Target selection	-	-	-
5.4.8	Indication of target derivation	-	-	-
5.4.9	Presentation of tracked radar target information	-	-	-
5.4.10	Presentation of reported AIS target information	-	-	-
5.4.11	Continual update of target information	-	-	-
5.4.12	Own ship's AIS information	-	-	-
5.4.13	Obscuring the operational display area	X	X	-
5.5	Operational alarms			
5.5.1	Alarm status	X	X	-
5.5.2	CPA/TCPA alarms	-	-	-
5.5.3	Acquisition/activation zones	-	-	-
5.5.4	Lost target alarms	-	-	-

IEC 62288, Clause/Subclause		ECS class		
		A	B	C
5.6	AIS and radar target association			
5.6.1	Target association	-	-	-
5.6.2	AIS presentation status	-	-	-
5.6.3	Trial manoeuvre	-	-	-
5.7	Measurement			
5.7.1	Measurement from own ship	X	X	-
5.7.2	Bearing and range measurements (See also 4.2.1.6)	X	X	-
5.8	Navigation tools			
5.8.1	Range rings	-	-	-
5.8.2	Variable range marker (VRM)	X	X	-
5.8.3	Bearing scale	-	-	-
5.8.4	Electronic bearing line (EBL)	X	X	-
5.8.5	Parallel index lines (PI)	-	-	-
5.8.6	Offset measurement of range and bearing	-	-	-
5.8.7	User cursor (See also 4.2.1.7)	X	X	-
6	Radar and chart displays			
6.1	General			
6.1.1	Multifunction displays	-	-	-
6.1.2	Simultaneous display of radar and chart data	-	-	-
6.1.3	Range scale (See also 4.2.1.8)	-	-	-
6.1.4	Range ring scale	-	-	-
6.1.5	Operational display area	X	X	-
6.1.6	Motion display modes	X	X	-
6.1.7	Orientation modes	X	X	X
6.1.8	Off-centring	X	X	-
6.1.9	Stabilisation modes	X	X	-
6.2	Radar displays			
6.2.1	Radar video image	-	-	-
6.2.2	Brightness of radar information	-	-	-
6.2.3	Display of chart information on radar	-	-	-
6.2.4	Priority of radar information	-	-	-
6.2.5	Display of map graphics	-	-	-
6.3	Chart display			
6.3.1	Display of chart information (See also. 4.2.1.9)	X	X	X
6.3.2	IMO display categories	X	X	-
6.3.3	Adding or removing information from the display (See also 4.2.1.10)	X	X	-
6.3.4	Safety contour	X	X	-
6.3.5	Safety depth	X	X	-
6.3.6	Chart scale	X	X	-
6.3.7	Display of radar and target information	-	-	-
6.3.8	Display of additional navigation-related information	-	-	-
6.4	Composite task-oriented presentations			
6.4.1	User-configured presentations	X	X	-

IEC 62288, Clause/Subclause		ECS class		
		A	B	C
6.4.2	Information associated with the task-at-hand (See also 4.2.1.11)	X	X	-
7	Physical requirements			
7.1	General			
7.2	Display adjustment			
7.2.1	Contrast and brightness	X	X	-
7.2.2	Magnetic interference	X	X	X
7.2.3	Temporal stability	X	X	-
7.2.4	Physical controls and status indicators	X	X	-
7.3	Screen size (See also 4.2.1.12)	X	X	X
7.4	Multicoloured display equipment	X	X	-
7.5	Screen resolution (See also 4.2.1.13)	X	X	X
7.6	Screen viewing angle	X	X	-

Legend:

"X" denotes a required capability and associated test (as clarified by 4.2.1.2 through 4.2.1.13).

"-" denotes a capability and associated test that is not required but may be implemented, and if implemented shall be implemented as if it is a required capability.

NOTE Where screen size and/or resolution are issues, the presentation may be adjusted.

4.2.1.2 Consistent presentation of information

(A B) The ECS shall present terms and abbreviations using the nomenclature published in IMO SN/Circ. 243 and further specified in IEC 62288.

(A B C) The ECS shall present data in the units in which the data is provided. The ECS may present data in other units. The ECS shall generate an indication of the units in use.

(C) The ECS shall provide a legend of general information relating to the area displayed, applicable to the ship's position. This legend shall contain as a minimum:

- units for depth;
- units for height;
- scale (or range) of display.

4.2.1.3 Presentation of text

(B C) Where screen size is an issue for the presentation of text, the use of standard symbology is encouraged.

4.2.1.4 Electronic chart information

(A B C) The ECS may present the electronic chart database using a proprietary set of colours and symbols (for example, symbology based upon the traditional paper nautical chart of the geographic area) in a manner equivalent to the IHO S-52 Annex A (ECDIS Presentation Library). If a proprietary set is used, then the ECS shall provide a legend of those colours and symbols.

(A B C) The ECS may establish an alternative priority for layering of the electronic chart database in the presentation (for example, changing the priority of the radar video image or mariners' data).

(A B C) If the electronic chart database provides detailed bathymetric information, the ECS may adjust the depth information by actual and/or predicted water levels (for example, tidal height and storm surge). If this adjustment is enabled, means or method shall also be provided to accept water level data inputs and the ECS shall provide a permanent or persistent indication. The ECS shall provide means or method to disable depth information adjustment.

(A B C) The ECS may also present additional information included in, or added to, the electronic chart database, for example, detailed bathymetry, ice, coastal zone management information, information from nautical publications, etc.

4.2.1.5 Graphical representation of own ship

(A B C) The ECS may provide the capability to represent own ship's true scale outline in 3 dimensions.

(A B C) The ECS may use the antenna position of the continuous positioning system as the CCRP (for example, as opposed to the conning position).

4.2.1.6 Bearing and range measurements

(A B C) The ECS may present distances in other units than those specified in IEC 62288.

4.2.1.7 User cursor

(A B C) The ECS shall provide a means or method to display information about vector chart objects identified by geographic position. (See also IHO S-52, Annex A, 8.8.)

4.2.1.8 Range scale

(A B C) The ECS shall provide means or method to change the display scale by chart scale.

4.2.1.9 Display of chart information

(A B) At a minimum, the ECS shall be capable of displaying the ECDIS standard display or the equivalent electronic chart database content.

NOTE Equivalent content might be interpreted, for example, as replacing own ship's safety contour with one or more appropriate depth contours.

(C) As a minimum, the ECS shall be capable of displaying the ECDIS display base or the equivalent electronic chart database content. (See also IEC 61174, Annex A.)

(A B C) The ECS may present raster chart data using proprietary colour palettes. (See also IHO S-61, 3.4.2.17.)

4.2.1.10 Adding or removing information from the display

(A B) If information layers included in the ECDIS Standard Display are removed to customize the display, this status shall be permanently or persistently indicated as appropriate for the application.

4.2.1.11 Information associated with the task-at-hand

(A B C) ECS manufacturers are encouraged to consider IEC 62288, 4.2.1 and 6.4 for guidance regarding composite task-oriented presentations.

4.2.1.12 Screen size

(A) The ECS shall provide a minimum operational display area of at least 250 mm horizontal and 250 mm vertical.

(B) The ECS shall provide a minimum operational display area of at least 150 mm horizontal and 150 mm vertical.

(C) The ECS shall provide a minimum operational display area of at least 101 mm horizontal and 101 mm vertical.

(B C) Where screen size is an issue for the presentation of standard symbology, symbols may be adjusted to support a smaller operational display area.

4.2.1.13 Screen resolution

(A) The ECS shall provide a minimum pixel format of 1 280 × 1 024.

(B) The ECS shall provide a minimum pixel format of 1 024 × 768.

(C) The ECS shall provide a minimum pixel format of 640 × 480.

(B C) Where screen resolution is an issue for the presentation of standard symbology, symbols may be adjusted to support a lesser screen resolution.

4.2.2 Methods of test and required results

4.2.2.1 Presentation of navigation-related information on navigational displays

(A B C) Verify that the ECS meets the requirements and associated tests for the presentation of navigation information identified in Table 3 as clarified by 4.2.1.2 through 4.2.1.13.

4.2.2.2 Electronic chart information

(A B C) If the ECS presents the electronic chart database using a proprietary set of colours and symbols verify by observation that a legend of those colours and symbols equivalent to a chart 1 is provided on the ECS display.

NOTE Chart 1 is a set of symbol diagrams and symbol meanings given in S-52 Annex A.

(A B C) If the ECS provides the capability to display and adjust detailed bathymetric information from an electronic chart database, confirm by analysis that it also provides means or method(s)

- to accept water level data inputs,
- to display a persistent indication that displayed depth information is adjusted, and
- for an operator to disable the capability.

4.2.2.3 Range scale

(A B C) Verify by observation that the ECS provides a means or method to change the display scale by chart scale.

4.2.2.4 Screen size

(A B C) Verify by measurement that the operational area is not less than the dimensions specified in 4.2.1.12.

4.2.2.5 Screen resolution

(A B C) Verify by inspection of manufacturer-provided documentation that the pixel format is not less than the number of pixels specified in 4.2.1.13.

5 Operational and performance requirements

5.1 Chart information

5.1.1 Provision of chart information

5.1.1.1 Requirements

(A B C) An ECS shall use one or more of the following electronic chart database categories:

a) ENC, Inland ENC, and/or SENC;

NOTE 1 ENC to SENC conversion should be performed using type approved software. The SENC update mechanism should not be inferior to the ENC update mechanism. Any copyright of the ENC data should be maintained. A SENC distribution option is described in IHO Technical Resolution 3.11.

NOTE 2 ENC charts are available as plain S-57 and as S-57 encrypted by S-63. As guidance to manufacturers this standard recommends implementation of S-63 for systems directly compatible with S-57 ENC charts and not using ENC charts via a SENC distribution option.

b) RNC;

c) a standards-compliant electronic chart database derived from official nautical charts and nautical publications, for example, an ISO 19379 ECS database.

(A B C) The ECS shall inform the user of the chart database category in use.

5.1.1.2 Methods of tests and required results

(A B C) Confirm by observation that a means is provided to inform the user of the chart database category in use.

5.1.2 Replacing an electronic chart database

5.1.2.1 Requirements

(A B C) The ECS shall provide the user with the capability to replace the electronic chart database in its entirety.

5.1.2.2 Methods of test and required results

Perform the following:

a) (A B C) load the electronic chart test database. Confirm by observation that it is loaded;

b) (A B C) load the replacement electronic chart test database. Confirm by observation that it is loaded and has replaced the original electronic chart test database.

5.1.3 Automatically updating an electronic chart database

5.1.3.1 Requirements

(A B) The ECS shall provide the user with the capability to import and store updates to an electronic chart database.

(A) The ECS shall store updates separate from the electronic chart database.

NOTE Separate storage of updates may utilize the same data storage area.

(A B) The ECS shall provide the user with the capability to apply updates to an electronic chart database. The application of updates shall not interfere with the display in use.

(A) The ECS shall provide the user with the capability to review updates applied to an electronic chart database.

(A B) The ECS shall provide the user with the capability to reject the application of an update to an electronic chart database. The ECS shall restore the electronic chart database to its original form (i.e. prior to the application of the update). This may be accomplished by prompting the user to reload the electronic chart database.

(A B) The ECS shall maintain a record of updates automatically applied to the electronic chart database. The record of updates shall include the date and time of application and rejection, if applicable.

(A) The record of updates for each electronic chart database shall be maintained until the database is removed from the ECS.

5.1.3.2 Methods of test and required results

Perform the following:

a) (A B) load the electronic chart test database. Confirm by observation that the ECS provides the user with the capability to import an update to the electronic chart database;

b) (A B) confirm by observation that the ECS provides the user with the capability to store the update;

c) (A) confirm by observation that the update is stored separate from the electronic chart test database;

d) (A B) confirm by observation that the ECS provides the user with the capability to apply the update to the electronic chart database;

e) (A B) confirm by observation that the application of the update does not interfere with the display in use;

f) (A) confirm by observation that the ECS provides the user with the capability to review the applied update;

g) (A B) confirm by observation that the ECS provides the user with the capability to reject the applied update;

h) (A B) confirm by observation that the ECS restores the electronic chart database to its original form, or prompts the user to reload the electronic chart database;

i) (A B) confirm by observation that the ECS creates a record of updates for the electronic chart database and that the record includes the date and time of application and rejection;

j) (A) confirm by inspection of documentation that the ECS will maintain the record of updates until the electronic chart database is removed from the ECS.

5.1.4 Displaying the electronic chart database

5.1.4.1 Requirements

(A B C) The ECS shall provide the user with the capability to display any geographic area of the electronic chart database (for example, for look ahead).

(A B) The ECS shall provide the user with the capability to enter the geographic coordinates of any position to display it on demand.

(A B) The ECS shall provide continuous position monitoring functions for own ship. These functions shall continue when the user displays a sea area that does not have own ship on the display (for example, while route planning).

(A B C) The ECS shall provide a single user action to immediately return the display to cover own ship when it is not on the display. (See also 5.2.2.)

5.1.4.2 Methods of test and required results

Perform the following:

a) (A B C) confirm by observation that the ECS provides the capability to display any geographic area of the electronic chart database;

b) (A B) confirm by observation that the ECS provides the user with the capability to enter the geographic coordinates of a position and display it on demand;

c) (A B) confirm by observation that the ECS provides continuous position monitoring functions for own ship;

d) (A B) display a sea area that does not have own ship on the display. Confirm by observation that the position monitoring functions continue;

e) (A B C) confirm by observation that the ECS provides a simple user action to immediately return the display to cover own ship.

5.1.5 Displaying metadata

5.1.5.1 Requirements

(A B C) The ECS shall provide a means or method to display the following information for each electronic chart database:

- database producer;
- edition number, version number (if provided), and issue date of the database;
- date of the most recent update to the database;
- horizontal datum of the database;
- vertical datum(s) of the database (for example, sounding/depth datum and height datum).

5.1.5.2 Methods of test and required results

(A B C) For each electronic chart database tested, confirm by observation that a means or method is provided to display the information required in 5.1.5.1.

5.1.6 Adjusting for differences in horizontal datum

5.1.6.1 Requirements

(A B C) The ECS shall generate an indication when the horizontal datum of the electronic chart database is not referenced to WGS 84.

(A B) The ECS shall provide the capability to display the electronic chart database using the WGS 84 as the horizontal datum.

(A B) The ECS shall perform datum transformation calculations in accordance with IHO S-60 when datum shift information is not available in the electronic chart database. The ECS shall generate an indication when a datum shift is calculated using IHO S-60.

5.1.6.2 Methods of test and required results

Perform the following:

a) (A B C) load an electronic chart test database with a known horizontal datum other than WGS 84. Confirm by observation that the ECS provides an indication that the electronic chart database is not referenced to WGS 84;

b) (A B) confirm by observation that the ECS provides the capability to transform the datum to WGS 84 and display the electronic chart database using WGS 84 as the horizontal datum;

c) (A B) confirm by analysis that the ECS performs datum transformation to WGS 84 using the datum shift information in the electronic chart database;

d) (A B) confirm by analysis that the ECS performs datum transformation to WGS 84 in accordance with IHO S-60 only when datum shift information is not available in the electronic chart database;

e) (A B) confirm by observation that the ECS provides an indication when the datum transformation to WGS 84 is performed in accordance with IHO S-60.

5.2 Position monitoring

5.2.1 Deriving own ship's position

5.2.1.1 Requirements

(A B C) The ECS shall provide the capability to connect to at least one EPFS. (See also 5.4.2.)

(A) The ECS shall provide the capability to simultaneously derive a separate position for own ship from a secondary positioning source of a different type or method.

(A B C) The ECS shall generate an indication for any alarm or indication (for example, differential corrections in use) passed to it from an EPFS.

(A B C) The ECS shall generate an alarm when the input from an EPFS in use is lost.

5.2.1.2 Methods of test and required results

Perform the following:

a) (A B C) connect an EPFS simulator to the ECS. Confirm by observation that the correct position is displayed;

b) (A) confirm by observation that the ECS provides a second positioning source of a different type or method. Confirm by observation that the correct position from the EPFS and the second positioning source are simultaneously displayed;

c) (A B C) simulate an alarm from the EPFS. Confirm by observation that the ECS generates an indication of the EPFS alarm condition;

d) (A B C) simulate an indication from the EPFS. Confirm by observation that the ECS generates an indication of the EPFS indication condition;

e) (A B C) disconnect the EPFS simulator from the ECS. Confirm by observation that the ECS generates an alarm;

f) (A) if the second positioning source is an EPFS, confirm by observation that the ECS generates an alarm when the input from the second positioning source is lost.

5.2.2 Displaying own ship's position

5.2.2.1 Requirements

(A B C) The ECS shall automatically plot own ship on the electronic chart database. (See also in Table 3, items 4.5.1 and 5.1.1.)

5.2.2.2 Methods of test and required results

(A B C) Connect an EPFS simulator to the ECS. Load the electronic chart test database. Confirm by observation that the ECS provides the capability to display own ship's symbol in the correct position as own ship's position moves.

5.2.3 Displaying own ship's past track

5.2.3.1 Requirements

(A B) The ECS shall provide the capability to display own ship's past track for the most recent two hours.

(A B) The ECS shall provide the capability to display time labels along own ship's past track at selected intervals between 1 min and 120 min.

5.2.3.2 Methods of test and required results

Perform the following:

a) (A B) connect an EPFS simulator to the ECS. Simulate own ship's continuous movement for 2,5 h. Confirm by observation that the ECS provides the capability to display own ship's past track for the most recent 2 h;

b) (A B) confirm by observation that the ECS provides the capability to display time labels along own ship's past track;

c) (A B) confirm by observation that the interval for the time labels is selectable from 1 min to 120 min.

5.3 Voyage related operation

5.3.1 Route planning

5.3.1.1 Requirements

(A B C) The ECS shall provide the user with the capability to plan a route consisting of at least 10 segments connecting 11 waypoints.

(A) The ECS shall provide the user with the capability to plan a route using both straight and curved line segments.

(A) The ECS shall provide the capability to plan an alternative route (i.e. an alternative series of segments and waypoints).

(A B C) The ECS shall provide the user with the capability to save planned routes to storage.

(A B C) The ECS shall provide the user with the capability to retrieve a planned route from storage.

(A B C) The ECS shall provide the capability to modify a planned route by:

- adding waypoints;
- deleting waypoints;
- inverting the sequence of waypoints along the route;
- changing the position of individual waypoints.

(A B C) The ECS shall provide the user with the capability to save a modified route.

(A B) The ECS shall generate an indication when the user plans a route across own ship's safety contour.

(A) The ECS shall generate an indication when the user plans a route closer than a user-specified minimum distance from a point object , including fixed and floating aids to navigation and isolated underwater and above-water dangers (see IEC 61174, Annex M) and the

boundaries of geographic areas for which special conditions exist listed in IEC 61174, Annex C.

NOTE The user-specified distance may be the same for the boundary of a geographic area and for the aids to navigation and isolated dangers.

(A B) The ECS shall provide the capability for the user to specify an off-track deviation limit from a planned route.

5.3.1.2 Methods of test and required results

Perform the following:

a) (A B C) confirm by observation that the ECS provides the capability to plan a route consisting of at least 10 segments connecting 11 waypoints;

b) (A) confirm by observation that the ECS provides the capability to use both straight and curved line segments;

c) (A) confirm by observation that the ECS provides the capability to plan an alternative series of segments and waypoints;

d) (A B C) confirm by observation that the ECS provides the capability to save the planned route to storage;

e) (A B C) confirm by observation that the ECS provides the capability to retrieve a planned route from storage;

f) (A B C) confirm by observation that the ECS provides the capability to modify a planned route by

- adding waypoints,
- deleting waypoints,
- inverting the sequence of waypoints along the route,
- changing the position of individual waypoints;

g) (A B C) confirm by observation that the ECS provides the capability to save the modified route;

h) (A B) plan a route across own ship safety contour. Confirm by observation that the ECS generates an indication;

i) (A) confirm by observation that the ECS provides the user with the capability to specify a minimum distance a planned route may pass a point or area object in the electronic chart database;

j) (A) plan a route that passes closer than the specified minimum distance to the following objects:

- a fixed aid to navigation;
- a floating aid to navigation;
- an isolated underwater danger;
- an isolated above-water danger;
- the boundary of each type of geographic area for which special conditions exist.

Confirm by observation that the ECS generates an indication for each;

k) (A B) confirm by observation that the ECS provides the capability to enter an off-track deviation limit from the planned route.

5.3.2 Route monitoring

5.3.2.1 Requirements

(A B C) The ECS shall provide a simple user action to select a planned route for monitoring.

(A B C) The ECS shall display the monitored route and own ship's position whenever the display covers that geographic area. (See also in Table 3, items 4.5.1 and 6.3.8.)

(A B C) The ECS shall provide continuous route monitoring functions when the user displays a sea area that does not have own ship on the display (for example, for look-ahead or route planning).

(A B) The ECS shall generate an alarm when own ship will cross the safety contour within a user-specified time. (See also 5.3.1.1.)

(A) The ECS shall generate an alarm or indication, as specified by the user, when own ship will cross the boundary of a geographic area for which special conditions exist listed in IEC 61174, Annex C within a user-specified time. (See also 5.3.1.1.)

(A) The ECS shall generate an indication when own ship will pass closer than the user-specified minimum distance to a point object and in the electronic chart database, including fixed and floating aids to navigation and isolated underwater and above-water dangers (see IEC 61174, Annex M) within a user-specified time. (See also 5.3.1.1.)

NOTE The user-specified time may be the same for crossing the safety contour, crossing the boundaries of geographic areas and for passing close to aids to navigation and isolated dangers.

(A B C) The ECS shall generate an alarm when own ship deviates from the monitored route by more than the user-specified off-track deviation limit. (See also 5.3.1.1.)

5.3.2.2 Methods of test and required results

Perform the following:

a) (A B C) load a planned route. Confirm by observation that the ECS provides the capability to select the planned route for monitoring;

b) (A B C) connect an EPFS simulator to the ECS. Simulate own ship's movement along the monitored route. Display an area that does not include own ship or the monitored route. Confirm by observation that the ECS provides continuous route monitoring functions while own ship is not on the display;

c) (A B C) return the display to an area that includes own ship and the monitored route. Confirm by observation that the monitored route and own ship's position are displayed;

d) (A B) confirm by observation that the ECS provides the user with the capability to specify a time at which the ECS will generate an alarm before own ship crosses the safety contour;

e) (A B) load a planned route that crosses own ship's safety contour. Select the planned route for monitoring. Simulate own ship's movement along the monitored route. Confirm by observation that the ECS generates an alarm at the user-specified time before own ship crosses the safety contour;

f) (A) confirm by observation that the ECS provides the user with the capability to specify whether the ECS will generate an alarm or indication when own ship will cross the boundary of a geographic area for which special conditions exist;

g) (A) confirm by observation that the ECS provides the user with the capability to specify a time at which the ECS will generate an alarm before own ship crosses the boundary of a geographic area for which special conditions exist;

h) (A) load a planned route that crosses the boundary of each type of geographic area for which special conditions exist. Select the planned route for monitoring. Simulate own ship's movement along the monitored route. Confirm by observation that the ECS generates an alarm or indication, as specified by the user, at the user-specified time before own ship crosses each boundary;

i) (A) confirm by observation that the ECS provides the user with the capability to specify a time at which the ECS will generate an indication before own ship will pass closer than the user-specified minimum distance to a point or area object in the electronic chart database;

j) (A) load a planned route that passes closer than the specified minimum distance to the following objects:

- a fixed aid to navigation;
- a floating aid to navigation;
- an isolated underwater danger;
- an isolated above-water danger;
- the boundary of each type of geographic area for which special conditions exist.

Select the planned route for monitoring. Simulate own ship's movement along the monitored route. Confirm by observation that the ECS generates an indication at the user-specified time before own ship will pass each object;

k) (A B C) load a planned route with user-specified deviation limits. Select the planned route for monitoring. Simulate own ship's movement along the monitored route. Simulate own ship's deviation from the route to exceed the user-specified deviation limits. Confirm that the ECS generates an alarm when own ship exceeds the deviation limits.

5.3.3 Voyage recording

5.3.3.1 Requirements

(A B) The ECS shall keep a record of own ship's actual track at one minute intervals for the most recent 12 h. At a minimum, the record shall include own ship's positions, corresponding times, courses and speeds. The ECS shall preserve the record to prevent it from being over-written.

(A) The ECS shall keep a separate voyage record of own ship's actual track at intervals not exceeding 4 h. The voyage record shall have a minimum capacity of three months. The ECS shall preserve the record to prevent it from being over-written.

(A) The ECS shall prevent manipulation or changes to recorded information.

5.3.3.2 Methods of test and required results

Perform the following:

a) (A B) connect an EPFS simulator to the ECS. Simulate own ship's continuous movement for 12,5 h. Confirm by inspection of the recorded data that the ECS recorded own ship's past track for the most recent 12 h, that the past track includes at least one data point for each minute, and that each data point consists of own ship's position and time of position, course and speed;

b) (A) confirm by observation that the ECS has recorded a separate voyage record;

c) (A) confirm by inspection of the recorded data that the ECS recorded at least three data points separated by not more than 4 h, and that each data point consists of own ship's position and time of position, course and speed;

d) (A) confirm by inspection of documentation and by analysis that the ECS has sufficient storage capacity for a voyage record spanning three months;

e) (A B) confirm by inspection of documentation and by observation that the recorded data cannot be deleted or over-written;

f) (A) confirm by inspection of documentation and by observation that the recorded data cannot be manipulated or changed.

5.3.4 Distance and azimuth

5.3.4.1 Requirements

(A B C) The ECS shall provide the capability to calculate the distance and azimuth between two known geographic positions.

(A B C) The ECS shall provide the capability to calculate a geographic position from a known position and a distance and azimuth.

(A) The ECS shall provide the capability to perform both rhumb line and great circle calculations. (See also 5.3.1.1.)

(A B C) The accuracy of all ECS calculations involving data from the electronic chart database shall be consistent with the accuracy of the data in the electronic chart database.

(A B C) The accuracy of all ECS calculations involving data from the electronic chart database shall be independent of the characteristics of the displayed scale of the presentation.

(A B C) The accuracy of all ECS calculations involving data input from the HMI shall be consistent with the displayed scale of the presentation.

5.3.4.2 Methods of test and required results

Perform the following:

a) (A B C) confirm by analysis that the ECS correctly calculates the distance and azimuth between two known geographic positions;

b) (A B C) confirm by analysis that the ECS correctly calculates a geographic position from a known position and a distance and azimuth;

c) (A) confirm by analysis that the ECS provides the capability to perform both rhumb line and great circle calculations;

d) (A B C) confirm by analysis that ECS calculations involving data from the electronic chart database are consistent with the accuracy of the data in the electronic chart database;

e) (A B C) confirm by observation that ECS calculations involving data from the electronic chart database are independent of the characteristics of the displayed scale of the presentation;

f) (A B C) confirm by observation that ECS calculations involving data input from the HMI is consistent with the displayed scale of the presentation.

5.4 Connections with other equipment

5.4.1 General

(A B C) In the requirements and methods of test described below, IEC 61162-1 sentence formatters and IEC 61162-3 parameter group numbers (PGNs) are cited. The manufacturer's documentation shall identify which standard(s) is/are supported.

NOTE IEC 61162-3 PGNs are defined in the NMEA 2000 standard for interfacing marine electronic devices.

5.4.2 Electronic position-fixing system

5.4.2.1 Requirements

(A B C) If an EPFS receiver is a permanently installed non-separable assembly of the ECS, then an external communications interface is not required.

(A B) The ECS shall accept the following IEC 61162 sentence formatters or PGNs:

IEC 61162-1 sentence formatters	IEC 61162-3 PGNs
ALR – Set alarm state	126983 – Alert
DTM – Datum reference GGA – Global positioning system fix data GNS – GNSS fix data RMC – Recommended minimum specific GNSS data	129029 – GNSS position data
VTG – Course over ground and ground speed	129026 – COG and SOG, rapid update
ZDA – Time and date	129033 – Time and date 129793 – AIS UTC and date report

(C) At a minimum, the ECS shall accept the following IEC 61162 sentence formatters or PGNs.

IEC 61162-1 sentence formatters	IEC 61162-3 PGNs
DTM – Datum reference GGA – Global positioning system fix data GNS – GNSS fix data RMC – Recommended minimum specific GNSS data	129029 – GNSS position data

(C) If the ECS provides an external communications interface for an automatic identification system (AIS, see 5.4.7), then the ECS may accept the following IEC 61162 sentence formatters or PGNs in lieu of a separate external communications interface for an EPFS. (See also ITU-R Recommendation M.1371.)

IEC 61162-1 sentence formatters	IEC 61162-3 PGNs
VDO – AIS VHF data-link own-vessel report	129038 – AIS Class A Position Report 129039 – AIS Class B Position Report

(A B) The ECS shall provide the capability to adjust the EPFS antenna location parameters to the CCRP (for example, the conning position).

(A B) The ECS shall provide the capability to process position data input at a rate of at least one position per second. Latency between position data input and presentation shall be less than one second.

(C) The ECS shall provide the capability to process position data input at a rate of at least one position every two seconds. Latency between data input and presentation shall be less than one second.

5.4.2.2 Methods of test and required results

Perform the following:

a) (A B C) connect an EPFS simulator to the ECS. Output the appropriate IEC 61162 data supported by the ECS. Confirm by observation that the ECS accepts the data and correctly displays it;

b) (A B) confirm by observation that the ECS provides the capability to adjust the EPFS antenna location to the CCRP;

c) (A B) confirm by measurement that the ECS processes position data at a rate of at least one position per second;

d) (A B C) confirm by measurement that the ECS processes position data at a rate of at least one position every two seconds;

e) (A B C) confirm by measurement that own ship's position data is updated in the presentation in less than one second after the ECS receives the data.

5.4.3 Heading sensor

5.4.3.1 Requirements

(A B) The ECS shall provide the capability to connect to a heading sensor or transmitting heading device.

(A B C) If the ECS provides the capability to connect to a heading sensor, then it shall accept the following IEC 61162 sentence formatters or PGNs.

IEC 61162-1 sentence formatters	IEC 61162-3 PGNs
HDG – Heading, deviation and variation HDT – Heading, true THS – True heading and status	127250 – Vessel heading

(C) If the ECS provides an external communications interface for an automatic identification system (AIS, see 5.4.7), then the ECS may accept the following IEC 61162 sentence formatters or PGNs in lieu of a separate external communications interface for a heading sensor. (See also ITU-R Recommendation M.1371.)

IEC 61162-1 sentence formatters	IEC 61162-3 PGNs
VDO – AIS VHF data-link own-vessel report	129038 – AIS Class A Position Report 129039 – AIS Class B Position Report

(A B C) If the ECS provides the capability to connect to a heading sensor, then it shall generate an indication when the input from the heading sensor is lost.

5.4.3.2 Methods of test and required results

Perform the following:

a) (A B C) connect a heading sensor simulator to the ECS. Output the appropriate IEC 61162 data supported by the ECS. Confirm by observation that the ECS accepts the data and correctly displays it;

b) (A B C) disconnect the simulator. Confirm by observation that the ECS generates an indication.

5.4.4 Speed and distance measuring equipment

5.4.4.1 Requirements

(A B C) If the ECS provides the capability to connect to speed and distance measuring equipment (SDME), then it shall accept the following IEC 61162 sentence formatters or PGNs.

IEC 61162-1 sentence formatters	IEC 61162-3 PGNs
VBW – Dual ground/water speed VHW – Water speed and heading	130577 – Direction data

(A B C) If the ECS provides the capability to connect to SDME, then it shall generate an indication when the input from the SDME is lost.

5.4.4.2 Methods of test and required results

Perform the following:

a) (A B C) connect an SDME simulator to the ECS. Output the appropriate IEC 61162 data supported by the ECS. Confirm by observation that the ECS accepts the data and correctly displays it;

b) (A B C) disconnect the simulator. Confirm by observation that the ECS generates an indication.

5.4.5 Echosounding equipment

5.4.5.1 Requirements

(A B C) If the ECS provides the capability to connect to an echosounder, then it shall accept the following IEC 61162 sentence formatters or PGNs.

IEC 61162-1 sentence formatters	IEC 61162-3 PGNs
DBT – Depth below transducer DPT – Depth	128267 – Water depth

(A B C) If the ECS provides the capability to connect an echosounder, then it shall generate an indication when the input from the echosounder is lost.

5.4.5.2 Methods of test and required results

Perform the following:

a) (A B C) connect an echosounder simulator to the ECS. Output the appropriate IEC 61162 data supported by the ECS. Confirm by observation that the ECS accepts the data and correctly displays it;

b) (A B C) disconnect the simulator. Confirm by observation that the ECS generates an indication.

5.4.6 Radar target tracking system

5.4.6.1 Requirements

(A B C) If the ECS provides the capability to connect to a radar target tracking system, then it shall accept the following IEC 61162 sentence formatters or PGNs.

IEC 61162-1 sentence formatters	IEC 61162-3 PGNs
ALR – Set alarm state	126983 – Alert
OSD – Own ship data	127250 – Vessel heading 129291 – Set and drift, rapid update 130577 – Direction data
RSD – Radar system data	N/A
TLB – Target label TTD – Tracked target data TTM – Tracked target message	128520 – Tracked target data

(A B C) If the ECS provides the capability to connect a radar target tracking system, then it shall generate an indication when the input from the radar tracking system is lost.

(A B) If the ECS provides the capability to connect to a radar target tracking system, then it shall provide the capability to adjust the radar antenna location to the CCRP.

5.4.6.2 Methods of test and required results

Perform the following:

a) (A B C) connect a radar target tracking system simulator to the ECS. Output the appropriate IEC 61162 data supported by the ECS. Confirm by observation that the ECS accepts the data and correctly displays it;

b) (A B C) disconnect the simulator. Confirm by observation that the ECS generates an indication;

c) (A B) confirm by observation that the ECS provides the capability to adjust the radar antenna location to the CCRP.

5.4.7 Automatic identification system

5.4.7.1 Requirements

(A B C) If the ECS provides the capability to connect to an AIS unit, then it shall accept the following IEC 61162 sentence formatters or PGNs.

IEC 61162-1 sentence formatters	IEC 61162-3 PGNs
ABM – AIS addressed binary and safety related	129801 – AIS addressed safety related message
ALR – Set alarm state	126983 – Alert
BBM – AIS broadcast binary message	129797 – AIS binary broadcast message 129802 – AIS safety related broadcast
TXT – Text transmission	N/A
VDO – AIS VHF data-link own-vessel report VDM – AIS VHF data-link message	129038 – AIS Class A position report 129039 – AIS Class B position report 129040 – AIS Class B extended position report 129794 – AIS Class A static and voyage related data 129798 – AIS SAR aircraft position report 129807 – AIS Class B group assignment 129809 – AIS Class B “CS” static data report, Part A 129810 – AIS Class B “CS” static data report, Part B

The manufacturer shall identify which data, including encapsulated messages, the ECS supports. (See also ITU-R Recommendation M.1371.)

(A B C) If the ECS provides the capability to connect to an AIS unit, then it shall generate an indication when the input from the AIS unit is lost.

NOTE In order to connect to an AIS unit an interface according to IEC 61162-2 is required.

5.4.7.2 Methods of test and required results

Perform the following:

a) (A B C) connect an AIS simulator to the ECS. Output the appropriate IEC 61162 data supported by the ECS. Confirm by observation that the ECS accepts the data and correctly displays it as described in IEC 62288 for each of the following message types:
   1) Messages 1, 2, 3 and 5 (Class A AIS);
   2) Messages 18, 19 and 24 (Class B AIS);
   3) Message 4 (AIS Base Stations);
   4) Message 9 (AIS on Airborne SAR-craft);
   5) Message 21 (AIS AtoN);
   6) Messages 12 and 14 (Safety related messages)

b) (A B C) disconnect the simulator. Confirm by observation that the ECS generates an indication.

Annex A
(informative)

Guidance for testing

A.1 Application of IEC 60945

A.1.1 Equipment category

The manufacturer should categorize their ECS as portable, protected from the weather, exposed to the weather, or submerged or in continuous contact with sea water. The manufacturer should declare the equipment category in the manual. (See also Table 1, item 4.4.)

A.1.2 Technical performance

A performance test should be used to confirm compliance with requirements specifying parameters. A performance check should be used to confirm that the equipment operates. The testing laboratory should define the appropriate measure of technical performance (i.e. performance test or performance check) for each test in the test plan. The ECS should operate in accordance with this standard during each performance test or performance check.

A.1.3 Pre-conditioning for environmental tests

The manufacturer should specify any mechanical or electrical preconditioning required for environmental tests. The testing laboratory should inspect the ECS and perform any preconditioning specified by the manufacturer. The testing laboratory should carry out environmental tests with the ECS in its normal operational configuration, including mounting and supports, and with all mechanical arrangements secure.

A.2 Methods of test derived from ISO 9241-12

A.2.1 General

The methods of test in this standard are derived from ISO 9241-12. The methods do not identify specific processes, approaches or facilities. Rather, they are intended to provide guidance to accredited testing laboratories for the development of test plans and test procedures that evaluate compliance with the requirements specified.

A.2.2 Observation

The test method “observation” refers to simple examination of the presentation of information to confirm that a particular observable condition has been met. The phrase "confirm by observation" is used.

Observations may be made by any person with the necessary skill to determine if a statement concerning an observable property has been correctly applied. It is used when suitably trained individuals with a broad range of education and/or experience can be confidently expected to reach the same conclusion about the performance of ECS.

Compliance is determined by comparing the performance to the requirement. Some observations may be made directly from the ECS display. Other observations may require simulation. Typical confirmations by observation include:

- existence of functions or features;
- use of symbols or a defined range of words;
- a system output in response to a defined input.

A.2.3 Inspection of documentation

The test method “inspection of documentation” refers to examination of relevant documents to confirm that a particular ECS requirement has been met. The phrase "confirm by inspection of documentation" is used.

Documentation may include manuals, system requirements, design justification, industry conventions, etc. Inspections may be made by a suitably qualified person who has the necessary education, skill and/or experience to apply the documentation to the ECS. It is used when performance is not directly observable or measurable. It may also be used when observation would be excessively repetitious, time consuming, or expensive.

Compliance is determined by comparing the documentation to the requirement. Typical confirmations by inspection of documentation include:

- conformance to a standard or other documentation;
- existence of optional features or functions;
- design and/or operation of algorithms.

A.2.4 Measurement

The test method “measurement” refers to measuring or calculating a value or variable for comparison to a specified value to determine that a particular requirement has been met. The phrase "confirm by measurement" is used.

Measurements may require the use of test facilities and equipment. Measurements may be made by any person with the necessary skill to measure and/or calculate the value and compare it against a requirement, standard or other documented evidence.

Compliance is determined by comparing the measured or calculated value or variable to the requirement. A typical confirmation by measurement would be the achievement of a level of availability or dependability.

A.2.5 Analysis

The test method “analysis” refers to detailed examination of the ECS to confirm that a particular condition has been met. The phrase "confirm by analysis" is used.

Analysis may be made by a relevant expert with the necessary education, skills and/or experience to make an informed and reliable judgement concerning the presentation of information, its appropriateness and usability. It is used for the evaluation of properties which can be judged only in the context of other information or knowledge which requires the tester to make an informed assessment of the likely performance of the ECS.

Compliance is determined by evaluating the performance against the requirement.

A.3 Compliance with requirements

Compliance with a requirement can be established by verifying that it is implemented in accordance with another standard (or with another clause or subclause within this standard); or by confirming that it is implemented in accordance with the requirement(s) specified in the current clause.

A.4 Simulation

Some test methods require simulation. A simulator should provide the capabilities to replicate own ship's navigational sensors, radar video images, reported radar targets (for example, in accordance with the IEC 61162 series of standards), and reported AIS targets.

IEC 62388, Annex F describes a Target Scenario Simulator (TSS), a Reported Target Simulator (RTS) and a combined TSS/RTS.

A.5 Electronic chart test database

Some test methods require electronic chart test database(s). The manufacturer should provide the electronic chart test database(s) necessary to associate the tests of the ECS with one or more of the electronic chart database format(s) specified in 5.1.1.

The following electronic chart test database(s) are publically available.

- The IHO provides an ENC test database including S-57 ENC data, updates and an Instruction Manual. The latest version of the ENC test data set is available from the IHB at http://www.iho.shom.fr.
- The UKHO provides an HCRF RNC test database. NOAA provides a BSB test database for the USA. Details for obtaining the latest version of the RNC test data sets are available from the IHB at http://www.iho.shom.fr.

Bibliography

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

IEC 61162-2, *Maritime navigation and radiocommunication equipment and systems – Digital interfaces – Part 2: Single talker and multiple listeners, high-speed transmission*

IEC 61993-2:2001, *Maritime navigation and radiocommunication equipment and systems – Automatic identification systems (AIS) – Part 2: Class A shipborne equipment of the universal automatic identification system (AIS) – Operational and performance requirements, methods of test and required test results*

IEC 62252:2004, *Maritime navigation and radiocommunication equipment and systems – Radar for craft not in compliance with IMO SOLAS Chapter V – Performance requirements, methods of test and required test results*

IEC 62287-1:2006, *Maritime navigation and radiocommunication equipment and systems – Class B shipborne equipment of the automatic identification system (AIS) – Part 1: Carrier-sense time division multiple access (CSTDMA) techniques*

ISO 9241-12:1998, *Ergonomic requirements for office work with visual display terminals (VDTs) – Part 12: Presentation of information*

ISO 19379:2003, *Ships and marine technology – ECS databases – Content, quality, updating and testing*

IENC 2010, *Product specification for inland ENC Version 2.2* (available from Internet at http://ienc.openecdis.org)

IHO M-3:2009, *Resolutions of the IHO, Chapter A, Section 3, Technical Resolution 3.11 SENC distribution*

IHO S-4 INT 1:2008, *Symbols, abbreviations and terms used on charts*

IHO S-32 Appendix 1:2007, *Hydrographic Dictionary – Glossary of ECDIS Related Terms*

IHO S-52:2010, *Specifications for chart content and display aspects for ECDIS*

IHO S-57 Appendix B-1, *ENC Product Specification* and its Annexes A, B and D

IHO S-63:2008, *IHO Data Protection Scheme*

IHO S-64:2008, *Test data sets for ECDIS*

ITU-R Recommendation M.1371-3:2007, *Technical characteristics for an automatic identification system using time division multiple access in the VHF maritime mobile band*

NMEA 2000:2009, *Standard for Interfacing Marine Electronic Devices*

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