

# INTERNATIONAL STANDARD

## NORME INTERNATIONALE

**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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Electronic chart system (ECS) – Operational and performance requirements,  
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## INTERNATIONAL ELECTROTECHNICAL COMMISSION

**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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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.

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## 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	-
<p>Legend:</p> <p>“X” denotes a required capability (as clarified by 4.1.1.2 through 4.1.1.8 and 5.4).</p> <p>“-” denotes a capability that is not required but may be implemented, and if implemented shall be implemented as if it is a required capability.</p> <p>NOTE Where screen size and/or resolution are issues, the presentation may be adjusted.</p> <p>“N/A” denotes a capability that does not apply and shall not be implemented.</p>				

#### 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
<p>Legend:</p> <p>"X" denotes a required test (as clarified by 4.1.2.2 through 4.1.2.10 and 5.4).</p> <p>"-" denotes a test that is not required but may be implemented, and if implemented shall be implemented as if it is a required test.</p> <p>NOTE Where screen size and/or resolution are issues, the presentation may be adjusted.</p> <p>"N/A" denotes a capability that does not apply and shall not be implemented.</p>				

#### 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