

INTERNATIONAL STANDARD

IEC 61174

First edition
1998-08

**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**

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*Matériels et systèmes de navigation et de radiocommunication
maritimes – Systèmes de visualisation des cartes électroniques
et d'information (ECDIS) – Exigences d'exploitation et de
fonctionnement, méthodes d'essai et résultats d'essai exigés*

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* See web site address on title page.

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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 IEC (International Electrotechnical Commission) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of the 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, the IEC publishes International Standards. 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. The IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
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International Standard IEC 61174 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
80/190/FDIS	80/201/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.

Annexes A, B, C, D, E and F form an integral part of this standard.

Annex G is for information only.

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

**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 A.817.

This standard is based upon the performance standards of IMO resolution A.817, and is also associated with IMO resolution A.694 and IEC 60945. Reference is made, where appropriate, to IMO resolution A.817, and all subclauses whose wording is identical to that in the resolution are printed in italics.

In association with the above IMO resolution A.817, are the International Hydrographic Organization (IHO) publications S-52 and S-57. 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.

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

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All normative documents are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

IEC 60872:1987, *Marine automatic radar plotting aids (ARPA) – Operational requirements – Methods of testing and test results*
Amendment 1 (1991)

IEC 60945:1996, *Maritime navigation and radiocommunication equipment and systems – General requirements – Methods of testing and required test results*

IEC 61162-1:1995, *Maritime navigation and radiocommunication equipment and systems – Digital interfaces – Part 1: Single talker and multiple listeners*

ISO 9000 (all parts), *Quality management and quality assurance standards*

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

IMO A.424:1979, *Performance standards for gyro-compasses*

IMO A.686:1991, *Code on alarms and indicators*

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

IMO A.817:1995, *Performance standards for electronic chart display and information systems (ECDIS)*

IMO A.821:1995, *Performance standards for gyro-compasses for high-speed craft*

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

IMO A.824:1995, *Performance standards for devices to indicate speed and distance*

IMO MSC.64(67):1996, Annex 4 – *Performance standards for radar equipment*

IMO MSC.64(67):1996, Annex 5 – *Amendment to IMO.817 – Appendix 6 – Back up arrangements*

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 2:1997, *Colour and symbol specifications for ECDIS*

IHO S-52 appendix 3:1997, *Glossary of ECDIS – related terms*

IHO S-57:1996, *Transfer standard for digital hydrographic data*

IHO:1997, *Test data set for use with IEC 61174*

3 Definitions and abbreviations

Definitions of ECDIS related terms pertaining to IMO performance standards for ECDIS are listed in 4.2. A glossary of ECDIS related terms is included in IHO S-52 appendix 3.

For the purpose of this standard the following definitions and abbreviations apply.

3.1 Definitions

3.1.1

CIE colour calibration

procedure to confirm that the colour specified in IHO S-52 appendix 2 is correctly reproduced on the ECDIS display

3.1.2

common reference system

sensor input data, providing identical and obligatory reference pertaining to position, course, heading, bearing, speed, velocity, etc. and horizontal datum to different subsystems within an integrated navigation system

3.1.3

compilation scale

scale with which the chart information meets the IHO requirements for chart accuracy. It is established by the producing hydrographic office and encoded in the ENC

3.1.4**corrupted data**

ENC data produced according to the IHO S-57 ENC product specification, but altered or modified during production, transmission, or retrieval

3.1.5**degrade**

reduce the information content of

3.1.6**display redraw time**

interval from when the display starts to change until the new display is complete

3.1.7**display regeneration time**

interval from operator action until the consequent redraw is complete

3.1.8**display scale**

ratio between a distance on the display and a distance on the ground, normalized and expressed as, for example, 1:10 000

3.1.9**ENC cell**

geographic division of ENC data for distributing purposes. For further information, refer to the ENC product specification in IHO S-57

3.1.10**ENC data**

data conforming to 4.2.2

3.1.11**ENC test data set**

standardized data set supplied on behalf of the International Hydrographic Organization (IHO) that is necessary to accomplish IEC testing requirements for ECDIS. This data set is encoded according to the IHO S-57 ENC product specification and contains update information based on IHO S-52 appendix 1. The specific requirements are listed in annex F

3.1.12**non-ENC data**

data not conforming to 4.2.2

3.1.13**overscale**

display of the chart information at a display scale larger than the compilation scale. Overscaling may arise from deliberate overscaling by the mariner, or from automatic overscaling by ECDIS in compiling a display when the data included is at various scales

3.1.14

presentation library

implementation of the display specifications in IHO S-52, appendix.2 “Colour and Symbol Specifications for ECDIS”, by de-coding and symbolizing the SENC. It contains:

- .1 the ECDIS symbol library, including the IEC navigation symbols;
- .2 the ECDIS colour tables for day, dusk, and night viewing;
- .3 look-up tables, linking SENC objects to the appropriate colour and symbology;
- .4 conditional symbology procedures for:
 - cases where symbolizing depends on circumstances, such as the mariner’s choice of safety contour;
 - cases where symbolizing is too complex to be defined in a direct look-up table;
- .5 description of symbology instructions;
- .6 mariner’s navigation objects, specified in the same format as chart objects for convenience of processing in ECDIS;
- .7 supplementary features, for example ECDIS chart 1 colour differentiation test diagrams and colour calibration software.

The presentation library is available in hard-copy or in digital form. The symbols shall be replicated in size and shape, using any convenient format. The colour tables shall be reproduced within the tolerances given in S-52 appendix 2/5.2.3. The remaining items may be implemented in any convenient form which produces the same results as the presentation library.

3.1.15

single operator action

single operation shall be achieved by activating a hardkey or softkey, including any necessary cursor movement

3.2 Abbreviations

AIS	Automatic identification system
ARPA	Automatic radar plotting aid
ATA	Automatic tracking aid
CIE	Comité International de l' Eclairage
EBL	Electronic bearing line
EPA	Electronic plotting aid
EPFS	Electronic position fixing system
EUT	Equipment under test
HO	Hydrographic office
VRM	Variable range marker

4 Minimum operational and performance requirements

4.1 Introduction

NOTE – In the following subclauses of clause 4, the text in *italics* is from the identical paragraph of the annex to IMO Resolution A.817. For example, 4.1.1 is paragraph 1.1 from the annex of A.817.

4.1.1 *The primary function of the ECDIS is to contribute to safe navigation.*

4.1.2 *ECDIS with adequate back-up arrangements may be accepted as complying with the up-to-date charts required by regulation V/20 of the 1974 SOLAS Convention.*

4.1.3 *In addition to the general requirements for shipborne radio equipment forming part of the global maritime distress and safety system (GMDSS) and the requirements for electronic navigational aids contained in IMO resolution A.694(17)*, ECDIS shall meet the requirements of IMO A.817.*

4.1.4 *ECDIS shall be capable of displaying all chart information necessary for safe and efficient navigation originated by, and distributed on the authority of, government authorized hydrographic offices.*

4.1.5 *ECDIS shall facilitate simple and reliable updating of the electronic navigational chart.*

4.1.6 *Use of ECDIS shall reduce the navigational workload as compared to use of the paper chart. It shall enable the mariner to execute in a convenient and timely manner all route planning, route monitoring and positioning currently performed on paper charts. It shall be capable of continuously plotting the ship's position.*

4.1.7 *ECDIS shall have at least the same reliability and availability of presentation as the paper chart published by government authorized hydrographic offices.*

4.1.8 *ECDIS shall provide appropriate alarms or indications with respect to the information displayed or malfunction of the equipment. (See annex D.)*

4.2 ECDIS definitions

For the purpose of this standard:

4.2.1 *Electronic chart display and information system (ECDIS) means a navigation information system which with adequate backup arrangements can be accepted as complying with the up-to-date chart required by regulation V/20 of the 1974 SOLAS Convention, 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 by displaying additional navigation-related information.*

The reference geodetic datum is WGS-84.

4.2.2 *Electronic Navigational Chart (ENC) means the database, standardized as to content, structure and format, issued for use with ECDIS on the authority of government authorized hydrographic offices. The ENC contains all the chart information necessary for safe navigation and may contain supplementary information in addition to that contained in the paper chart (e.g. sailing directions) which may be considered necessary for safe navigation.*

The content, structure and format of the ENC are specified in IHO S-57 edition 3, including the associated ENC product specification.

4.2.3 *System electronic navigational chart (SENC) means a database resulting from the transformation of the ENC by ECDIS for appropriate use, updates to the ENC by appropriate means, and other data added by the mariner. It is this database that is actually accessed by ECDIS for the display generation and other navigational functions, and is the equivalent of an up-to-date paper chart. The SENC may also contain information from other sources.*

4.2.4 *Standard display means the SENC information that shall be shown when a chart is first displayed on ECDIS. The level of the information it provides for route planning or route monitoring may be modified by the mariner according to the mariner's needs.*

* See also IEC 60945.

4.2.5 *Display base means the level of SENC information which cannot be removed from the display, consisting of information which is required at all times in all geographic areas and all circumstances. It is not intended to be sufficient for safe navigation.*

4.2.6 *Further information on ECDIS definitions may be found in IHO S-52, appendix 3.*

4.3 Display of SENC information

4.3.1 *ECDIS shall be capable of displaying all SENC information. (See 6.5.1 and 6.8.2 to 6.8.5.)*

4.3.2 *SENC information available for display during route planning and route monitoring shall be subdivided into three categories, display base, standard display and all other information. (See 6.8.2 to 6.8.4 and annex A.)*

4.3.3 *ECDIS shall present the standard display at any time by a single operator action. (See 6.8.2.)*

4.3.4 *When a chart is first displayed on ECDIS, it shall provide the standard display at the largest scale available in the SENC for the displayed area. (See 6.8.1.)*

This is only applicable when the first chart is displayed subsequent to power up.

4.3.5 *It shall be easy to add or remove information from the ECDIS display. It shall not be possible to remove information contained in the display base. (See 6.8.2.)*

The addition or deletion of information (see annex A, 2 and 3) shall be limited to categories of information, e.g. prohibited and restricted areas, spot soundings; not individual items, e.g. an individual area or an individual sounding.

4.3.6 *It shall be possible for the mariner to select a safety contour from the depth contours provided by the SENC. ECDIS shall give the safety contour more emphasis than other contours on the display. (See 6.8.8.)*

4.3.7 *It shall be possible for the mariner to select a safety depth. ECDIS shall emphasize soundings equal to or less than the safety depth whenever spot soundings are selected for display. (See 6.8.9.)*

4.3.8 *The ENC and all updates to it shall be displayed without any degradation of their information content. (See 6.8.)*

Degradation shall be understood as degradation in information quantity as well as quality with respect to a standard test chart provided by government authorized hydrographic offices.

4.3.9 *ECDIS shall provide a method of ensuring that the ENC and all updates to it have been correctly loaded into the SENC. (See 6.8.15.2.)*

4.3.10 *The ENC data and updates to it shall be clearly distinguishable from other displayed information, such as, for example, that listed in annex B. (See 6.8.5 and 6.8.15.2.)*

Adherence to the IHO colours and symbols requirements ensure these features.

4.4 Provision and updating* of chart information

4.4.1 *The chart information to be used in ECDIS shall be the latest edition of information originated by a government authorized hydrographic office, and conform to IHO standards. (See 6.5.)*

In order to identify the date and origin of the ENC in use, the ECDIS shall include a graphical index of ENC data available, presented upon the mariner's request and providing access to the edition and date of each cell (S-52 6.3(d)).

A new edition of an ENC will supersede a previous ENC and its integrated updates issued by a government authorized hydrographic office.

4.4.2 *The contents of the SENC shall be adequate and up to date for the intended voyage, as required by regulation V/20 of the 1974 SOLAS Convention. (See 6.5.)*

4.4.3 *It shall not be possible to alter the contents of the ENC.*

4.4.4 *Updates shall be stored separately from the ENC. (See 6.8.15.2.)*

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

4.4.5 *ECDIS shall be capable of accepting official updates to the ENC data provided in conformity with IHO standards. These updates shall be automatically applied to the SENC. By whatever means updates are received, the implementation procedure shall not interfere with the display in use.*

The contents of an update assume that all earlier updates have been applied to the SENC. A new edition of an ENC shall supersede a previous ENC and its updates.

4.4.6 *ECDIS shall also be capable of accepting updates to the ENC data entered manually with simple means for verification prior to the final acceptance of the data. They shall be distinguishable on the display from ENC information and its official updates and not affect display legibility. (See 6.8.5 and 6.8.16.)*

4.4.7 *ECDIS shall keep a record of updates including time of application to the SENC. (See 6.8.15.3.)*

4.4.8 *ECDIS shall allow the mariner to display updates so that the mariner may review their contents and ascertain that they have been included in the SENC. (See 6.8.15.2.)*

4.5 Scale

ECDIS shall provide an indication if:

- .1 the information is displayed at a larger scale than that contained in the ENC; or*
- .2 own ship's position is covered by an ENC at a larger scale than that provided by the display. (See 6.8.6.)*

* IHO S-52 appendix 1.

4.6 Display of other navigational information

4.6.1 *Radar information or other navigational information may be added to the ECDIS display. However, it shall not degrade the SENC information, and shall be clearly distinguishable from the SENC information. (See 6.8.3, 6.8.4 and 6.8.13.)*

4.6.2 *ECDIS and added navigational information shall use a common reference system. If this is not the case, an indication shall be provided. (See 6.8.12g.)*

Such advice shall be included in the manufacturer's installation handbook.

4.6.3 Radar and plotting information

4.6.3.1 *Transferred radar information may contain both the radar image and ARPA or ATA or EPA information. (See 6.2.)*

Where plotting information is added it shall be indicated to the operator whether the vectors are relative or true, and if true whether they are sea or ground stabilized.

4.6.3.2 *If the radar image is added to the ECDIS display, the chart and the radar image shall match in scale and in orientation. (See 6.8.13.)*

Additionally the ECDIS and radar image shall match in projection.

4.6.3.3 *The radar image and the position from the position sensor shall both be adjusted automatically for antenna offset from the coming position. (See 6.8.13.)*

4.6.3.4 *It shall be possible to adjust the displayed position of the ship manually so that the radar image matches the SENC display. (See 6.8.13.)*

If an offset is applied, it shall be clearly indicated. The details of the offset shall be readily available.

4.6.3.5 *It shall be possible to remove the radar or plotting information by single operator action. (See 6.8.13.)*

4.7 Display mode and generation of the neighbouring area

4.7.1 *It shall always be possible to display the SENC in a 'north-up' orientation. Other orientations are permitted. (See 6.8.7.)*

4.7.2 *ECDIS shall provide for true motion mode. Other modes are permitted. (See 6.8.7.)*

4.7.3 *When true motion mode is in use, reset and generation of the neighbouring area shall take place automatically at a distance from the border of the display determined by the mariner. (See 6.8.7.)*

4.7.4 *It shall be possible to change manually the chart area and the position of own ship relative to the edge of the display. (See 6.8.7.)*