British Standard

BRITISH STANDARD

BS EN
60936-3:2002

Maritime navigation and radiocommunication equipment and systems — Radar —

Part 3: Radar with chart facilities — Performance requirements — Methods of testing and required test results

The European Standard EN 60936-3:2002 has the status of a British Standard

ICS 47.020.70

National foreword

This British Standard is the official English language version of EN 60936-3:2002. It is identical with IEC 60936-3:2002.

The UK participation in its preparation was entrusted to Technical Committee EPL/80, Maritime navigation and radiocommunication equipment and systems, which has the responsibility to:

— aid enquirers to understand the text;

— present to the responsible international/European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;

— monitor related international and European developments and promulgate them in the UK.

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

Cross-references

The British Standards which implement international or European publications referred to in this document may be found in the *BSI Catalogue* under the section entitled "International Standards Correspondence Index", or by using the "Search" facility of the *BSI Electronic Catalogue* or of British Standards Online.

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This British Standard, having been prepared under the direction of the Electrotechnical Sector Policy and Strategy Committee, was published under the authority of the Standards Policy and Strategy Committee on 31 October 2002

Summary of pages

This document comprises a front cover, an inside front cover, the EN title page, pages 2 to 24, an inside back cover and a back cover.

The BSI copyright date displayed in this document indicates when the document was last issued.

Amendments issued since publication

Amd. No.	Date	Comments

ISBN 0 580 40645 8

EUROPEAN STANDARD **EN 60936-3**

NORME EUROPÉENNE

EUROPÄISCHE NORM July 2002

ICS 47.020.70

English version

Maritime navigation and radiocommunication equipment and systems - Radar Part 3: Radar with chart facilities - Performance requirements - Methods of testing and required test results

(IEC 60936-3:2002)

Matériels et systèmes de navigation et de radiocommunications maritimes - Radars
Partie 3: Radars avec systèmes d'enregistrement - Performances techniques - Méthodes d'essai et résultats exigibles
(CEI 60936-3:2002)

Navigations- und Funkkommunikations-geräte und -systeme für die Seeschifffahrt - Radar
Teil 3: Radar mit Seekarteneinrichtung - Leistungsanforderungen, Prüfverfahren und geforderte Prüfergebnisse
(IEC 60936-3:2002)

This European Standard was approved by CENELEC on 2002-06-01. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

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

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

Central Secretariat: rue de Stassart 35, B - 1050 Brussels

Ref. No. EN 60936-3:2002 E

Foreword

The text of document 80/337/FDIS, future edition 1 of IEC 60936-3, prepared by IEC TC 80, Maritime navigation and radiocommunication equipment and systems, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 60936-3 on 2002-06-01.

The following dates were fixed:

– latest date by which the EN has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2003-03-01

– latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 2005-06-01

Annexes designated "normative" are part of the body of the standard.
In this standard, annexes A, B, C and ZA are normative.
Annex ZA has been added by CENELEC.

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Endorsement notice

The text of the International Standard IEC 60936-3:2002 was approved by CENELEC as a European Standard without any modification.

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MARITIME NAVIGATION AND RADIOCOMMUNICATION EQUIPMENT AND SYSTEMS – RADAR –

Part 3: Radar with chart facilities – Performance requirements – Methods of testing and required test results

1 Scope

This part of IEC 60936 specifies the minimum operational and performance requirements, methods of testing and required test results conforming to performance standards not inferior to those adopted by the IMO in Resolution MSC.64(67) Annex 4 Radar clauses 3.3.9 and 3.3.10 for the optional requirements for superimposition of selected parts of SENC information. In addition it takes account of IMO Resolution A.694 and is associated with IEC 60945. When a requirement of this standard is different from IEC 60945, the requirement in this standard shall take precedence.

A High Speed Craft (HSC) radar, as defined in IEC 60936-2, that uses 'selected parts of the SENC' shall comply with the requirements of this standard.

This standard does not include the mandatory performance requirements for the shipborne radar or HSC radar. These are specified in IEC 60936-1, Shipborne radar, and IEC 60936-2, HSC radar respectively.

All text in this standard, whose wording is identical to that in IMO Resolution MSC.64(67) Annex 4 is printed in *italics* and the Resolution (abbreviated to – A4) and paragraph numbers are indicated in brackets, i.e. (A4/3.3).

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 60872-1, *Maritime navigation and radiocommunication equipment and systems – Radar plotting aids – Part 1: Automatic radar plotting aids (ARPA) – Methods of testing and required test results*

IEC 60872-2, *Maritime navigation and radiocommunication equipment and systems – Radar plotting aids – Part 2: Automatic tracking aids (ATA) – Methods of testing and required test results*

IEC 60872-3, *Maritime navigation and radiocommunication equipment and systems – Radar plotting aids – Part 3: Electronic plotting aid (EPA) – Methods of testing and required test results*

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

IEC 60936-1, *Maritime navigation and radiocommunication equipment and systems – Radar – Part 1: Shipborne radar – Performance requirements – Methods of testing and required test results*

IEC 60936-2, *Maritime navigation and radiocommunication equipment and systems – Radar – Part 2: Shipborne radar for high-speed craft (HSC)– Methods of testing and required test results*

IEC 61162, *Maritime navigation and radiocommunication equipment and systems – Digital interfaces*

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

IMO Convention for the Safety of Life at Sea (SOLAS) as amended

IMO Resolution MSC.64(67) Annex 4 *Recommendation on performance standards for radar equipment.*

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

IMO Resolution A.820(19), *Performance standards for navigational radar equipment for high-speed craft*

IMO Resolution A.817(19), *Performance standards for electronic chart display and information systems*

IHO S52 and appendices

3 Definitions and abbreviations

For the purposes of this part of IEC 60936 the following definitions and abbreviations apply.

3.1 Definitions

3.1.1
ECDIS
IEC 61174 '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. It displays selected information from a system electronic navigational chart (SENC) with positional information from navigational 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

3.1.2
SENC
System Electronic Navigational Chart (SENC) means a database resulting from the transformation of the ENC 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 for the display generation and other navigational functions, and which is the equivalent to an up-to-date paper chart. The SENC may also contain information from other sources

3.1.3
ENC
Electronic Navigation 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

3.1.4
ENC test data set
a standardized data set supplied on behalf of the International Hydrographic Organisation (IHO) that is necessary to accomplish IEC testing requirements for ECDIS. This test 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 IEC 61174 annex F

3.1.5
consistent 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 sub-systems within an integrated navigation system

3.1.6
degrade
reduce the information content of

3.1.7
primary chart-information set
coastlines, own ship's safety contour, dangers to navigation and fixed and floating aids to navigation, as further detailed in IMO Resolution A.817 Appendix 2 clauses 1.1, 1.2, 1.3, 1.4 and 2.3 only. See annex A of this standard for the specification of chart symbols and features, to be used.

3.2 Abbreviations

ECDIS	Electronic chart display and information system
ENC	Electronic navigation chart
EPFS	Electronic position fixing system
EUT	Equipment under test
HSC	High speed craft
IHO	International Hydrographic Organisation
SENC	System electronic navigational chart
TM	True motion
N UP	North up

4 Performance requirements

4.1 General

The performance of the shipborne radar (or HSC radar) shall not be inferior to the performance requirements adopted by the IMO in MSC.64(67) Annex 4 Radar (or A.820(19) HSC radar) as specified in IEC 60936-1 and IEC 60936-2 respectively.

4.1.1 Quality assurance

The Administration shall require that the manufacturers have a quality control system audited by a competent authority to ensure continuous compliance with the type approval conditions (SOLAS Chapter V / Regulation 18.5).

4.2 Display requirements

4.2.1 Display conflict

It shall not be possible for radar maps to be displayed at the same time as SENC navigational information. However, the navigational lines, other than those used for maps, and symbols given in IEC 60936-1, annex C, clauses C.3, C.4 and C.5 are permitted, provided there is no conflict between these sets of information.

Raster nautical charts (RNC) are not applicable for chart radar.

4.2.2 Display size

The equipment shall provide, without external magnification, a daylight display with a radar minimum effective diameter within the bearing scale of not less than 250 mm.

4.2.3 Display resolution

The display shall have a minimum resolution of (L) lines per mm given by L = 800/s, where s is the smaller dimension of the SENC information area. (e.g. for the minimum chart area, s = 250 mm and the resolution L = 3,20 lines per mm, giving a picture unit size of 0,312 mm.)

4.2.4 Display colour

The display shall be multi-colour. The colours used for navigational lines and symbols and the SENC information shall harmonize. The SENC information is permitted to be in shades of grey.

4.3 Display of SENC information

4.3.1 Display degradation (A4/3.3.9)

Selected parts of the System Electronic Navigation Chart (SENC) information shall *be displayed in such a way that the radar* and plotting *information is not masked, obscured or degraded*

4.3.2 SENC information brilliance

The SENC information brilliance shall be adjustable by the user at any time.

4.3.3 Display functionality and response time

The radar functionality and response time shall not be adversely affected by the SENC information.

4.3.4 Primary chart-information set

The *SENC information made available for* use on *a radar display* shall *at least include coastlines, own ship's safety contour, dangers to navigation and fixed and floating aids to navigation.* This set of information shall be known as the ‘primary chart-information set’.

The radar shall be capable of displaying the ‘primary chart-information set’ of SENC information. Any additional SENC information as specified by the manufacturer shall meet the requirements of this standard.

The radar shall present the 'primary chart-information set' of SENC required at any time by dedicated controls or primary access in an associated menu.

4.3.5 Selection of parts of SENC for display

From the radar display *the mariner* shall *be able to select those parts of the SENC, which can be made available and the mariner requires to be displayed.*

The selected parts of SENC shall be displayed with minimum reduction of the information content.

It shall be possible to suppress or remove all SENC information with a momentary control function and it shall be possible to remove all SENC information from the radar display at any time by a dedicated control or primary access in an associated menu.

It shall be possible to remove or add categories of the SENC information made available to the radar. The addition or deletion of information shall be limited to categories of information, for example prohibited and restricted areas, spot soundings, etc., but not individual items such as individual area or an individual sounding. Full details and relevant safety cautions, shall be provided in the operator's handbook.

If a facility has been provided to call up information associated with an object by cursor enquiry on its symbol, then the data shall be presented outside the radar video area. Where this facility is provided, the text shall not appear automatically whenever the object with which it is associated appears on the display. If depth information is displayed, it shall only be presented as it has been provided in the ENC and not adjusted by tidal height.

4.4 Superimposition (A4/3.3.10)

For the superimposition of selected parts of the SENC:

4.4.1 Reference management

Reference management is required to ensure that the information displayed is correlated and in the same reference and co-ordinate system;

A consistent common reference of position (with a datum of WGS84), including antenna positions, heading and speed shall be used. The operations manual shall contain appropriate information including the expected tolerance (uncertainty) of the chart to radar picture.

4.4.2 Display area

The whole effective radar display area shall *contain the available radar and SENC information.* The SENC information shall not be displayed outside this area, unless there is a clear indication of the radar display area limit, for example bearing scale.

4.4.3 Matching and adjustment

In case of any deviations between the chart image and the radar image through detectable causes, manual adjustment of the SENC shall *be possible. Any manual adjustment shall be clearly indicated as long as it is activated. Resetting* shall *be possible in a simple manner.*

a) The SENC information shall match within appropriate tolerances the range scale, orientation and projection of the radar information.

b) The radar with chart facilities shall provide an indication if the SENC information is displayed at a larger scale than contained in the ENC.

4.4.4 Priority in the display

The display of radar information shall have priority. (See 4.3.)

Provided the functional requirements in 4.3 and 4.4.6 a) are met, all methods of presentation are permitted.

4.4.5 Stabilization

The equipment shall *be capable of appropriately stabilising the radar image, ARPA*, ATA and EPA *vectors and SENC information*. *The operating mode shall be clearly indicated*.

a) The SENC information may be maintained or re-introduced by switching to an alternative method of stabilization only by operator action. A clear indication of the active mode shall be given.

b) If the position sensor fails or is switched off, the SENC information shall be removed automatically within 1 min. An alternative position information source, such as Loran-C, DR, etc. may be provided together with a clear indication.

c) If the azimuth stabilization sensor fails or is switched off, the SENC information shall be removed automatically within 1 min.

d) The display of SENC information is permitted in all radar modes.

4.4.6 Independence of radar image, ARPA, ATA, EPA and SENC

a) The SENC information shall not have an adverse effect on the radar picture.

b) *Radar/ARPA*, ATA and EPA *information and SENC information shall be clearly recognisable as such.*

c) *In the case of a* detectable *malfunction of one component* (the radar or source of SENC information)*, the function of the other component shall not be adversely affected.* If the radar fails while SENC information is selected, a clear visual indication shall be displayed in the radar video area. The SENC information may remain.

4.5 Colours and symbols

4.5.1 Background colour

a) Radar background and water surfaces in the SENC information shall be in the same basic colour.

b) Different shades of the colour of water are permitted to indicate water with depth greater than or less than the safety contour. Lighter shades shall indicate shallower water.

c) Day and night modes shall be provided. The colours provided shall be documented in the operator's handbook.

d) If land colour infill is used it shall be in a different colour to the water colour (or, if used, a different shade of grey).

e) If the SENC information covers only part of the radar video area, the limitations for SENC information shall be clearly indicated when SENC information is present.

f) For borderlines between No-Data, Official-Data and Non-Official-Data, the appropriate line styles defined in S-52 shall be used.

g) For areas in which no data are provided the NO-DATA-Pattern according to S-52 shall not be used.

h) If Non-Official-Data are used a clear indication shall be given to the user according to S-52.

4.5.2 Chart symbols and colours

At least the simplified chart symbols shall be displayed, using size, shape and colour as specified in annex A of this standard which is based on IHO S52 Appendix 2.

4.6 Presentation

4.6.1 SENC availability

The SENC information shall be available, as a minimum, for TM, N UP mode on 3 nm, 6 nm and 12 nm range scales. Presentation of SENC information is permitted in other presentation modes. If other display modes and range scales are provided, the same requirements shall be met for presentation of SENC information, as for the minimum requirements.

4.6.2 New chart latency

After a change of range scale or upon radar origin resetting, SENC information that is incompatible with the selected radar presentation in use shall be suppressed and an indication given until the new chart is fully displayed. The new chart shall be fully displayed within 10 s of this suppression occurring.

4.6.3 Own ships turn

The equipment shall be capable of operating with the SENC information continuously displayed in the presence of a turn. The turn rate shall be 12 °/s at 30 kt for SOLAS chapter V craft, and 20 °/s at a speed of 70 kt for HSC to SOLAS Chapter X, on all radar modes for which SENC information is available.

4.6.4 SENC latency

While the SENC information is continuously displayed the SENC positioning latency shall not exceed the time required to complete one radar scan, for example 3 s for a scanner turning rate of 20 rpm or 1,5 s for a scanner turning rate of 40 rpm and pro rata for other scanner turning rates.

4.7 Interfacing

a) All interfacing to external sensors and sources that are additionally required for SENC information purposes shall be to appropriate IEC 61162 interface standards.

b) If no suitable IEC 61162 interface standard is available, an appropriate interface may be used. Full details of such interfaces shall be adequately documented.

4.8 Alarms and indications

If an operational alarm for crossing a safety contour is provided it shall conform to the ECDIS standard as defined in IEC 61174.

The input from the position sensor and SENC shall be on the same geodetic datum (WGS84). An alarm shall be given if this is not the case.

4.9 Ergonomics

The ergonomic requirements of IEC 60945 and IEC 60936-1 or IEC 60936-2 as appropriate, shall apply.

4.10 ENC issue status

The date and number of last update affecting the cells currently in use and the edition number and date of issue of the ENC shall be available.

4.11 Installation matters

Alignment matters and their means of adjustment and limitations shall be included in the manufacturer's manual. The manual shall include qualitative information on the limitations of accuracy caused by the antenna(s) location, and the relative geographic antenna position, with respect to the SENC information.

5 Methods of testing and required test results

This clause defines the type test methods and results required ensuring that equipment complies with the requirements of clause 4.

5.1 General conditions of measurement and definitions

The equipment under test (EUT) shall be tested to IEC 60936-1 or IEC 60936-2 as applicable. All the tests to the general requirements of IEC 60945 shall be carried out to verify that the EUT meets these technical requirements. The equipment shall comply with those requirements of IEC 60945 appropriate to its category or evidence of prior testing supplied.

The manufacturer shall declare which equipment or units are 'protected' or 'exposed'. The manufacturer shall declare if 'preconditioning' is required before environmental checks.

For the purposes of this standard the following definitions shall apply:

– performance check – Reconfiguration of the EUT and carry out the appropriate IEC 60936 performance check. See annex B;

– performance test – For radar EUT, shall be identical to the performance check for the purposes of IEC 60945. See annex B;

– by inspection – a visual check of the equipment or documentation;

– 'clear indication' or 'visibility of test targets' – shall mean being visible for 50 % of the antenna scans;

– standard operating mode – in the operational condition defined in 4.5, for example TM, N UP.

The ENC test data set and a matched radar simulator are required, together with a source of SENC information.

All radar modes offered by the manufacturer with SENC information shall be exercised

An IEC 61162 interface simulator is required capable of transmitting valid and invalid messages with correct and incorrect checksum.

5.1.1 Test site

Tests will normally be carried out at test sites selected by the type test authority. The manufacturer shall, unless otherwise agreed, set up the equipment and ensure that it is operating normally before type testing commences.

5.2 General tests

5.2.1 Quality assurance

(See 4.1.1)

Test by inspection of the manufacturer's documentation.

5.3 Display tests

5.3.1 Display conflict

(See 4.2.1)

By observation.

5.3.2 Display size

(See 4.2.2)

By measurement and inspection.

5.3.3 Display resolution

(See 4.2.3)

From information supplied by the manufacturer, verify that the resolution defined in 4.2.3 is met.

5.3.4 Display colour

(See 4.2.4)

By observation.

5.4 Display of SENC information tests

(See 4.3)

5.4.1 Display degradation test

(See 4.3.1)

5.4.1.1 Objective

To show that the selected parts of the SENC do not mask, obscure or degrade the radar and plotting displays.

5.4.1.2 Method of test

a) Switch the radar to TM N UP and 3 nm range scale
b) Apply the SENC test data set and matching simulated radar information
c) Display 20 targets (at sea) with 10 being tracked or plotted
d) Display the ‘primary chart-information set’

5.4.1.3 Results required

The requirements of 4.3.1 shall be met.

The test shall be repeated at all other range scales where the SENC information is provided.

5.4.2 SENC information brilliance

(See 4.3.2)

Check that the SENC information brilliance is adjustable.

5.4.3 Display functionality and response time tests

(See 4.3.3)

5.4.3.1 Objective

To check functionality and response time.

5.4.3.2 Method of test

Use the method of test in 5.4.1 with additionally the following:

a) switch the radar to all other modes and range scales for which SENC information is provided;

b) add to the ‘primary chart information set’ all other SENC information that is provided;

c) move the cursor, rotate the EBL and change the VRM, change the vector from relative to true.

5.4.3.3 Results required

The radar functionality and response time shall be as required in the IEC 60936 radar series and IEC 60872 radar plotting series of standards as appropriate.

5.4.4 Primary chart information set

(See 4.3.4)

By inspection.

5.4.5 Selection of parts of SENC for display

(See 4.3.5)

By inspection of the EUT and handbooks.

5.5 Superimposition tests

(See 4.4)

5.5.1 Reference management

(See 4.4.1)

By inspection of the EUT and the handbooks. Check the manufacturers handbooks for guidance on installation matters and on the use of the ‘consistent common reference system’.

5.5.2 Display area

(See 4.4.2)

By inspection.

5.5.3 Matching and adjustment

(See 4.4.3)

5.5.3.1 Objective

Test of SENC and radar matching.

5.5.3.2 Method of measurement

a) Using SENC information covering the area surrounding 70° N or S, simulate own ship position to 70° N or S respectively. Set range scale to 12 nm.

b) Measure, using the radar tools (EBL/VRM and or cursor) the range and bearing to 4 points in the chart. The 4 points shall be situated at a range between 10 and 12 nm and bearings of 45°, 135°, 225° and 315° with a bearing tolerance of ±5°.

c) Check by observation that manual adjustment of SENC information is available, that an indication is given and that resetting is simple

5.5.3.3 Results required

The measurements, using the radar tools, shall be within 0,25 nm in range and 1,0° in bearing as compared to those taken from the SENC information.

5.5.4 Priority in the display

(See 4.4.4)

No further test is required as already done in 5.4.2.

5.5.5 Stabilization

(See 4.4.5)

Repeat 5.4.2 functional test while exercising position and rotation at 12 °/s and 30 kt, for equipment complying with IEC 60936-1 or 20 °/s and 70 kt for equipment complying with IEC 60936-2, for at least 20 consecutive scans.

Results required: the chart and radar images remain matched, by visual assessment, after each radar update. The operating mode shall be clearly indicated.

5.5.6 Independence of radar image, ARPA, ATA, EPA and SENC

(See 4.4.6)

Test and inspect all EUT available modes.

5.6 Colours and symbols

(See 4.5)

5.6.1 Background colour

(See 4.5.1)

Using the test data set (and annex A) and by inspection.

5.6.2 Chart symbols and colours

(See 4.5.2)

By inspection and using annex A.

5.7 Presentation tests

(See 4.6)

5.7.1 SENC availability

(See 4.6.1)

By observation.

5.7.2 New chart latency

(See 4.6.2)

5.7.2.1 Method of test

a) Repeat 5.4.1.

b) Select other range scales supporting the SENC information.

5.7.2.2 Results required

Check that the SENC information is suppressed and that there is an indication until the required data has been generated. The new SENC information shall be fully displayed within 10 s.

5.7.3 Own ships turn

(See 4.6.3)

By observation during 5.5.5

5.7.4 SENC latency

(See 4.6.4)

5.7.4.1 Method of test

Repeat test 5.5.5 and after 1 min stop the rotation.

5.7.4.2 Results required

The SENC positioning latency shall not exceed one radar scan.

5.8 Interfacing tests

(See 4.7)

a) All interfaces that conform to IEC 61162 shall be tested in accordance with the relevant annex of IEC 61162, for example annex C of IEC 61162-1.

b) Any additional interfaces based on IEC 61162 standards shall be tested to the appropriate IEC 61162 standard.

c) All other interfaces shall be tested in accordance with the documentation provided by the manufacturer.

5.9 Alarms and indications tests

(See 4.8)

Verify that an alarm is generated when the vessel is going to cross the safety contour within the time specified by the mariner.

Test by demonstration that an inappropriate datum (i.e. non-WGS84) is alarmed.

5.10 Ergonomic tests

(See 4.9)

Check that the EUT complies the ergonomic requirements of IEC 60945 and IEC 60936-1 or IEC 60936-2 as appropriate.

5.11 ENC issue status

(See 4.10)

Check the availability of date / number of update / issue number and date of issue of the SENC information on the display

5.12 Installation handbook checks

(See 4.11)

Check that the manufacturer's installation and operation manual includes appropriate cautions, setting up, commissioning and other installation matters.

Annex A
(normative)

Specification of chart symbols and colours to be used

A.1 Minimum SENC information.

The minimum SENC information to be made available shall be the 'primary chart-information set' as defined in 3.1.

A.1.1 Primary chart information set

The chart features and symbols that make up the 'primary chart information set' are based on those defined in source documents of IEC 61174 and IHO S52 Appendix 2 as given in Table A.1.

Table A.1 – Specification reference for chart features and symbols

Specification Feature or Symbol	Based on IEC 61174 annex A	Colour See A.1.3	Size See A.1.2
1 Fixed and floating A to N		See A.1.3	9x
2 Coastlines	1.1	See A.1.3	2x
2.1 Land (area fill)	–	See A.1.3	–
3 Own ship's safety contour	1.2	Clearly differentiated from coastlines	4x
3.1 Shallow side (area fill)	–	Lighter than radar background	–
3.2 Deep side (area fill)	–	As radar background	–
4 Dangers to navigation	1.3, 1.4	See A.1.3	Symbol 4x Lines 2x
5 Chart boundary	2.7		2x
5.1 No chart domain (area fill)	–		–

A.1.2 Size

The size column gives the minimum permitted line width or symbol definition in pixels, i.e. at least 9 pixels for symbols and at least 4 pixels wide for the line defining the safety contour.

A.1.3 Colours

The colours shall be compatible with those of a radar map as given in annex C of IEC 60936-1 and are related to those in IEC 61174.

Where grey is used for certain features, the shade shall be chosen to distinguish between their respective features and radar information.

A.2 Presentation of chart symbols

The display presentation of chart symbols shall be within the SCAMIN and SCAMAX range as given in the ENC.

A.3 Colour fill

Colour fill[1] is permitted in the A to N symbols of Table A.1 row 1 but if used the radar video shall not be degraded.

A.4 Coastlines

Coastlines shall be displayed as a line. The defined colours shall differentiate coast areas.

A.5 Own ship's safety contour

Own ship's safety contour shall be displayed by a line and shall be further differentiated by colour shade differences as defined in the table.

A.6 Day and night colours

The SENC information day and night colours shall be selected simultaneously with the radar's day/night colour mode.

[1] NOTE Colour fill is currently being considered by IEC/TC80/WG10 for specific purposes such as target presentation being combined after appropriate correlation and association. It is therefore not recommended that colour fill is used for single system target presentation.

Annex B
(normative)

Performance checks during environment testing

Performance check: – to test for appropriate SENC display and radar matching.

B.1 Method of measurement:

a) Switch on the radar to TM / N UP and 12 nm range;
b) Apply simulated positional (GNSS) and gyro-compass information;
c) Apply the SENC test data set.

B.2 Confirmation

Confirm the following:

Requirement	OK	Not OK comment
1 SENC chart orientation		
2 Display of 'Primary Chart Information Set'		
3 Using EBL/VRM (or cursor) Confirm the position of known chart points At approximately 10 nm at bearings of approximately		
45°		
135°		
225°		
315°		

B.3 Results required

The measurements shall be better than 0,25 nm in range and 0,5° in bearing.

Annex C
(normative)

Additional requirements for 'standalone' radar with chart facilities

The following requirements for provision and updating of chart information are relevant for a standalone 'radar with chart facilities' system, which does not get pre-processed SENC information from an 'associated ECDIS'.

Where only the 'primary chart information set' is to be used in the conversion of ENC and updates without an associated ECDIS, then the requirements of this annex shall be applied.

Where additional facilities are provided, then the appropriate requirements and tests from IEC 61174 shall also be applied.

NOTE At the end of a section, text and reference numbers are given, for example (6.8.15.2). These indicate the clauses/subclauses for requirements and corresponding tests respectively given in edition 2 of IEC 61174. Subsequent editions of IEC 61174 may use different numbering.

C.1 Provision and updating of chart information

In order to identify the date and origin of the ENC in use, the EUT shall include a chart library, which lists the ENC in the EUT by edition and date. A new edition of an ENC will supersede a previous ENC and its integrated updates issued by a government authorized hydrographic office. Initial data test (6.5). Display-show and verify (6.8.15.2)

The EUT 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. Automatic updates (6.8.15)

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. Automatic updates (6.8.15)

The EUT shall keep a record of updates including time of application to the SENC. Record and logs (6.8.15.3)

Official HO updates shall be distinguished from local ones. Display-show and verify (6.8.15.2d))

The EUT shall warn the user when an update is out of sequence, terminate the update and restore the SENC as it was before application of the ENC update file. Receipt – installation and application (6.8.15.1d), e) and f))

C.2 Content and structure of chart data

The EUT shall be capable of accepting and converting official HO data (ENC) to the internal storage structure of the individual EUT (system ENC or SENC). Such data includes both that in the ENC and that delivered in digital format to update the ENC. Loading corrupted data (6.8.14), initial test (6.5) and automatic update (6.8.15)

Each manufacturer of ‘radar with chart facilities’ systems may design their own storage formats or data structure to allow its system to meet the performance requirements stated in this standard. The resulting database is called the System ENC (SENC). Automatic update 6.8.15, receipt – installation and application (6.8.15.1).

The precision of HO supplied data shall be maintained, for example HO data provided in degrees and decimal degrees, when converted to manufacturer specific formats and structures and used in calculations, shall also be maintained to the same accuracy. Accuracy (6.6)

If the manufacturer uses point reduction or smoothing operations in order to compress the chart information in the SENC, the resultant image of the chart displayed at ENC scale shall not differ from the ENC image by more than the display resolution. Accuracy (4.11.1, 4.12.1, 5.1, 5.4.4, and 6.6)

HO data will be supplied in a cell structure. If this cell structure is modified, it is the EUT manufacturer’s responsibility to maintain cell dependent characteristics. ENC (4.4.1, 4.4.2, 5.5.2 and 6.5.2)

Annex ZA
(normative)

Normative references to international publications with their corresponding European publications

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

NOTE When an international publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

Publication	Year	Title	EN/HD	Year
IEC 60872-1	- [1)]	Maritime navigation and radiocommunication equipment and systems - Radar plotting aids Part 1: Automatic radar plotting aids (ARPA) - Methods of testing and required test results	EN 60872-1	1998 [2)]
IEC 60872-2	- [1)]	Part 2: Automatic tracking aids (ATA) - Methods of testing and required test results	EN 60872-2	1999 [2)]
IEC 60872-3	- [1)]	Part 3: Electronic plotting aid (EPA) - Performance requirements - Methods of testing and required test results	EN 60872-3	2001 [2)]
IEC 60945	- [1)]	Maritime navigation and radiocommunication equipment and systems - General requirements - Methods of testing and required test results	EN 60945	1997 [2)]
IEC 60936-1	- [1)]	Maritime navigation and radiocommunication equipment and systems - Radar Part 1: Shipborne radar - Performance requirements - Methods of testing and required test results	EN 60936-1	2000 [2)]
IEC 60936-2	- [1)]	Part 2: Shipborne radar for high-speed craft (HSC) - Methods of testing and required test results	EN 60936-2	1999 [2)]
IEC 61162	Series	Maritime navigation and radiocommunication equipment and systems - Digital interfaces	EN 61162	Series

1) Undated reference.

2) Valid edition at date of issue.

Publication	Year	Title	EN/HD	Year
IEC 61174	- [1)]	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	EN 61174	2001 [2)]
IMO	- [1)]	Convention for the Safety of Life at Sea (SOLAS), as amended	-	-
IMO Resolution MSC.64(67) Annex 4	- [1)]	Performance standards for radar equipment	-	-
IMO Resolution A.694(17)	- [1)]	General requirements for shipborne radio equipment forming part of the global maritime distress and safety system (GMDSS) and for electronic navigational aids	-	-
IMO Resolution A.820	- [1)]	Performance standards for navigational radar equipment for high-speed craft	-	-
IMO Resolution A.817	- [1)]	Performance standards for electronic chart display and information systems (ECDIS)	-	-
IHO S52 and appendices	- [1)]	Specifications for Chart Content and Display Aspects of ECDIS	-	-

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