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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 60936-2:1998)

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English version

**Maritime navigation and radiocommunication  
equipment and systems - Radar  
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(IEC 60936-2:1998)**

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Navigations- und  
Funkkommunikationsgeräte und  
-systeme für die Seeschifffahrt - Radar  
Teil 2: Radar für  
Hochgeschwindigkeitsfahrzeuge (HSC)  
Prüfverfahren und geforderte  
Prüfergebnisse  
(IEC 60936-2:1998)

SIST EN 60936-2:2004

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This European Standard was approved by CENELEC on 1999-01-01. 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.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the Central Secretariat has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

## 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

## Foreword

The text of document 80/193/FDIS, future edition 1 of IEC 60936-2, 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 60936-2 on 1999-01-01.

The EN 60936 series supersedes EN 60936:1993.

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) 1999-10-01
- latest date by which the national standards conflicting  
with the EN have to be withdrawn (dow) 2001-10-01

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

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Endorsement notice

The text of the International Standard IEC 60936-2:1998 was approved by CENELEC as a European Standard without any modification.

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## 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.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60872-1	1998	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
IEC 60872-2	<sup>-1)</sup>	Part 2: Automatic tracking aids (ATA) Methods of testing and required test results	-	-
IEC 60872-3	<sup>-1)</sup>	Part 3: Electronic plotting aids (EPA) Methods of testing and required test results	-	-
IEC 60936-1	<sup>-1)</sup>	Maritime navigation and radiocommunication equipment and systems Radar Part 1: Shipborne radar - Methods of testing and required test results	-	-
IEC 60945	1996	Maritime navigation and radiocommunication equipment and systems General requirements - Methods of testing and required test results	EN 60945	1997
IEC 61162	series	Maritime navigation and radiocommunication equipment and systems Digital interfaces	EN 61162	series
IEC 61174	1998	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	1998

1) To be published.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
ISO 9000	series	Quality management and quality assurance standards	EN 29000 EN ISO 9000	series series
IMO Resolution A.694	1991	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	1995	Performance standards for navigational radar equipment for high-speed craft	-	-
IMO A.823	1995	Performance standards for automatic radar plotting aids (ARPAs)	-	-
IMO MSC.64 (67)	1996	Annex 4 - Performance standards for radar equipment	-	-
IMO MSC.36 (63)	1994	International code of safety for high-speed craft (HSC)	-	-
IMO MSC SN/Circular 197	-	Operation of marine radar for search and rescue radar transponder (SART) detection	-	-
IMO	1992	Convention for Safety of Life at Sea (SOLAS), as amended	-	-
ITU	1997	Radio regulations	-	-
IHO S-52	1994	Specifications for chart content and display aspects of ECDIS	-	-

# INTERNATIONAL STANDARD

**IEC**  
**60936-2**

First edition  
1998-10

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## Maritime navigation and radiocommunication equipment and systems – Radar –

### Part 2: Shipborne radar for high-speed craft (HSC) – Methods of testing and required test results

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Commission Electrotechnique Internationale  
International Electrotechnical Commission  
Международная Электротехническая Комиссия

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# INTERNATIONAL ELECTROTECHNICAL COMMISSION

## MARITIME NAVIGATION AND RADIOCOMMUNICATION EQUIPMENT AND SYSTEMS – RADAR –

### Part 2: Shipborne radar for high-speed craft (HSC) – 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.
- 2) The formal decisions or agreements of the IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested National Committees.
- 3) The documents produced have the form of recommendations for international use and are published in the form of standards, technical reports or guides and they are accepted by the National Committees in that sense.
- 4) In order to promote international unification, IEC National Committees undertake to apply IEC International Standards transparently to the maximum extent possible in their national and regional standards. Any divergence between the IEC Standard and the corresponding national or regional standard shall be clearly indicated in the latter.
- 5) The IEC provides no marking procedure to indicate its approval and cannot be rendered responsible for any equipment declared to be in conformity with one of its standards.
- 6) Attention is drawn to the possibility that some of the elements of this International Standard may be the subject of patent rights. The IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 60936-2 has been prepared by IEC technical committee 80: Maritime navigation and radiocommunication equipment and systems. The IEC 60936 series, of which this is part 2, replaces IEC 60936 published in 1988, in order to reflect the new requirements of the International Maritime Organisation (IMO). This part of the series contains some of the specific requirements.

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

FDIS	Report on voting
80/193/FDIS	80/210/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 and E form an integral part of this standard.

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

## MARITIME NAVIGATION AND RADIOCOMMUNICATION EQUIPMENT AND SYSTEMS – RADAR –

### Part 2: Shipborne radar for high-speed craft (HSC) – Methods of testing and required test results

#### 1 Scope

This International Standard specifies the minimum operational and performance requirements, methods of testing and required test results as required by IMO resolution A.820 and Chapter X of the high-speed craft (HSC) code. It complies with the requirements of 13.13 of the HSC code and incorporates applicable parts of 13.5 of the HSC code on radar installations. In addition it takes account of IMO resolution A.694 and is associated with IEC 60945. When a requirement in this standard is different from IEC 60945, the requirement in this standard takes precedence.

The HSC scenarios, as defined in annex D, apply to equipment intended for use on high-speed craft and to equipment which is tested to IEC 60872-1 and IEC 60872-2 and also intended for use on high-speed craft.

All texts of this standard, whose wording is identical to that in IMO resolution A.820 are printed in *italics* and the resolution and paragraph numbers are indicated in brackets.

#### 2 Normative references

[SIST EN 60936-2:2004](https://standards.iteh.ai/catalog/standards/sist/cb7e95cf-14c9-40dd-a69b-157663483222/iec-60936-2-2004)

[https://standards.iteh.ai/catalog/standards/sist/cb7e95cf-14c9-40dd-a69b-](https://standards.iteh.ai/catalog/standards/sist/cb7e95cf-14c9-40dd-a69b-157663483222/iec-60936-2-2004)

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of IEC 60936. At the time of publication, the editions indicated were valid. All normative documents are subject to revision, and parties to agreements based on this part of IEC 60936 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 60872-1:1998, *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*<sup>1)</sup>

IEC 60872-3, —, *Maritime navigation and radiocommunication equipment and systems – Radar plotting aids – Part 3: Electronic plotting aids (EPA) – Methods of testing and required test results*<sup>1)</sup>

IEC 60936-1, —, *Maritime navigation and radiocommunication equipment and systems – Radar – Part 1: Shipborne radar – Methods of testing and required test results*<sup>1)</sup>

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

<sup>1)</sup> To be published.

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

IEC 61174:1998, *Maritime navigation and radiocommunication equipment and systems – Electronic chart display and information system (ECDIS) – Operational and performance standards, methods of testing and required test results*

ISO 9000, *Quality management and quality assurance standards*

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

IMO A.820:1995, *Performance standards for navigational radar equipment for high speed craft*

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

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

IMO MSC.36 (63):1994, *International code of safety for high-speed craft (HSC)*

IMO MSC SN/Circular 197, *Operation of marine radar for search and rescue radar transponder (SART) detection*

IMO:1992, *Convention for Safety of Life at Sea (SOLAS), as amended*

ITU:1997, *Radio regulations*

IHO S-52:1994, *Specifications for chart content and display aspects of ECDIS*

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### **3 Performance requirements**

The radio frequency of operation of the equipment and its characteristics shall at all times be within the limits defined in the ITU Radio regulations. In particular, compliance with those limits is defined in IEC 60936-1.

#### **3.1 (A.820/1) Introduction**

**3.1.1 (A.820/1.1)** *The radar equipment is intended for installation in craft with the following characteristics:*

- .1 *A maximum speed of up to 70 knots;*
- .2 *A maximum rate of turn up to 20°/s; and*
- .3 *normally operate between latitudes 70° N and 70° S.*

**3.1.2 (A.820/1.2)** *In addition to the general requirements contained in resolution A.694:1991 the radar equipment shall comply with the following minimum performance requirements.*

### 3.2 (A.820/2) General

*The radar equipment shall provide an indication, in relation to the craft, of the position of other surface craft and obstructions and of buoys, shorelines and navigational marks in a manner which will assist in navigation and in avoiding collision.*

**3.2.1** Equipment shall be installed in such a manner that it is capable of meeting its recommended performance standards.

**3.2.2** The operator manual for the radar shall include precautions in the use of the radar under certain combinations of conditions with regard to not performing to specification i.e. picture smearing and target tracking loss when at high speed close to targets.

### 3.2.3 Quality assurance

The radar shall be designed, produced and documented by companies complying with the ISO 9000 series standards, as applicable.

### 3.3 (A.820/3) Range performance

*The operational requirement, where the radar antenna is mounted 7,5 m above sea level, is that the equipment shall give a clear indication of surface objects such as a navigational buoy, with a radar reflector height of 3,5 m, having an effective echoing area of approximately 10 m<sup>2</sup> at 2,5 nautical miles in the absence of clutter.*

### 3.4 (A.820/4) Minimum range (standards.iteh.ai)

*The surface objects specified in 3.3 shall be clearly displayed from a minimum range of 35 m up to a range of one nautical mile, without changing the setting of controls other than the range selector.*

The minimum range is the shortest distance at which, using a mandatory range scale of not more than 1,5 nautical miles, a stationary target ahead is still presented separately from the point representing the antenna position.

### 3.5 (A.820/5) Display

**3.5.1 (A.820/5.1)** *The equipment shall without external magnification provide a multi-colour daylight display with an effective radar picture diameter of not less than 250 mm.*

**3.5.1.1** Target echoes shall be displayed by means of the same basic colours and the echo strength shall not be displayed in different colours.

**3.5.1.2** Additional information may be shown in different colours.

**3.5.2 (A.820/5.2)** *Day and night colours shall be provided. It shall be possible to adjust brightness.*

**3.5.2.1** The radar picture and information shall be readable under all ambient light conditions. If a light shield is necessary to facilitate operation of the display in high ambient levels, then means shall be provided for its ready attachment and removal.

**3.5.3 (A.820/5.3)** *The equipment shall provide the following set of range scales of display:*

*0,25; 0,5; 0,75; 1,5; 3; 6; 12; 24 nautical miles.*

**3.5.4 (A.820/5.4)** *Additional range scales may be provided. These additional range scales shall be either smaller than 0,25 nautical miles or greater than 24 nautical miles.*

**3.5.5 (A.820/5.5)** *The range scale displayed and, when in use, the distance between range rings shall be clearly indicated.*

**3.5.6 (A.820/5.6)** *Off-centre facilities shall be provided of up to at least a minimum of 50 % and not more than 75 % of range scale in use.*

**3.5.7** The origin of the range scale (radar video) shall start at own ship, be linear and shall not be delayed.

**3.5.8 (64 (67)/Annex 4/3.3.5)** *Within the effective display radar video area, the display shall only contain information which pertains to the use of the radar display for navigation or collision avoidance and which has to be displayed there because of its association with a target (e.g. target identifiers, vectors) or because of some other direct relationship with the radar display.*

**3.5.9** The frequency band in use shall be indicated to the operator as X-BAND or S-BAND as applicable.

### **3.6 (A.820/6) Range measurement**

**3.6.1 (A.820/6.1)** *Fixed electronic range rings equally spaced from the origin shall be provided for range measurements as follows:*

- .1 on the range scales of 0,25, 0,5 and 0,75 nautical miles at least two range rings; and*
- .2 on all other range scales six range rings shall be provided.*

Any number of range rings are allowed on the voluntary additional range scales. When off-centred facilities are used, additional rings shall be provided at the same range intervals as on the mandatory range scales (see 3.5.3).

**3.6.2 (A.820/6.2)** *A variable electronic range marker (VRM) shall be provided with a numeric readout of range.*

It shall be possible to position a range marker, on any range scale, at any range, within 5 s of operation. The readout shall not display other data. For ranges of less than 1 nautical mile, there shall be only one zero before the decimal point. Additional variable range markers meeting the same requirements may be provided, in which case, read-outs shall be provided.

**3.6.3 (A.820/6.3)** *The fixed range rings and the variable range marker shall enable the range of an object to be measured with an error not exceeding 1 % of the maximum range of the scale in use, or 30 m, whichever is the greater.*

The accuracy of range rings and range marker shall be maintained when the display is off-centred.

**3.6.4 (A.820/6.4)** *It shall be possible to vary the brilliance of the fixed range rings and the variable range marker and to remove them independently and completely from the display.*

**3.6.5** The thickness of the fixed range rings shall not be greater than the maximum permissible thickness of the heading line.



### 3.7 (A.820/7) Heading indicator (heading line)

**3.7.1 (A.820/7.1)** *The heading of the craft shall be indicated by a continuous line on the display with a maximum error not greater than  $\pm 1^\circ$ . The thickness of the display heading shall not be greater than  $0,5^\circ$  measured at maximum range at the edge of the screen, when the display is centred. The heading line shall extend from the own ship's position to the edge of the display. A bearing scale shall be provided to give an indication of the heading in all display modes. It shall have an accuracy of  $\pm 1^\circ$  when centred. The radar picture shall be within this scale.*

**3.7.2 (A.820/7.2)** *Provision shall be made to switch off the heading indicator (heading line) by a device which cannot be left in the "heading marker off" (heading line off) position.*

**3.7.3** A heading marker shall be displayed on the bearing scale by a mark.

### 3.8 (A.820/8) Bearing measurement

**3.8.1 (A.820/8.1)** *Provision shall be made to obtain quickly the bearing of any object whose echo appears on the display. An electronic bearing line (EBL) shall be positioned and give a numeric readout within 5 s.*

**3.8.2 (A.820/8.2)** *The means provided for obtaining bearing shall enable the bearing of a target whose echo appears at the edge of the display to be measured with a radar system, excluding sensor errors, accuracy of  $\pm 1^\circ$  or better.*

**3.8.3** The EBL shall be displayed on the screen in such a way that it is clearly distinguishable from the heading indicator. It shall not be thicker than the heading indicator.

**3.8.4** It shall be possible to vary the brilliance of the EBL. This variation may be separate or combined with the intensity of other markers. It shall be possible to remove the EBL completely from the screen.

**3.8.5** The rotation of the EBL shall be possible in both directions continuously or in steps of not more than  $0,2^\circ$ .

**3.8.6** The numeric readout of the bearing of the EBL shall be displayed with at least 4 digits including one after the decimal point. The EBL readout shall not be used to display any other data. There shall be a positive identification of whether the bearing indicated is a relative or true bearing.

**3.8.7** A bearing scale around the edge of the display shall be provided. Linear or non-linear bearing scales may be provided.

**3.8.8** The bearing scale shall have division marks for at least each 5 degrees, with the 5 degree and 10 degree divisions clearly distinguishable from each other. Numbers shall clearly identify at least each 30 degree division.

**3.8.9** It shall be possible to measure the bearing relative to the heading line and relative to North.

**3.8.10** It shall be possible to move the position of the EBL origin away from the own ship to any desired point on the effective display area. By a fast simple operation it shall be possible to move the EBL origin back to own ship's position on the screen. On the EBL, it shall be possible to display a variable range marker.