
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 60872-1:1998)

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

Navigation- und Funkkommunikationsgeräte und -systeme für die Seeschifffahrt - Radar -Plathilfen -- Teil 1: Automatische Radar-Plathilfen (ARPA) - Prüfverfahren und geforderte Prüfergebnisse

Matériels et systèmes de navigation et de radiocommunication maritimes - Aides de pointage radar -- Partie 1: Aides de pointage radar automatiques (APRA) - Méthodes d'essai et résultats d'essai exigés

[SIST EN 60872-1:2004](https://standards.iteh.ai/catalog/standards/sist/f8ce7777-c137-4071-9d85-)

<https://standards.iteh.ai/catalog/standards/sist/f8ce7777-c137-4071-9d85->

Ta slovenski standard je istoveten z: EN 60872-1:1998

ICS:

| | | |
|-----------|----------------------------------|----------------------------------|
| 33.060.01 | Radijske komunikacije na splošno | Radiocommunications in general |
| 47.020.70 | Navigacijska in krmilna oprema | Navigation and control equipment |

SIST EN 60872-1:2004**en**

iTeh STANDARD PREVIEW
(standards.iteh.ai)

SIST EN 60872-1:2004

<https://standards.iteh.ai/catalog/standards/sist/f8ce7777-c137-4071-9d85-7b566cd63ecb/sist-en-60872-1-2004>

English version

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 60872-1:1998)

Matériels et systèmes de navigation et
de radiocommunication maritimes
Aides de pointage radar
Partie 1: Aides de pointage radar
automatiques (APRA) - Méthodes
d'essai et résultats d'essai exigés
(CEI 60872-1:1998)

Navigations- und
Funkkommunikationsgeräte und
-systeme für die Seeschifffahrt
Radar-Plöthilfen
Teil 1: Automatische Radar-Plöthilfen
(ARPA) - Prüfverfahren und geforderte
Prüfergebnisse
(IEC 60872-1:1998)

[SIST EN 60872-1:2004](https://standards.iteh.ai/catalog/standards/sist/8ce777-c137-4071-9d85-7b566cd63ecb/sist-en-60872-1-2004)
<https://standards.iteh.ai/catalog/standards/sist/8ce777-c137-4071-9d85-7b566cd63ecb/sist-en-60872-1-2004>

This European Standard was approved by CENELEC on 1998-10-01. 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 80/192/FDIS, future edition 1 of IEC 60872-1, 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 60872-1 on 1998-10-01.

This European Standard supersedes EN 60872:1993 and its amendment A1:1993.

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) 1999-07-01
- latest date by which the national standards conflicting
with the EN have to be withdrawn (dow) 2001-07-01

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.

iTeh STANDARD PREVIEW

Endorsement notice

The text of the International Standard IEC 60872-1:1998 was approved by CENELEC as a European Standard without any modification.

[SIST EN 60872-1:2004](https://standards.iteh.ai/catalog/standards/sist/8ce7777-c137-4071-9d85-7b566cd63ecb/sist-en-60872-1-2004)

<https://standards.iteh.ai/catalog/standards/sist/8ce7777-c137-4071-9d85-7b566cd63ecb/sist-en-60872-1-2004>

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 60872-2 | - ¹⁾ | 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 | - ¹⁾ | Part 3: Electronic plotting aids (EPA) Methods of testing and required test results | - | - |
| IEC 60936-1 | - ¹⁾ | Maritime navigation and radiocommunication equipment and systems Radar Part 1: Shipborne radar - Methods of testing and required test results | - | - |
| IEC 60936-2 | - ¹⁾ | Part 2: Shipborne radar for high-speed craft (HSC) - 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 |
| ISO 9000 | 1987 | Quality management and quality assurance standards | EN 29000 ²⁾ | 1988 |
| IMO Resolution A.477 | 1981 | Performance standards for radar equipment | - | - |

1) To be published.

2) EN 29000 is superseded by EN ISO 29000-1:1994 which is based on ISO 29000-1:1994.

| <u>Publication</u> | <u>Year</u> | <u>Title</u> | <u>EN/HD</u> | <u>Year</u> |
|----------------------|-------------|--|--------------|-------------|
| IMO Resolution 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 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 A.824 | 1995 | Performance standards for devices to indicate speed and distance | - | - |
| IMO MSC. 64(67) | 1996 | Annex 4 - Performance standards for radar equipment | - | - |
| IHO S-52 | 1996 | Specifications for chart content and display aspects of ECDIS | - | - |

iTeh STANDARD PREVIEW
(standards.iteh.ai)

SIST EN 60872-1:2004

<https://standards.iteh.ai/catalog/standards/sist/f8ce7777-c137-4071-9d85-7b566cd63ecb/sist-en-60872-1-2004>

INTERNATIONAL STANDARD

IEC
60872-1

First edition
1998-09

Maritime navigation and radiocommunication equipment and systems – Radar plotting aids –

Part 1:

Automatic radar plotting aids (ARPA) –

Methods of testing and required test results

(standards.iteh.ai)

*Matériels et systèmes de navigation et de radiocommunication
maritimes – Aides de pointage radar –*
[https://standards.iteh.ai/catalog/standards/sist/8ce7777-c137-4071-9d85-](https://standards.iteh.ai/catalog/standards/sist/8ce7777-c137-4071-9d85-7b566cd63ecb/sist-en-60872-1-2004)

Partie 1:

*Aides de pointage radar automatiques (APRA) – Méthodes
d'essai et résultats d'essai exigés*

© IEC 1998 — Copyright - all rights reserved

No part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from the publisher.

International Electrotechnical Commission
Telefax: +41 22 919 0300

3, rue de Varembé Geneva, Switzerland
e-mail: inmail@iec.ch IEC web site <http://www.iec.ch>



Commission Electrotechnique Internationale
International Electrotechnical Commission
Международная Электротехническая Комиссия

PRICE CODE

S

For price, see current catalogue

CONTENTS

| | Page |
|---|------|
| FOREWORD | 3 |
| Clause | |
| 1 Scope | 4 |
| 2 Normative references..... | 4 |
| 3 Performance requirements..... | 5 |
| 3.1 Introduction | 5 |
| 3.2 Definitions | 6 |
| 3.3 Performance standards..... | 6 |
| 4 Methods of testing and required test results | 12 |
| 4.1 General | 12 |
| 4.2 Detection, acquisition, tracking and general facilities..... | 12 |
| 4.3 Tracking reliability..... | 14 |
| 4.4 Tracking accuracy..... | 15 |
| 4.5 Closing target warning | 15 |
| 4.6 Collision risk (CPA/TCPA) warning..... | 16 |
| 4.7 Trial manoeuvre | 16 |
| 4.8 Display | 16 |
| 4.9 Audible warnings | 16 |
| 4.10 Data requirements | 17 |
| 4.11 Interfaces | 17 |
| 4.12 Performance test and warnings..... | 17 |
| 4.13 Sea and ground stabilization | 17 |
| 4.14 System configuration and quality assurance..... | 17 |
| Annexes | |
| A Definition of terms to be used in connection with ARPA performance standards..... | 18 |
| B Operational scenarios | 21 |
| C Sensor errors..... | 22 |
| D ARPA testing using simulated targets..... | 24 |
| E Electronic plotting video symbols (EPVS) | 25 |

INTERNATIONAL ELECTROTECHNICAL COMMISSION

**MARITIME NAVIGATION AND RADIOCOMMUNICATION
EQUIPMENT AND SYSTEMS –
RADAR PLOTTING AIDS –**
**Part 1: Automatic radar plotting aids (ARPA) –
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 60872-1 has been prepared by IEC technical committee 80: Maritime navigation and radiocommunication equipment and systems. The IEC 60872 series, of which this is part 1, replaces IEC 60872 published in 1987 and amendment 1 (1991) and reflects the new requirements of the International Maritime Organization (IMO).

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

| FDIS | Report on voting |
|-------------|------------------|
| 80/192/FDIS | 80/207/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 issued at a later date.

MARITIME NAVIGATION AND RADIOCOMMUNICATION EQUIPMENT AND SYSTEMS – RADAR PLOTTING AIDS –

Part 1: Automatic radar plotting aids (ARPA) – Methods of testing and required test results

1 Scope

This International Standard specifies the minimum operational and performance requirements, methods of testing and test results for equipment that complies with performance standards not inferior to those adopted by the International Maritime Organization (IMO) in Resolution A.823. In addition, this standard 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 shall take precedence.

All texts of this standard, in which the wording is identical to that in IMO Resolution A.823, are printed in *italics* and the resolution and paragraph numbers are indicated in brackets.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of IEC 60872. 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 60872 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 60872-2, — *Maritime navigation and radiocommunication equipment and systems – Radar plotting aids – Part 2: Automatic tracking aids (ATA) – Methods of testing and required test results*¹⁾

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*¹⁾

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

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*¹⁾

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

¹⁾ To be published.

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

ISO 9000:1987, *Quality management and quality assurance standards*

IMO Resolution A.477:1981, *Performance standards for radar equipment*

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

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

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

IHO S-52:1996, *Specifications for chart content and display aspects of ECDIS*

3 Performance requirements

STANDARD PREVIEW

3.1 (A.823/A.1) Introduction (standards.iteh.ai)

3.1.1 (A.823/A.1.1) *Automatic radar plotting aids (ARPA) shall, in order to improve the standard of collision avoidance at sea:*

.1 *reduce the workload of observers by enabling them to obtain information about automatically plotted targets so that they can perform as well with several separate targets as they can by manually plotting a single target;*

.2 *provide continuous, accurate and rapid situation evaluation.*

3.1.2 (A.823/A.1.2) *The radar facilities provided by an ARPA display shall comply with the performance standards for radar equipment (Resolution A.477) appropriate to its mode of use.*

3.1.3 (A.823/A.1.3) *In addition to the general requirements contained in resolution A.694, ARPA shall comply with the following minimum performance standards.*

3.1.4 *Where an ARPA display is intended for use as the master display of a complete radar system, the system shall comply with IEC 60936-1. For high speed craft (HSC) ARPA, the relevant clauses of IEC 60936-2 apply.*

3.1.5 *Where an ARPA display is intended for use as a slave display of a complete radar system, it shall comply with the relevant clauses of IEC 60936-1, where applicable to such a display. For high speed craft (HSC) ARPA, the relevant clauses of IEC 60936-2 apply.*

3.1.6 Quality assurance

The ARPA shall be designed, produced and documented by companies complying with ISO 9000, as applicable.

3.2 (A.823/A.2) Definitions

Definitions of terms used in these performance standards are given in annex A.

3.3 (A.823/A.3) Performance standards

3.3.1 (A.823/A.3.1) Detection

Where a separate facility is provided for detection of targets, other than by the radar observer, it shall have a performance not inferior to that which could be obtained by the use of the radar display.

3.3.2 (A.823/A.3.2) Acquisition

3.3.2.1 (A.823/A.3.2.1) Target acquisition may be manual or automatic for relative speeds up to 100 knots. However there shall always be a facility to provide for manual acquisition with the relevant symbol (see symbol 1 of annex E) and cancellation: ARPAs with automatic acquisition shall have a facility to suppress acquisition in certain areas. On any range scale where acquisition is suppressed over a certain area, the area of acquisition shall be defined and indicated on the display with the relevant symbol (see symbol 2 of annex E).

3.3.2.2 (A.823/A.3.2.2) Automatic or manual acquisition shall have a performance not inferior to that which could be obtained by the user of the radar display.

3.3.3 (A.823/A.3.3) Tracking (standards.iteh.ai)

3.3.3.1 (A.823/A.3.3.1) The ARPA shall be able to automatically track, process, simultaneously display and continuously update the information on at least 20 targets, whether automatically or manually acquired. A target being acquired and tracked during the initial stage shall be shown by a symbol (see symbol 3 of annex E) within 3 s. Targets being tracked when tracking is in steady state shall be shown by symbols 4A or 4B and 5 of annex E within 20 scans.

3.3.3.2 (A.823/A.3.3.2) If automatic acquisition is provided, description of the criteria of selection of targets for tracking shall be provided to the user. If the ARPA does not track all targets visible on the display, targets which are being tracked shall be clearly indicated with the relevant symbol (see symbols 4A, 4B, or 14 of annex E) on the display. The reliability of tracking shall not be less than that obtainable using manual recordings of successive target positions obtained from the radar display.

3.3.3.3 In order to reduce the complexity of vectors and graphics, a facility for the input of operator interest limits may be provided. If targets are being tracked, which do not require vectors or graphics, because they are outside the operator interest limits (e.g. range, CPA, TCPA), they shall be clearly indicated with the relevant symbol (see symbol 14 of annex E). The operating manual shall contain an explanation of the operator interest limits.

3.3.3.4 (A.823/A.3.3.3) The ARPA shall continue to track an acquired target which is clearly distinguishable on the display for any 5 out of 10 consecutive scans, provided the target is not subject to target swop.

3.3.3.5 (A.823/A.3.3.4) The possibility of tracking errors, including target swop, shall be minimised by ARPA design. A qualitative description of the effects of error sources on the automatic tracking and corresponding errors shall be provided to the user, including the effects of low signal-to-noise and low signal-to-clutter ratios caused by sea returns, rain, snow, low clouds and non-synchronous emissions. Such descriptions shall be in the operating manual.

3.3.3.6 Automatically applied "target identities" shall not be re-used until, as a minimum, the number assigned equals the maximum number of tracked targets.

3.3.3.7 The ARPA shall continuously track a manoeuvring target.

3.3.3.8 (A.823/A.3.3.5) *The ARPA shall be able to display on request with the relevant symbol (see symbol 6 of annex E) at least four equally time-spaced past positions of any targets being tracked over a period appropriate to the range scale in use. At least on 3, 6 and 12 nautical mile range scales, user-selectable time intervals of 0,5 min, 1,0 min and 2,0 min shall be provided. Facility to switch to other time intervals is permitted. The time scale of the past position plot shall be continuously indicated, together with an indication of whether they are true or relative "past positions". The operating manual shall contain an explanation of what the past position plots represent.*

3.3.4 (A.823/A.3.4) Display

3.3.4.1 (A.823/A.3.4.1) *The display may be a separate or integral part of the ship's radar. However, the ARPA display shall include all the data required to be provided by a radar display in accordance with the performance standards for navigational radar equipment.*

3.3.4.2 (A.823/A.3.4.2) *The design shall be such that any malfunction of ARPA parts producing data additional to information to be produced by the radar as required by the performance standards for navigational equipment shall not affect the integrity of the basic radar presentation.*

The equipment shall be regarded as complying with the above if the design is such that, where practicable, normal performance of the radar system, in accordance with IEC 60936-1, will not be affected by malfunction of any ARPA subsystem that is not an essential part of the radar.

<https://standards.iteh.ai/catalog/standards/sist/8ce7777-c137-4071-9d85->

3.3.4.3 (A.823/A.3.4.3) *The ARPA facilities shall be available on at least 3, 6 and 12 mile range scales, and there shall be a positive indication of the range scale in use.*

3.3.4.4 (A.823/A.3.4.4) *ARPA facilities may also be provided on other range scales permitted by resolution A.820 and MSC.64(67), annex 4 and, if provided, shall comply with this standard.*

3.3.4.5 (A.823/A.3.4.5) *The ARPA shall be capable of operating with a relative motion display with "north-up" and "course-up" azimuth stabilisation. In addition, the ARPA may also provide for a true motion display. If true motion is provided, the operator shall be able to select for his display either true or relative motion. There shall be a positive indication of the display mode and orientation in use.*

3.3.4.6 (A.823/A.3.4.6) *The course and speed information generated by the ARPA for acquired targets shall be displayed in a vector or graphic form which clearly indicates the target's predicted motion with the relevant symbols (see symbols 4A or 4B or 5 of annex E). In this regard:*

- .1 ARPA presenting predicted information in vector form only shall have the option of both true and relative vectors. There shall be an indication of the vector mode selected and if true vector mode is selected, the display shall show whether it is sea or ground stabilized;*
- .2 an ARPA which is capable of presenting target course and speed information in graphic form shall also, on request provide the target's true and/or relative vector;*
- .3 vectors displayed shall be time-adjustable;*
- .4 a positive indication of the time-scale of the vector in use shall be given; and*