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Maritime navigation and radiocommunication equipment and systems - General requirements - Methods of testing and required test results (IEC 60945:2002)

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English version

**Maritime navigation and radiocommunication equipment and systems -  
General requirements -  
Methods of testing and required test results  
(IEC 60945:2002)**

Matériels et systèmes de navigation  
et de radiocommunication maritimes -  
Spécifications générales -  
Méthodes d'essai et résultats exigibles  
(CEI 60945:2002)

Navigations-  
und Funkkommunikationsgeräte  
und -systeme für die Seeschifffahrt -  
Allgemeine Anforderungen -  
Prüfverfahren und  
geforderte Prüfergebnisse  
(IEC 60945:2002)

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This European Standard was approved by CENELEC on 2002-10-01. 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, Hungary, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Slovakia, 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 80/345/FDIS, future edition 4 of IEC 60945, 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 60945 on 2002-10-01.

This European Standard supersedes EN 60945:1997.

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) 2003-07-01
- latest date by which the national standards conflicting  
with the EN have to be withdrawn (dow) 2005-10-01

Annexes designated "normative" are part of the body of the standard.

Annexes designated "informative" are given for information only.

In this standard, annexes A and ZA are normative and annexes B to G are informative.

Annex ZA has been added by CENELEC.

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The text of the International Standard IEC 60945:2002 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following notes have to be added for the standards indicated:

IEC 60068-2-32	NOTE	Harmonized as EN 60068-2-32:1993 (not modified).
IEC 60068-3-4	NOTE	Harmonized as EN 60068-3-4:2002 (not modified).
IEC 60073	NOTE	Harmonized as EN 60073:1996 (not modified).
IEC 60300-1	NOTE	Harmonized as EN 60300-1:1993 (not modified).
IEC 60721-2-1	NOTE	Harmonized as HD 478.2.1 S1:1989 (not modified).
IEC 60721-2-4	NOTE	Harmonized as HD 478.2.4 S1:1989 (not modified).
IEC 60721-3-6	NOTE	Harmonized as EN 60721-3-6:1993 + A2:1997 (not modified).
IEC 61162 (Series)	NOTE	Harmonized as EN 61162 (Series) (not modified).
IEC 61209	NOTE	Harmonized as EN 61209:1999 (not modified).
IEC 61508-1	NOTE	Harmonized as EN 61508-1:2001 (not modified).

## 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 60050-161	1990	International Electrotechnical	-	-
A1	1997	Vocabulary (IEV)	-	-
A2	1998	Chapter 161: Electromagnetic compatibility	-	-
IEC 60068-2-1	1990	Environmental testing	EN 60068-2-1	1993
A1	1993	Part 2: Tests - Tests A: Cold	A1	1993
A2	1994		A2	1994
IEC 60068-2-2	1974	Part 2: Tests - Tests B: Dry heat	EN 60068-2-2 <sup>1)</sup>	1993
A1	1993		A1	1993
A2	1994		A2	1994
IEC 60068-2-5	1975	Part 2: Tests - Test Sa: Simulated solar radiation at ground level	EN 60068-2-5	1999
IEC 60068-2-6 + corr. March	1995 1995	Part 2: Tests - Test Fc: Vibration (sinusoidal)	EN 60068-2-6	1995
IEC 60068-2-9 + A1 A1/corr. August	1975 1984 1989	Part 2: Tests - Guidance for solar radiation testing	EN 60068-2-9	1999
IEC 60068-2-30 + A1	1980 1985	Part 2: Tests - Test Db and guidance: Damp heat, cyclic (12 + 12 hour cycle)	EN 60068-2-30	1999
IEC 60068-2-48	1982	Part 2: Tests - Guidance on the application of the tests of IEC 60068 to simulate the effects of storage	EN 60068-2-48	1999
IEC 60068-2-52 corr. July	1996 1996	Part 2: Tests - Test Kb: Salt mist, cyclic (sodium chloride solution)	-	-
IEC 60071-2	1996	Insulation co-ordination Part 2: Application guide	EN 60071-2	1997

<sup>1)</sup> EN 60068-2-2 includes supplement A:1976 to IEC 60068-2-2.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60092-101 A1 A1/corr. November	1994 1995 1996	Electrical installations in ships Part 101: Definitions and general requirements	-	-
IEC 60417	Series	Graphical symbols for use on equipment	EN 60417	Series
IEC 60529 A1	1989 1999	Degrees of protection provided by enclosures (IP Code)	EN 60529 + corr. May A1	1991 1993 2000
IEC 60533	1999	Electrical and electronic installations in ships - Electromagnetic compatibility	-	-
IEC 60651 A1	1979 1993	Sound level meters	EN 60651 A1	1994 1994
IEC 61000-4-2	1995	Electromagnetic compatibility (EMC) Part 4-2: Testing and measurement techniques - Electrostatic discharge immunity test	EN 61000-4-2	1995
IEC 61000-4-3 (mod)	1995	Part 4-3: Testing and measurement techniques - Radiated, radio- frequency electromagnetic field immunity test	EN 61000-4-3	1996 <sup>2)</sup>
IEC 61000-4-4	1995	Part 4-4: Testing and measurement techniques - Electrical fast transient/burst immunity test	EN 61000-4-4	1995
IEC 61000-4-5	1995	Part 4-5: Testing and measurement techniques - Surge immunity test	EN 61000-4-5	1995
IEC 61000-4-6	1996	Part 4-6: Testing and measurement techniques - Immunity to conducted disturbances, induced by radio- frequency fields	EN 61000-4-6	1996
IEC 61000-4-8	1993	Part 4-8: Testing and measurement techniques - Power frequency magnetic field immunity test	EN 61000-4-8	1993
IEC 61000-4-11	1994	Part 4-11: Testing and measurement techniques - Voltage dips, short interruptions and voltage variations immunity tests	EN 61000-4-11	1994
CISPR 16-1	1999	Specification for radio disturbance and immunity measuring apparatus and methods Part 1: Radio disturbance and immunity measuring apparatus	-	-

<sup>2)</sup> EN 61000-4-3:1996 is superseded by EN 61000-4-3:2002, which is based on IEC 61000-4-3:2002.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
ISO 694	2000	Ships and marine technology - Positioning of magnetic compasses in ships	EN ISO 694	2001
ISO 3791	1976	Office machines and data processing equipment - Keyboard layouts for numeric applications	-	-
IMO SOLAS	1997	International Convention for the Safety of Life at Sea (SOLAS)	-	-
IMO Torremolinos Protocol	1993	Modification of the Torremolinos International Convention for the Safety of Fishing Vessels:1977	-	-
IMO MSC/Circular 794	1997	Standard Marine Communication Phrases (SMCPs)	-	-
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.803	1995	Performance standards for shipborne VHF radio installations capable of voice communication and digital selective calling	-	-
IMO Resolution A.813	1995	General requirements for electromagnetic compatibility (EMC) for all electrical and electronic ship's equipment	-	-
ITU-T Recommendation E.161	1993	Arrangement of digits, letters and symbols on telephones and other devices that can be used for gaining access to a telephone network	-	-

# INTERNATIONAL STANDARD

**IEC  
60945**

Fourth edition  
2002-08

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

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International Electrotechnical Commission, 3, rue de Varembé, PO Box 131, CH-1211 Geneva 20, Switzerland  
Telephone: +41 22 919 02 11 Telefax: +41 22 919 03 00 E-mail: [inmail@iec.ch](mailto:inmail@iec.ch) Web: [www.iec.ch](http://www.iec.ch)



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## INTERNATIONAL ELECTROTECHNICAL COMMISSION

**MARITIME NAVIGATION AND RADIOCOMMUNICATION  
EQUIPMENT AND SYSTEMS –****General 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.
- 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 specifications, technical reports or guides and they are accepted by the National Committees in that sense.
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- 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 60945 has been prepared by IEC technical committee 80: Maritime navigation and radiocommunication equipment and systems.

This fourth edition cancels and replaces the third edition published in 1996 and constitutes a technical revision.

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

FDIS	Report on voting
80/345/FDIS	80/349/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.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 3.

Annex A forms an integral part of this standard.

Annexes B, C, D, E, F, and G are for information only.

The committee has decided that the contents of this publication will remain unchanged until 2007. At this date, the publication will be

- reconfirmed;
- withdrawn;
- replaced by a revised edition, or
- amended.

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## INTRODUCTION

IEC 945 was originally produced to give test methods and, where appropriate, limit values to the IMO Resolution A.574(14) which was a recommendation on general requirements for electronic navigational aids. (It has subsequently been replaced, see below.) The tests dealing with electromagnetic immunity could not be produced in time for the publication of the original standard, and these were added later in 1992 as amendment 1.

In 1991 the IMO, when discussing the changes that would arise with the introduction of the global maritime distress and safety system (GMDSS), noted that in future, radio equipment would be installed on the bridge of a vessel alongside the navigation equipment instead of in a special radio room as hitherto. The IMO consequently withdrew Resolution A.574(14), and a corresponding Resolution A.569(14) dealing with the general requirements of radio equipment, and replaced them with IMO Resolution A.694(17). A second edition of IEC 945 was rapidly prepared to reflect this change.

The third edition of IEC 945 in 1996 was a complete revision which aligned the test methods with appropriate other IEC standards and introduced, wherever possible, the requirements of the classification societies. The scope was extended to make the standard applicable additionally to other equipment installed on and around the bridge of a ship with regard to EMC. A new class of equipment – “portable” – was added, together with better definitions of operational tests which involve subjective judgement and descriptions of operational and durability aspects of software.

This fourth edition (now IEC 60945) extends the detail of operational tests particularly for equipment which is operated through software menus. This has been derived from an exhaustive investigation of appropriate references as described in the Bibliography. The layout of clause 4 (Minimum performance requirements) has been changed to give a better grouping of ergonomics, hardware and software requirements.

<https://standards.iteh.ai/catalog/standards/sist/0b3f68f7-6f2d-493c-a80f-6b141979558e/iec-60945-1996>

The EMC tests have been revised with the frequency range having been extended from 1 GHz to 2 GHz.

Clarifications to the text of the third edition have been added where experience has shown a need and the references have been updated.

A comparison of the test requirements in the third and fourth editions is given in annex G to assist manufacturers and test houses in the use of the new edition.

## MARITIME NAVIGATION AND RADIOCOMMUNICATION EQUIPMENT AND SYSTEMS –

### General requirements – Methods of testing and required test results

#### 1 Scope

This International Standard assists in meeting a requirement of the International Convention for Safety of Life at Sea (SOLAS), adopted by the International Maritime Organization (IMO), that the radio equipment defined in chapters III and IV, and the navigation equipment defined in chapter V of the Convention, be type-approved by administrations to conform with performance standards not inferior to those adopted by the IMO. (Administrations are defined by the IMO as governments of the states whose flags the ships are entitled to fly.)

The performance standard for general requirements for shipborne radio equipment and electronic navigation aids that has been adopted by the IMO is given in IMO Resolution A.694 and is reproduced in this standard as annex A, which forms the basis for this standard. Reference is made, where appropriate, to IMO Resolutions A.694 and A.813 and all subclauses whose wording is identical to that in the resolutions are printed in italics.

This standard specifies minimum performance requirements, methods of testing and required test results for general requirements which can be applied to those characteristics common to all equipment described hereunder.

- a) shipborne radio equipment forming part of the global maritime distress and safety system required by the International Convention for Safety of Life at Sea (SOLAS) as amended, and by the Torremolinos International Convention for the Safety of Fishing Vessels as amended;
- b) shipborne navigational equipment required by the International Convention for Safety of Life at Sea (SOLAS) as amended, and by the Torremolinos International Convention for the Safety of Fishing Vessels as amended, and to other navigational aids, where appropriate; and
- c) for EMC only, all other bridge-mounted equipment, equipment in close proximity to receiving antennas, and equipment capable of interfering with safe navigation of the ship and with radio-communications (see IMO Resolution A.813).

NOTE For EMC, this standard is in the IEC category “product family”.

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