

Marine navigation equipment General requirements

Methods of testing and required test results

The European Standard EN 60945 : 1995 has the status of a British Standard

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Committees responsible for this British Standard

The preparation of this British Standard was entrusted to Technical Committee EPL/80, Maritime navigation and radiocommunication equipment and systems, upon which the following bodies were represented:

- British Marine Electronics Association
- British Marine Equipment Council
- British Nautical Instrument Trade Association
- Chamber of Shipping
- Federation of the Electronics Industry
- Lloyd's Register of Shipping
- Marine Safety Agency
- Marine Trades Association
- Ministry of Defence
- Nautical Institute
- Radiocommunications Agency

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English version

**Marine navigational equipment
General requirements
Methods of testing and required test results**

(IEC 945 : 1994)

Appareils de navigation maritime
Spécifications générales
Méthodes d'essai et résultats exigibles
(CEI 945 : 1994)

Navigationsgeräte für die Seeschifffahrt
Allgemeine Anforderungen
Prüfverfahren und geforderte Prüfergebnisse
(IEC 945 : 1994)

This European Standard was approved by CENELEC on 1995-09-20. 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, 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 the International Standard IEC 945 : 1994, prepared by IEC TC 80, Navigational instruments, was submitted to the formal vote and was approved by CENELEC as EN 60945 on 1995-09-20 without any modification.

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) 1996-09-01
- latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 1996-09-01

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

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MARINE NAVIGATIONAL EQUIPMENT – General requirements – Methods of testing and required test results

(SHIPBORNE RADIO EQUIPMENT FORMING PART OF
THE GLOBAL MARITIME DISTRESS AND SAFETY SYSTEM AND
MARINE NAVIGATIONAL EQUIPMENT)

1 Scope

This International Standard is based on IMO Resolution A.694 (17) and specifies the requirements and type testing which can be applied, for those aspects which are common to all such equipment, to:

- a) shipborne radio equipment forming part of the global maritime distress and safety system and
- b) electronic navigational aids

required to be carried on board ships, by Regulation 12 of Chapter V of the International Convention for the Safety of Life at Sea (SOLAS) of 1974, as amended, and to other navigational aids, where appropriate.

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

Minimum performance standards and methods of testing and required test results are established for those general requirements which can be applied to all equipment described above.

Where a requirement in an equipment standard is different from this standard, the requirement in the equipment standard shall take precedence.

The clause numbering of IMO Resolution A.694 (17) is indicated in brackets and all clauses whose meanings are identical to those in that resolution are printed in italics.

2 Normative references

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

IEC 50(161): 1990, *International Electrotechnical Vocabulary – Chapter 161: Electro-magnetic compatibility*

IEC 92-101: 1980, *Electrical installations in ships – Part 101: Definitions and general requirements*

IEC 417: 1973, *Graphical symbols for use on equipment. Index, survey and compilation of the single sheets* (including supplements)

IEC 529: 1989, *Degrees of protection provided by enclosures (IP Code)*

IEC 533: 1977, *Electromagnetic compatibility of electrical and electronic installations in ships*

IEC 651: 1979, *Sound level meters*

IEC 801-2: 1991, *Electromagnetic compatibility for industrial-process measurement and control equipment – Part 2: Electrostatic discharge requirements*

CISPR 16: 1987, *CISPR specification for radio interference measuring apparatus and measurement methods*

IMO: 1974, *International convention for safety of life at sea* (as amended)

IMO: Resolution A.278(VIII), *Symbols for controls on marine navigational radar equipment*

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

ISO/R 694: 1968, *Positioning of magnetic compasses in ships*

ISO 3791: 1976, *Office machines and data processing equipment – keyboard layouts for numeric applications*

CCITT: 1988, Recommendation E. 161, *Arrangement of figures, letters and symbols on rotary dials and pushbutton telephone sets*

3 Minimum performance standards

3.1 Introduction

3.1.1 All equipment shall be subjected, or already have been subjected, to the satisfaction of the type test authority, to all the appropriate tests, as specified in the relevant equipment standard, provided that, at the discretion of the testing authority:

3.1.1.1 the mould growth test and/or the corrosion test may be waived where the manufacturer is able to produce evidence that the components, materials and finishes employed in the equipment would satisfy the test;

3.1.1.2 for equipment which is not normally located in areas where devices sensitive to radio interference are fitted, the radiated interference tests may be waived or the limits may be modified, taking into account the normal location of such equipment. If this clause is invoked the testing authority shall endorse the test certificate appropriately.

3.1.2(1.2) *Where a unit of equipment provides a facility which is additional to the minimum requirements of both this standard and the appropriate equipment standard, the operation and, as far as is reasonably practicable, the malfunction of such additional facility shall not degrade the performance of the equipment below those minimum standards.*

3.2 Operation

3.2.1 Equipment shall be so constructed that it is capable of being operated properly and readily by a suitably qualified member of a ship's staff.

3.2.2(3.1) *The number of operational controls, their design and manner of function, location, arrangement and size shall provide for simple, quick and effective operation. The controls shall be arranged in a manner which minimizes the chance of inadvertent operation.*

3.2.2.1 Operational controls, the inadvertent activation of which could switch off the equipment or lead to a failure of the equipment, or to false indications, shall be protected especially against unintentional operation.

3.2.3(3.2) *All operational controls shall permit normal adjustments to be easily performed and shall be easy to identify from the position at which the equipment is normally operated. Controls not required for normal operation shall not be readily accessible.*

3.2.3.1 The controls shall be identified in English. In addition, symbols as specified in IEC 417 or IMO Resolution A.278 (VIII) may be used.

3.2.3.2 The operation of a control shall not cause obscuration of its related indicator, where observation of the indicator is necessary for making the adjustment.

3.2.3.3 Provision shall be made for the removal of, or for blocking off, the position of controls of any optional facilities which are not fitted.

3.2.4(3.3) *Where equipment is likely to be fitted in places which need to have low levels of ambient lighting, adequate adjustable illumination shall be provided in the equipment or in the ship to enable identification of controls and facilitate reading of indicators at all times. Means shall be provided for dimming the output of any equipment light source which is capable of interfering with navigation.*

3.2.4.1 The illumination shall be dazzle-free and adjustable to extinction, except for those warning and alarm indicators which are illuminated in the warning/alarm condition.

3.2.5(3.4) *The design of the equipment shall be such that misuse of the controls shall not cause damage to the equipment or injury to personnel.*

3.2.6(3.5) *If a unit of equipment is connected to one or more other units of equipment the performance of each shall be maintained.*

3.2.7(3.6) *Where a digital input panel with the digits 0 to 9 is provided, the digits shall be arranged preferably to conform with relevant CCITT recommendations¹. However, where an alphanumeric keyboard layout, as used on office machinery and data processing equipment, is provided, the digits 0 to 9 may, alternatively, be arranged to conform with the relevant ISO standard².*

3.2.7.1 Where data is shown in digital form other than on a cathode-ray tube screen, a suitable test circuit arrangement shall be provided which permits the testing of the individual digit elements without affecting the functioning of the equipment.

3.3 Power supply

3.3.1(4.1) *Equipment shall continue to operate in accordance with the requirements of the relevant standard in the presence of variations of power supply normally to be expected in a ship.*

3.3.1.1 The equipment shall be capable of normal operation under the following variations of the appropriate power supply:

AC Variation from nominal voltage: $\pm 10\%$
variation from nominal frequency: $\pm 6\%$

DC Variation from nominal voltage:
mains supplies: $+10\%$
 -20%
battery supplies: $+30\%$
 -10%

3.3.2(4.2) *Means shall be incorporated for the protection of equipment from the effects of excessive current and voltage, transients and accidental reversal of the power supply polarity or phase sequence.*

3.3.3(4.3) *If provision is made for operating equipment from more than one source of electrical energy, arrangements for rapidly changing from one source to the other shall be provided but not necessarily incorporated in the equipment.*

3.4 Durability and resistance to environmental conditions

3.4.1(5) *Equipment shall be capable of continuous operation under the conditions of various sea states, ship's motion, vibration, humidity and temperature likely to be experienced in ships³.*

3.4.1.1 The equipment shall be divided into three classes as follows:

Class B – equipment or units intended to be protected from weather;

Class X – equipment or units intended to be exposed to weather;

Class S – equipment or units intended to be submerged or in continuous contact with sea water.

¹ CCITT Recommendation E 161

² ISO Standard 3791

³ IEC Publications 92-101 and 945

3.4.1.2 Each unit of the equipment shall be marked to indicate the class for which it is intended. Where symbols are used for this purpose, they shall conform to figure 1.

3.5 Interference

3.5.1(6.1) *All reasonable and practicable steps shall be taken to ensure electromagnetic compatibility between the equipment concerned and other radiocommunication and navigational equipment carried on board in compliance with the relevant requirements of chapter IV and chapter V of the 1974 SOLAS Convention¹.*

3.5.1.1 All practicable steps shall be taken to ensure that the equipment shall not cause harmful interference to other equipment installed in ships.

3.5.1.2 The equipment shall be so designed that it can be expected to operate properly in the electromagnetic environment normally found on board ships.

3.5.2(6.2) *Mechanical noise from all units shall be limited so as not to prejudice the hearing of sounds on which the safety of the ship might depend.*

3.5.3(6.3) *Each unit of equipment normally to be installed in the vicinity of a standard compass or a magnetic steering compass shall be clearly marked with the minimum safe distances at which it may be mounted from such compasses.*

3.6 Maintenance

3.6.1(8.1) *The equipment shall be so designed that the main units, complex modules and any components with an expectation of life of less than 1 500 h, can be replaced readily, without elaborate recalibration or readjustment.*

3.6.1.1 The equipment shall, as far as is practicable, be so constructed that it can be installed in a ship in such a way that internal components are readily accessible for inspection and maintenance purposes.

3.6.2(8.2) *Equipment shall be so constructed and installed that it is readily accessible for inspection and maintenance purposes.*

3.7 Safety

3.7.1(7.1) *As far as is practicable, accidental access to dangerous voltages shall be prevented. All parts and wiring in which the direct or alternating voltages or both (other than radio-frequency voltages) combine to give a peak voltage greater than 55 V shall be protected against accidental access and shall be isolated automatically from all sources of electrical energy when the protective covers are removed. Alternatively, the equipment shall be so constructed that access to such voltages may only be gained after having used a tool for this purpose, such as spanner or screwdriver, and warning labels shall be prominently displayed both within the equipment and on protective covers.*

¹ IEC Publications 533 and 945

3.7.2(7.2) *Means shall be provided for earthing exposed metallic parts of the equipment but this should not cause any terminal of the source of electrical energy to be earthed.*

3.7.3(7.3/7.4.1) *All practicable steps shall be taken to ensure that electromagnetic radio-frequency energy, and X-radiation, radiated from the equipment shall not be a hazard to personnel. In particular the level of external X-radiation from the equipment in its normal working condition shall not exceed the limits laid down by the Administration concerned.*

3.7.3.1(7.4.2) *When X-radiation can be generated inside the equipment above the level of 4.6.2.2, a prominent warning shall be fixed inside the equipment and the precautions to be taken when working on the equipment shall be included in the equipment manual.*

3.7.3.2(7.4.3) *If malfunction of any part of the equipment can cause an increase in X-radiation, adequate advice shall be included in the information about the equipment, warning of the circumstances which could cause the increase and stating the precautions which should be taken.*

3.8 Equipment handbooks

3.8.1(8.3) *Adequate information shall be provided to enable the equipment to be properly operated and maintained by suitably qualified members of a ship's staff.*

3.8.2 Operating and servicing handbooks shall:

3.8.2.1 be written in English,

3.8.2.2(8.3.1) *in the case of equipment so designed that fault diagnosis and repair on board ship down to component level are practicable, provide full-circuit diagrams, component layouts, a component parts list, and fault-finding instructions and diagrams; and*

3.8.2.3(8.3.2) *in the case of equipment containing complex modules in which fault diagnosis and repair down to component level are not practicable, contain sufficient information to enable a defective complex module to be located, identified and replaced. Other modules and those discrete components which do not form part of modules shall also meet the requirements of 3.8.2.2 above.*

3.9 Equipment labelling

3.9.1(9) *Each unit of the equipment shall be marked externally with the following information which, where practicable, shall be clearly visible in the normal installation position:*

3.9.1.1(9.1) *identification of the manufacturer;*

3.9.1.2(9.2) *equipment type number or model identification under which it was type tested;*

3.9.1.3(9.3) *serial number of the unit.*