SLOVENSKI STANDARD

SIST EN 61110:2004

julij 2004

System Omega and differential Omega receivers for ships - Operational and performance requirements - Methods of testing and required test results (IEC 61110:1992)

ICS 33.060.20

Referenčna številka
SIST EN 61110:2004(en)

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 61110

September 1992

UDC 621.396.962:656.61.052:620.1:621.317

Descriptors: Ship, navigational instruments, Omega and differential Omega receiver, performance requirements, operational requirements, methods of testing, required test results

English version

System Omega and differential Omega receivers for ships — Operational and performance requirements — Methods of testing and required test results

(IEC 1110:1992)

Récepteurs des systèmes Oméga et Oméga différentiel pour navires — Exigences opérationelles et de fonctionement — Méthodes d'essai et résultats exigibles (CEI 1110:1992)

Omega und Differential-Omega-Empfänger-System für Schiffe — Betriebstechnische und Leistungsanforderungen — Prüfverfahren und geforderte Prüfergebnisse (IEC 1110:1992)

This European Standard was approved by CENELEC on 1992-03-24. 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

Ref. No. EN 61110:1992 E

Foreword

The text of document 80(CO)23, as prepared by IEC Technical Committee N° 80: Navigational instruments, was submitted to the IEC — CENELEC parallel vote in May 1991.

The reference document was approved by CENELEC as EN 61110 on 14 March 1992.

The following dates were fixed:

— latest date of publication of an identical national standard (dop) 1993-08-01

— latest date of withdrawal of conflicting national standards (dow) 1993-08-01

For products which have complied with the relevant national standard before 1993-08-01, as shown by the manufacturer or by a certification body, this previous standard may continue to apply for production until 1998-08-01.

Annexes designated "normative" are part of the body of the standard. In this standard, Annex ZA is normative.

Contents

1 Scope

This International Standard specifies the minimum performance standards and methods of testing of shipborne receivers for the Omega system and the differential Omega system, associated with IEC 945.

2 Normative references

The following IEC 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 edition of the normative documents indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

IEC 945:1988, *Marine navigational equipment. General requirements. Methods of testing and required test results.*

IMO Resolution A.425 (XI), *Performance standards for differential Omega correction transmitting stations.*

IMO Resolution A.479 (XII), *Performance standards for shipborne receivers for use with differential Omega.*

The clause numbering of Resolution A.479 (XII) is indicated in parentheses in the following clause 3. Identical sentences or parts of sentences are in italics.

3 Minimum performance standards

3.1 Object

(1.1) This International Standard defines the minimum characteristics of the Omega system and differential Omega system receivers *intended for navigational purpose on ships with maximum speeds not exceeding 35 knots.*

3.2 Omega and differential Omega systems

The Omega system is a hyperbolic radionavigation system with worldwide coverage, comprising eight base stations, with c.w. transmission on 10,20 kHz, 11,05 kHz, 11,33 kHz and 13,06 kHz according to predetermined sequences.

The differential Omega system is based on the transmission by adapted stations of corrections indicating the differences between the phase values actually given by the Omega system and the theoretical values corresponding to the geographic coordinates of the station and to the theoretical value of the propagation speed.

Those correcting stations are transmitting phase modulated signals in the bands allocated by the ITU Radio Regulations to radiobeacons (190 kHz to 435 kHz).

3.3 Receiver types

This standard concerns all Omega and differential Omega receiver types manufactured for marine navigational use, among which can be identified:

a) *Omega receivers:*

1) monofrequency receivers (10,2 kHz only);

2) multifrequency receivers with ambiguity elimination:

— with manual or automatic processing;

— with display of lines of position (LOPs) and/or geographical coordinates (latitude-longitude).

Omega receivers can be provided with:

— an input allowing the manual introduction of corrections or current known position;

— an input allowing the introduction of corrections from the differential Omega system, manually or automatically;

— one or several outputs allowing the operation of associated plotters or integrated navigation systems.

b) *Differential Omega receivers, providing corrections for:*

1) monofrequency receivers (10,2 kHz);

2) multifrequency receivers:

— with manual or automatic processing;

— with display of lines of position (LOPs) and/or of geographical coordinates (latitude-longitude).

Differential Omega receivers can be provided with outputs allowing the automatic input of the corrections into an Omega receiver.

c) *Combined Omega/differential Omega receivers:*

1) monofrequency receivers (10,2 kHz);

2) multifrequency receivers:

— with manual or automatic processing;

— with display of lines of position (LOPs) and/or of geographical coordinates (latitude-longitude).

Combined Omega/differential Omega receivers can be provided with:

— one or two inputs allowing the manual insertion of corrections or current known position;

— one or several outputs allowing the operation of associated plotters or integrated navigation systems.

3.4 General

3.4.1 *General requirements*

Omega and differential Omega receivers shall comply with the requirements of IEC 945.

Additions to that standard are given in **3.4.2**, **3.4.3** and **3.4.4** below.

3.4.2 *Power supply*

3.4.2.1 The receiver shall be able to be supplied at least by one of the usual sources on board ships, for example:

— (**2.6.1**) *Alternating current: 100*-110-*115*-120-*220-230* V (± *15* %), *50 Hz or 60 Hz*;

— *Direct current:* 12-*24-32* V (± *15* %).

The receivers shall comply with **6.1.1** of IEC 945, with respect to voltage and frequency tolerances. These tolerances shall apply to those sources declared by the manufacturer to be applicable to the receiver under test.

3.4.2.2 (**2.6.2**) *The receiver* shall *be fitted with a built-in emergency supply capable of being automatically substituted with no break to the normal supply described in* **3.4.2.1** *above. This emergency supply* shall *be capable of supplying the equipment during at least 10 min.*

3.4.3 *Starting-up*

The equipment shall be able to operate and to comply with this standard within 30 min after switching on.

3.4.4 *Safety*

3.4.4.1 Precautions shall be taken to ensure that no damage can result from an accidental short-circuit or grounding of the antenna input or any of the inputs or outputs for a duration of 5 min.

3.4.4.2 Precautions shall be taken to avoid as far as possible damage to receivers from transient overvoltages on the antenna or receiver inputs, e.g. those resulting from other equipment or from lightning.

3.4.4.3 Precautions shall be taken to ensure that isolation exists between the power supply input and receiver ground and that inadvertent reversal of polarity of the power supply causes no damage to the equipment.

3.4.4.4 Precautions shall be taken to ensure that no damage can result when an unmodulated 30 V r.m.s. test signal is applied for 15 min to the antenna input terminal of the receiver at any of the Omega and/or differential Omega frequencies.

3.4.5 *Antenna*

3.4.5.1 (**2.1.2**) *The antenna for the reception of Omega signals* shall *be capable of receiving these from any direction in the horizontal plane at all times.*

3.4.5.2 (**3.1.4**) *The antenna for the reception of differential Omega corrections* shall *provide satisfactory reception of correction signals from any direction of the horizontal plane at all times.*

3.4.5.3 (**3.1.4**) *The antenna for the reception of differential Omega corrections may be combined with the antenna described in* **3.4.5.1** *and* shall *provide satisfactory reception of correction signals in the conditions described in* **3.4.5.2**.

3.4.5.4 When any active or passive antenna forms a part of Omega and/or differential Omega receiving system, the radiofrequency (r.f.) input terminals of this device shall be taken as the r.f. input(s) of the receivers.

3.5 Receiving conditions of the radio signals

3.5.1 *Omega system reception*

3.5.1.1 *Signals to be received*

— Frequency of the signals: 10,2 kHz and additionally 11,05 kHz, 11,33 kHz, 13,06 kHz, as applicable.

— Signal level: 5 μV/m to 100 mV/m (14 dB/1 μV/m to 100 dB/1 μV/m).

— Differential signal level: 86 dB.

— Signal-to-noise ratio: – 25 dB in a 1 kHz band centred on the specified Omega frequency at the receiver input.

3.5.1.2 *Accuracy and stability of the frequency tuning*

The tuning error shall not exceed ± 0,01 Hz on the various considered frequencies. During any 15 min period after the start-up period defined in **3.4.3**, the tuning drift rate shall be reduced to less than ± 0,001 Hz.

3.5.1.3 *Interference protection*

The receiver shall be capable of operating properly in the presence of other signals transmitted on frequencies neighbouring the specified Omega frequencies, which have a field strength not exceeding:

a) – 6 dB below the field strength of the wanted signal at 50 Hz above and below the specified Omega frequency;

b) 0 dB to the field strength of the wanted signal at 200 Hz above and below the specified Omega frequency;

c) 40 dB above the field strength of the wanted signal, at 500 Hz above and below the specified Omega frequency.

These requirements shall be complied with whatever the Omega signal field strength may be, between 5 µV/m and 100 mV/m.

3.5.2 ***Differential Omega system reception***

3.5.2.1 *Signals to be received*

Frequency range: 190 kHz to 435 kHz.

Signal level: 10 µV/m to 50 mV/m.

(**3.1.1**) *Correction signals at least for the basic frequency of 10,2 kHz and additionally for one or more of the other Omega frequencies*, as applicable.

(**3.1.3**) Signal-to-noise ratio: *correction receivers* shall *operate satisfactorily when the electric field received from the transmitting station is 10 µV/m or greater, day and night in the conditions for atmospheric noise as defined by the CCIR for the band 285 kHz to 415 kHz.*

3.5.2.2 *Reception modes*

(**3.1.2**) *Receivers* shall *be able to receive corrections transmitted in accordance with the performance standards for differential Omega correction transmitting systems [Resolution A.425 (XI)] and* shall *indicate the Omega transmissions for which differential corrections are available.*

Correction signals may be transmitted continuously or sequentially, i.e. by grouped radiobeacons transmitting in a minimum time slot of 25 s every 6 min or less.

3.5.2.3 *Accuracy and stability of the tuning frequency*

For continuously tuned receivers and receivers with systems which include synthesizer, allowing step tuning with continuous adjustment between the discrete frequencies so obtained, the tuning frequency error shall not exceed ± 50 Hz in all the receiving range.

For any 15 min period, after the start-up period defined in **3.4.3**, the tuning frequency drift shall not exceed ± 5 Hz.

3.5.2.4 *Interference protection*

The receiver shall be capable of operating properly in the presence of other signals transmitted on frequencies neighbouring the wanted differential Omega frequency, which have a field strength not exceeding:

a) – 6 dB below the field strength of the wanted signal at 100 Hz above and below the nominal frequency of the correction transmitting station;

b) (**3.1.3**) *20 dB above the wanted signal, on any frequency at 200 Hz above and below the nominal frequency of the correcting transmitting station;*

c) 40 dB above the field strength of the wanted signal at 500 Hz or more, above and below the nominal frequency of the correction transmitting station.

These requirements shall be complied with whatever the differential Omega signal field strength may be, between 10 µV/m and 50 mV/m.

3.6 Processing

3.6.1 ***Processed Omega stations***

(**2.2.2**) and (**3.2.2**) *The receiving system shall be capable of processing information relating to at least four Omega stations simultaneously.*

3.6.2 ***Synchronization***

3.6.2.1 (**2.2.1**) *Means* shall *be provided for synchronizing the Omega receiving system to the Omega transmission format. Automatic or manual means may be used but, in any case, it* shall *be possible to monitor the synchronization state continuously.*

3.6.2.2 (**3.2.1**) *Means* shall *be available for the synchronization of the differential Omega receiving system with the differential Omega correction transmission format. It is possible to use automatic or manual means but, in any case, it* shall *be possible to monitor the state of synchronization.*

3.6.3 ***Instrumental errors***

3.6.3.1 (**2.3**) *When a ship is stationary, the instrumental error introduced by the Omega receiver to the measurement of uncorrected phase difference (LOP) on any selected pair of Omega signals* shall *not exceed 0,02 lane widths (2 centilanes). When sailing on a constant heading at speeds up to 35 knots, instrumental error* shall *not exceed 0,04 lane widths (4 centilanes).*

3.6.3.2 (**3.3**) *Instrumental error introduced by the correction receiving equipment* shall *not be greater than those accepted for Omega receivers according to* **3.6.3.1**.

3.7 Position information display

3.7.1 ***General arrangements***

3.7.1.1 *Lines of Position*

(**2.4.1**) *Equipment which gives positional information in terms of lines of position (LOPs)* shall *be capable of displaying at least three operator-selected LOPs either simultaneously or sequentially with the following facilities:*

a) *a display of at least two whole lane digits and providing a read-out to 0,01 lane width for each preselected pair of stations;*

b) *means for setting-up initially the whole lane digit count;*

c) *identification of the selected Omega stations;*

d) *where LOP information is displayed sequentially, provision* shall *be made for holding any one pair of stations on display for as long as required without interruption to the continuous updating of LOP counts. Separate visual indication that the display is in the "hold" condition* shall *be provided, and*

e) *where provision is made for manually entering corrections in order to display corrected LOP counts, the applied correction with its polarity sign* shall *be separately displayed at the same time as the corrected LOP.*

3.7.1.2 *Latitude-longitude*

3.7.1.2.1 (**2.9**) *For navigational purposes, a reliable automatic transformation of Omega information into geographical coordinates is preferable. In this case due regard* shall *be taken of possible additional errors which may be introduced by this process.*

Any additional error due to the coordinates calculation shall be negligible compared to the instrumental error given in **3.6.3.1**.

3.7.1.2.2 (**2.4.2**) *In the case where a latitude and longitude display is used, presentation* shall *be as a minimum in the form of degrees, minutes and tenths of minutes. The display* shall *also clearly indicate north, south, east and west.*

Longitude degrees shall be displayed by three digits, latitude degrees shall be displayed by two digits.

The read-out values of latitude and longitude shall *be based on the World Geodetic System 1972 (WGS, 1972)* or WGS, 1984 (as amended).

(**2.4.3**) *Means may be provided to transform the computed position based on WGS 72 into data compatible with the datum of the navigational chart in use. Where this facility exists, positive indication* shall *be provided to indicate that the facility is currently in use and means* shall *be provided to indicate the transformation correction.*

3.7.2 ***Differential Omega reception***

3.7.2.1 *Differential Omega correction*

(**3.4.2**) *Where the differential Omega receiver gives correction information for LOPs, it* shall *be able to display the corrections for at least three LOPs selected by the user, either simultaneously or sequentially in the following manner:*

a) *display of from 0 to 99 centilanes of correction, providing reading for 1 centilane for each station pair concerned;*

b) *if found necessary, display combined with the display described in* **3.7.1.1** *of the integer part of the correction;*

c) *identification of the selected Omega stations;*

d) *where LOP information is displayed sequentially, provision* shall *be made for holding any one pair of stations on display for as long as required without interruption to the continuous updating of LOP counts. Separate visual indication that the display is in the "hold" condition* shall *be provided;*

e) *where provision is made for manually entering corrections in order to display corrected LOP counts, the applied correction with its polarity sign* shall *be separately displayed at the same time as the corrected LOP. In addition the user* shall *be clearly advised whether corrections are applied or not;*

f) *where means are provided for automatically entering the differential Omega corrections, the user* shall *be clearly advised whether corrections are applied or not;*

g) *means* shall *also be provided to ensure that differential Omega corrections can only be applied to raw Omega data.*

3.7.2.2 (**3.4.1.1** and **3.4.1.2**) *Separate Omega and differential Omega receivers*

The operator may only add the differential Omega corrections to the raw Omega data from his Omega receiver before plotting his position on the chart.

The operator may enter differential Omega corrections into the receiver under the conditions described in **3.7.1.1** e).

3.7.2.3 (**3.4.1.2.1** and **3.4.1.2.2**) *Combined Omega and differential Omega receivers*

The combined receiver may separately display Omega and differential Omega data. The operator may combine them as described in **3.7.2.2**.

The combined receiver may, under the control of the operator, automatically add differential Omega corrections to raw Omega data as described in **3.7.2.1** f).

3.8 Automatic reception systems

(3.4.4) *Where automatic receiving systems are used:*

a) *The selection of Omega stations in such a system* shall *be automatic. The system* shall *be capable of evaluating the quality of Omega signals directly received as well as that for the corrections for each Omega station. It* shall *establish the position information through the use of all available information from the various stations while taking account of the quality of each one. The operator* shall *however have the possibility to control the choice of stations manually.*

b) *Position data* shall *be automatically obtained when a position estimated from dead-reckoning or another means has been introduced. The acceptable uncertainty on the estimated initial position is essentially related to the number of Omega frequencies that the system may directly receive on board. This acceptable uncertainty* shall *be clearly known by the operators.*

c) In a receiver using the Omega system alone, precomputed corrections can be stored in the receiver and applied automatically, at the discretion of the operator. If this automatic correction is selected, it shall be clearly indicated. In the case of use of differential Omega corrections, the precomputed corrections shall be inhibited, when the differential Omega corrections are applied.

d) *Even if it uses corrections only on the frequency 10,2 kHz, an automatic receiver should preferably be capable of directly receiving Omega signals on the frequencies 10,2 kHz and 13,6 kHz. It could also, although it is not essential, work with the frequencies 11,333 kHz and 11,05 kHz.* A multifrequency receiver shall include the necessary device for ambiguity elimination and position optimization, for the Omega as well as for the differential Omega.

e) *An automatic system of differential Omega should preferably be capable of correcting the dispersion which results, at a distance from the correction transmitting station of more than 200 nautical miles, from variations of the propagation velocity of Omega waves between day and night.*

f) *An automatic system* shall *be so designed that differential Omega corrections can only be applied to raw Omega data.*

g) *It is desirable for the system to give an indication of quality of the positional data displayed.*

3.9 Warning

3.9.1 *Omega reception*

3.9.1.1 (2.7.1) *If the receiver is of the type which requires the operator to select the Omega stations whose signals will be employed to generate position information, a warning device* shall *be provided to indicate the absence of a signal from a selected station.*

3.9.1.2 The receiver shall be fitted with a warning device for indicating that the receiver does not acquire the synchronization on the Omega format or that it loses it.

3.9.1.3 (2.7.2) *If the receiver is of the type which automatically selects the most suitable Omega signals from those received, a warning device* shall *be provided to indicate the lack of sufficient usable signals for normal equipment operation.*

3.9.1.4 (2.7.3) *Provision may be made to indicate which Omega signals are being received at a strength sufficient to be employed in position fixing.*

3.9.1.5 (2.7.4) *The equipment* shall *be fitted with a warning device for indicating main power supply failure which remains active until reset by the operator.*

3.9.2 *Differential Omega reception*

3.9.2.1 (3.7.2.1) *Warning* shall *be given when the differential Omega correction transmitting stations transmits no correction for any of the selected stations.*

3.9.2.2 (3.7.2.2) *Warning* shall *be given when differential Omega correction information for any of the selected stations is not correctly received on board.*

3.9.2.3 (3.7.2.3) *Warning* shall *be given when differential Omega correction information has not been updated during the last period of 6 min for any of the selected stations.*

3.9.2.4 (3.7.3) *Warning may be given when the 8 Hz modulation of the correction station transmission is not present.*

3.9.3 *Combined Omega/differential Omega reception*

(3.7.1) *The combined Omega/differential Omega receivers* shall *be fitted with the warning devices mentioned in* **3.9.1** *and* **3.9.2**.

3.9.4 *Automatic reception systems*

(3.7.4) *For automatic receivers mentioned in* **3.8** *the requirements of* **3.9.1** *and* **3.9.2** *are replaced by an alarm if the quality of position data is unacceptable.*