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Ships and marine technology — Marine facsimile receivers for meteorological charts

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National foreword

This British Standard is the UK implementation of ISO 9876:2015. It supersedes BS EN ISO 9876:1999 which is withdrawn.

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INTERNATIONAL STANDARD

ISO 9876

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Ships and marine technology — Marine facsimile receivers for meteorological charts

Navires et technologie maritime — Récepteurs marins de transmissions par télécopie des cartes météorologiques

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Foreword

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The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT), see the following URL: Foreword — Supplementary information.

The committee responsible for this document is ISO/TC 8, *Ships and marine technology*, Subcommittee SC 6, *Navigation and ship operations*.

This third edition cancels and replaces the second edition (ISO 9876:1997), which has been technically revised.

INTERNATIONAL STANDARD **ISO 9876:2015(E)**

Ships and marine technology — Marine facsimile receivers for meteorological charts

1 Scope

This International Standard specifies the construction, performance, type testing, and inspection for a ship borne marine facsimile receiver that receives meteorological charts transmitted by "Facsimile transmission of meteorological chart over radio circuits" stated in accordance with World Meteorological Organization (WMO) publication No. 386, Part III-5.

This International Standard applies to ship borne radio facsimile receivers for the reception of meteorological charts and other graphical representation of meteorological conditions intended as an aid to navigation at sea.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

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

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
dead sector
part of scanning line unavailable for picture signal transmissions the criteria of which are within 4,5 % ± 0,5 % of the length

3.2
facsimile
process, or the result of the process, by which fixed graphic charts are scanned and the information is converted to electric signals which are used remotely to produce a copy of the chart in record form

3.3
F3C
radio emissions designation from ITU Radio Regulations Appendix 1 for frequency modulation, single channel having analog information, facsimile

3.4
index of cooperation
IOC
value of the index of cooperation, *M*, is defined as follows:

$$M = LF / \pi$$

where

L is the length of the scanning line, in centimetres;

F is the density of the scanning line, in reciprocal centimetres.

3.5
IOC selection signal
signal for automatic IOC selection in the facsimile receiver which is accomplished by transmission of alternating black and white signals lasting for 5 s to 10 s with the following frequencies:

— 300 Hz for IOC 576;

— 675 Hz for IOC 288 (or IOC 576 with alternate line scanning).

Note 1 to entry: The envelopes of the signal are approximately rectangular.

3.6
meteorological chart
chart portraying the state of the weather (such as weather conditions, wind force and direction, high or low atmospheric pressure, weather front and isobar) at a particular time over a wide area

3.7
phasing
adjusting the phase of the independent synchronous power source so as to be able to receive the weather chart in its correct position

3.8
phasing signal
signal for automatically phasing the facsimile receiver accomplished by a 30 s transmission of alternating black and white signals with the following frequencies:

— 1 Hz for 60 lines per minute (60 r/min);

— 1,5 Hz for 90 lines per minute (90 r/min);

— 2 Hz for 120 lines per minutes (120 r/min).

Note 1 to entry: This signal may also be used for automatic starting, automatic selection of scanning frequency, and automatic adjustment of recording levels.

Note 2 to entry: The wave form of this signal is either symmetrical, i.e. black and white, each lasting half the scanning line, or symmetrical with the white lasting for 5 % and black for 95 % of the scanning line.

3.9
remote control signal
control signal for operating the apparatus from a distance

Note 1 to entry: The remote control signals for operating the facsimile receiver for meteorological charts include the phasing signal, the IOC selection signal, and stop signal.

3.10
SND/N
value of signal plus noise plus distortion to noise ratio

3.11
SND/ND
value of signal plus noise plus distortion to noise plus distortion ratio

3.12
spurious responses
ratio of the input level of an unwanted signal at the frequency of the spurious response to the input level of a wanted signal when the wanted and unwanted signals individually produce the same SND/N or SND/ND ratio at the receiver output

3.13
stop signal
transmission of 5 s of alternating black and white signals at 450 Hz, followed by 10 s of signal corresponding to continuous black

Note 1 to entry: The envelopes of the 450 Hz signals are approximately rectangular.

4 Requirements

4.1 Construction

4.1.1 The equipment shall comprise of a radio receiver and a recording unit.

4.1.2 The recording unit shall be constructed as to allow for the change of recording paper and either or both recording stylus during day and subdued artificial light. It should be possible to affect routine maintenance under the same conditions.

4.2 Performance standards for recording unit

4.2.1 Recording unit

The equipment shall be capable of continuous recording while transmissions are being received.

4.2.2 Input signals

The recording unit shall accept input signals from an external receiver in the audio frequency range at an input level of at least –10 dBm to +10 dBm and shifts of ±150 Hz and/or ±400 Hz about a centre frequency of 1 900 Hz at an impedance of 600 Ω.

4.2.3 Index of cooperation (IOC)

Automatic or manual operation at an index of cooperation of 576 and 288 shall be possible.

4.2.4 Scanning speeds

The recording unit shall be capable of the automatic and manual selection of scanning speeds of 60, 90 and 120 scans per minute.

4.2.5 Automatic operation

The recording unit shall automatically respond to control signals of 300 Hz and 675 Hz modulation of the carrier wave for start and index of cooperation selection shall be by detection of line synchronization and to 450 Hz modulation stop signal.

4.2.6 Synchronization of scanning and phasing

The recording unit shall be capable of synchronization of its operation with the facsimile transmitter by:

— frequency accuracy of $\pm 2 \times 10^{-6}$ min;

— frequency stability of $\pm 2 \times 10^{-5}$ min.

Phasing shall be automatic with a facility for manual adjustment.

4.2.7 Pitch of scanning trace

The pitch of scanning traces shall be maintained within ±25 % of its nominal value.

4.2.8 Recording size and marking

The minimum width of the recording shall be 180 mm.

The recording material shall be marked in such a way as to indicate that the material remaining is not less than 1 m.

4.3 Performance standards for radio receiver

4.3.1 Receiving frequency

The radio receiver shall have a range within 110 kHz to 27 MHz of at least 3 MHz to 24 MHz with the capability of receiving F3C transmissions. It should have up to six pre-set spot frequencies. Every selected frequency shall be displayed or easily identified by an appropriate method.

4.3.2 Frequency stability

The frequency drift shall not exceed 50 Hz over the temperature range +15°C to +35 °C.

4.3.3 Sensitivity

Input to the receiver shall be 3 μV or less for 3 MHz and above, and 10 μV or less for 110 kHz up to 3 MHz so that the recorder produces a readable picture.

4.3.4 Selectivity

Frequency bandwidth shall be within 6,2 kHz measured at the 6 dB attenuation points, and within 10 kHz at the 66 dB attenuation points.

4.3.5 Intermediate frequency rejection

Rejection of signals at the intermediate frequencies shall be greater than 60 dB.

4.3.6 Image frequency rejection

The receiver shall have an image frequency rejection of not less than 40 dB.

4.4 General requirement of the radio receiver and the recording unit

The radio receiver and the recording unit shall be in accordance with IEC 60945, for bridge-mounted equipment protected from the weather.

5 Test methods and required test results

5.1 General test requirements

Except where otherwise stated, electric power shall be supplied to the equipment only during the periods specified for electrical tests and performance tests.

Except where otherwise stated, the supply voltage applied to the equipment during the tests shall be the nominal voltage and alternating current supplies shall be at nominal frequency.

Any requirements in Clause 4 for which no test is specified in Clause 5 shall be checked by inspection of the equipment, its manufacturing drawings, or other relevant documents.

5.2 General conditions of measurement

5.2.1 Recording unit

Recording unit testing shall be undertaken using a facsimile transmitter linked to the recorder under test. If the transmitter is of AM output, it shall be linked through an AM/FM converter. The transmitter shall be capable of operating in accordance with the requirements given in 4.2.2 to 4.2.5.

The type testing authority has the option of evaluating overall performance of the equipment by receiving an actual facsimile transmission

5.2.2 Radio receiver

The radio receiver shall be tested by reception of signals of F3C class of emission from a signal generator while linked to the recording unit.

5.3 Construction

The requirements given in 4.1 shall be checked by visual inspection.

5.4 Performance tests for recording unit

5.4.1 Test method

Select, in turn, the following combinations of IOC and scanning speed in scans per minute:

288/60, 288/90, 288/120, 576/60, 576/90, and 576/120.

For each test, switch on the transmitter.

These tests cover the requirements given in 4.2.1 to 4.2.5.

5.4.2 Results required

The recorder shall, in each test, select the appropriate IOC and scanning speed and shall produce a chart facsimile identical to that transmitted.

5.4.3 Synchronization of scanning and phasing

By visual inspection, check that each test chart received is complete and square with the edge of the recording material.

During reception of a test chart, correct operation of the manual phase adjustment shall be checked.

5.4.4 Pitch of scanning trace

By visual inspection of the test charts, it shall be checked that each line is of even density and is parallel to the line preceding it.

5.4.5 Recording size and marking

The requirements given in 4.2.8 shall be checked by visual inspection.

5.5 Performance tests for radio receiver

5.5.1 Receiving frequency

5.5.1.1 Test method

The signal generator shall be used to transmit signals to the receiver, which shall be manually tuned to the frequency being transmitted.

Transmissions throughout the required frequency range shall be used, including the relevant six pre-set spot frequencies.

5.5.1.2 Result required

The receiver shall respond to each frequency transmitted. Every selected frequency shall be displayed or easily identified by an appropriate method.

5.5.2 Frequency stability

5.5.2.1 Test method

Using a frequency counter, the stability shall be measured for at least three of the pre-set spot frequencies.

5.5.2.2 Result required

The frequency drift shall not exceed 50 Hz over the temperature range +15°C to +35 °C for any 15 min period.

5.5.3 Sensitivity

5.5.3.1 Test method

With the receiver adjusted for each test frequency and class of emission for which it is designed, an input signal at the carrier frequency shall be used. For each test, the input level of the test signal shall be adjusted until the SND/N or SND/ND ratio at the receiver output is 20 dB.

The measured input level is a factor to indicate the sensitivity.

5.5.3.2 Result required

The input signal shall be 3 μV or less for 3 MHz and above, and 10 μV or less for 110 kHz up to 3 MHz.

5.5.4 Selectivity

5.5.4.1 Test method

Single-signal selectivity shall be measured; it is expressed in terms of the pass band measured at 6 dB attenuation points relative to peak response in the receiver circuit.

An unmodulated radio frequency test signal shall be applied to the receiver. The frequency of the test signal shall be varied and the voltage at the output of the IF amplifier shall be measured at a number of frequencies sufficient for a graph of voltage against frequency to be plotted. The level of input signal shall be such that it will not saturate the IF amplifier.

5.5.4.2 Result required

The pass band shall be the following:

— 6,2 kHz or less at 6 dB attenuation;

— 10 kHz or less at 66 dB attenuation.

5.5.5 Image frequency rejection and intermediate frequency rejection (spurious response)

5.5.5.1 Test method

The spurious response rejection ratio is the ratio of the input level of an unwanted signal at the frequency of the spurious response to the input level of a wanted signal when the wanted and unwanted signals individually produce the same SND/N or SND/ND ratio at the receiver output.

The receiver shall be adjusted in compliance with the arrangement for measurement of sensitivity. The carrier frequency of the input signal shall then be adjusted to the image and intermediate frequencies. For the image and intermediate frequencies, the carrier frequency of the input signal shall be adjusted to give maximum output power. The input level shall then be adjusted to give an SND/N or SND/ND ratio of 20 dB at the output of the receiver. The ratio between the input level of each spurious signal and the input level to the wanted signal shall then be evaluated.

5.5.5.2 Result required

The image frequency rejection ratio shall not be less than 40 dB and the intermediate frequency rejection ratio shall be at least 60 dB.

5.6 Other tests

The following tests shall be carried out on the radio receiver and the recording unit. The dry heat cycle test, the damp heat cycle test, and the low temperature cycle test shall be carried out without recording paper fitted, except during the performance check.

— operation test, in accordance with IEC 60945;

— power supply test, in accordance with IEC 60945;

— dry heat cycle test, in accordance with IEC 60945;

— damp heat cycle test, in accordance with IEC 60945;

— low temperature cycle test, in accordance with IEC 60945;

— vibration test, in accordance with IEC 60945;

— conducted interference test, in accordance with IEC 60945;

— radiated interference test, in accordance with IEC 60945;

— immunity to electromagnetic environment test, in accordance with IEC 60945;

— acoustic noise test, in accordance with IEC 60945.

6 Marking

The equipment shall be provided with an indication of the manufacturer, type, serial number, and year of manufacture.

Each unit of the equipment shall be marked with the minimum safe distance at which it may be mounted from a standard and a steering magnetic compass. The safe distance shall be measured in accordance with IEC 60945.

7 Information

Information shall be provided to enable competent members of a ship's crew to operate and maintain the equipment efficiently.

Bibliography

[1] Manual on the Global Telecommunication System, Volume 1 — Global Apects: Annex III to the WMO Technical Regulations. WMO, 2011 (WMO, 386)

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