



**Electromagnetic compatibility and
Radio spectrum Matters (ERM);
Portable Very High Frequency (VHF) radiotelephone
equipment for the maritime mobile service operating
in the VHF bands with integrated handheld class D DSC;
Part 1: Technical characteristics and
methods of measurement**

Reference

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Keywords

DSC, maritime, radio, VHF

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Foreword

This final draft European Standard (EN) has been produced by ETSI Technical Committee Electromagnetic compatibility and Radio spectrum Matters (ERM), and is now submitted for the Vote phase of the ETSI standards EN Approval Procedure.

The present document is part 1 of a multi-part deliverable covering the Electromagnetic compatibility and Radio spectrum Matters (ERM); Portable Very High Frequency (VHF) radiotelephone equipment for the maritime mobile service operating in the VHF bands with integrated handheld class D DSC, as identified below:

- Part 1:** "Technical characteristics and methods of measurement";
- Part 2: "Harmonized EN covering the essential requirements of article 3.2 of the R&TTE Directive";
- Part 3: "Harmonized EN covering the essential requirements of article 3.3(e) of the R&TTE Directive".

Proposed national transposition dates	
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1 Scope

The present document states the minimum technical characteristics and methods of measurement required for portable Very High Frequency (VHF) radiotelephones with integrated handheld class D DSC operating in certain frequency bands allocated to the maritime mobile service using either 25 kHz channels or 25 KHz and 12,5 kHz channels.

The present document also specifies technical characteristics, methods of measurement and required test results.

2 References

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the reference document (including any amendments) applies.

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NOTE: While any hyperlinks included in this clause were valid at the time of publication ETSI cannot guarantee their long term validity.

2.1 Normative references

The following referenced documents are necessary for the application of the present document.

- [1] ITU Radio Regulations (2012), appendix 18: "Table of transmitting frequencies in the VHF maritime mobile band".
- [2] Recommendation ITU-T E.161 (2001): "Arrangement of digits, letters and symbols on telephones and other devices that can be used for gaining access to a telephone network".
- [3] Recommendation ITU-R M.493-13 (2009): "Digital selective-calling system for use in the maritime mobile service".
- [4] Void.
- [5] ETSI EN 300 225 (V1.4.1): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Technical characteristics and methods of measurement for survival craft portable VHF radiotelephone apparatus".
- [6] Void.
- [7] Void.
- [8] ETSI TR 100 028-1 (V1.4.1): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics; Part 1".
- [9] Recommendation ITU-R M.1084-5 (2012): "Interim solutions for improved efficiency in the use of the band 156-174 MHz by stations in the maritime mobile service".
- [10] ETSI EN 300 338-5 (V1.1.1): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Technical characteristics and methods of measurement for equipment for generation, transmission and reception of Digital Selective Calling (DSC) in the maritime MF, MF/HF and/or VHF mobile service; Part 5: Handheld VHF Class D DSC".
- [11] CENELEC EN 61108 (all parts): "Maritime navigation and radiocommunication equipment and systems - Global navigation satellite systems (GNSS)".
- [12] CENELEC EN 60529:1991/A1:2000: "Degrees of protection provided by enclosures (IP Code)".

2.2 Informative references

The following referenced documents are not necessary for the application of the present document but they assist the user with regard to a particular subject area.

- [i.1] ETSI TS 101 570-5: "Electromagnetic compatibility and Radio spectrum Matters (ERM); Interoperability Testing for Maritime Digital Selective Calling (DSC) Radios; Part 5: Handheld VHF Class D Test Descriptions".
- [i.2] Recommendation ITU-R M.541-9 (2004): "Operational procedures for the use of digital selective-calling equipment in the maritime mobile service".
- [i.3] Recommendation ITU-T O.41 (1994): "Psophometer for use on telephone-type circuits".
- [i.4] Recommendation ITU-R SM.332-4: "Selectivity of receivers".
- [i.5] ANSI C63.5 (2006): "American National Standard for Calibration of Antennas Used for Radiated Emission Measurements in Electro Magnetic Interference".
- [i.6] IEC 60489-3 (Second edition (1988) appendix F): "Methods of measurement for radio equipment used in the mobile services; Part 3: Receivers for A3E or F3E emissions".
- [i.7] ETSI TR 102 273 (V1.2.1): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Improvement on Radiated Methods of Measurement (using test site) and evaluation of the corresponding measurement uncertainties Part I: Uncertainties in the measurement of mobile radio equipment characteristics; Sub-part 1: Introduction".

3 Definitions, symbols and abbreviations

3.1 Definitions

For the purposes of the present document, the following terms and definitions apply:

block: to inhibit a function by making it inaccessible from the user interface

detachable antenna: antenna fixed to the equipment by means of an antenna connector and detachable by the user

G3E: phase-modulation (frequency modulation with a pre-emphasis of 6 dB/octave) for speech

integral antenna: antenna that is permanently fixed to the equipment and not detachable by the user

modulation index: ratio between the frequency deviation and the modulation frequency

performance check: check of:

- the transmitter carrier power and frequency; and
- receiver sensitivity

3.2 Symbols

For the purposes of the present document, the following symbols apply:

dBa Relative to 2×10^{-5} Pa

3.3 Abbreviations

For the purposes of the present document, the following abbreviations apply:

ad	amplitude difference
CSP	Channel SPacing
DSC	Digital Selective Calling
emf	electromotive force
EUT	Equipment Under Test
fd	frequency difference
GNSS	Global Navigation Satellite System
GPS	Global Positioning System
IF	Intermediate Frequency
OATS	Open Area Test Site
rms	root mean square
SINAD	(Signal + Noise + Distortion)/(Noise + Distortion)
VHF	Very High Frequency
VSWR	Voltage Standing Wave Ratio

4 General and operational requirements

4.1 Construction

The manufacturer shall declare that compliance to the requirements of clause 4 is achieved and shall provide relevant documentation.

The mechanical and electrical construction and finish of the equipment shall conform in all respects to good engineering practice, and the equipment shall be suitable for use on board ships.

All controls shall be of sufficient size to enable the usual control functions to be easily performed and the number of controls should be the minimum necessary for simple and satisfactory operation.

All parts of the equipment to be checked during inspection or maintenance operations shall be readily accessible. The components shall be readily identifiable.

Technical documentation shall be supplied with the equipment.

The VHF maritime mobile service uses both single-frequency and two-frequency channels. For two-frequency channels there shall be a separation of 4,6 MHz between the transmitting frequency and the receiving frequency (see Radio Regulations appendix 18 [1]).

The equipment shall incorporate an integrated GNSS receiver. Manufacturers shall provide evidence that the GNSS device complies with the applicable part of CENELEC 61108 series, for instance part 1 for a GPS receiver [11].

The equipment shall have a minimum protection level of IP54 [12].

The equipment shall be capable of operating on single frequency and two-frequency channels with manual control (simplex).

The equipment shall be of a colour which distinguishes it from the portable VHF equipment specified in EN 300 225 [5].

The equipment shall be able to operate on all channels defined in Radio Regulations, appendix 18 [1], noting in particular footnotes m) and e).

Additional VHF channels for maritime use outside those defined by Appendix 18 to the Radio Regulations may also be provided where permitted by relevant administrations. These channels shall be clearly identified for use as relating to the relevant administration(s) and accessed through a positive action(s) for enabling use of these channel(s) but means shall be provided to block any or all of these additional channels if required by the relevant administration(s).

If 12,5 kHz channels are implemented in the equipment it shall be in accordance with Recommendation ITU-R M.1084-4 [9].

The equipment shall be so designed that use of channel 70 for purposes other than DSC is prevented (see Recommendations ITU-R M.493-13 [3] and M.541-9 [i.2]), and that use of channels AIS1 and AIS2 for purposes other than AIS is prevented.

Scan or multiple watch may be provided but means shall be provided to block or unblock these functions.

If the equipment is fitted with an auxiliary antenna connector, simultaneous connection of both the auxiliary antenna and the normal antenna shall be prevented.

It shall not be possible to transmit while any frequency synthesizer used within the transmitter is out of lock.

It shall not be possible to transmit during channel switching operations.

4.2 Controls and indicators

The equipment shall have a channel selector and shall indicate the designator, as shown in Radio Regulations, appendix 18 [1], of the channel at which the equipment is set. The channel designator shall be legible irrespective of the external lighting conditions.

Channel 16 shall be distinctively marked. Selection of channel 16, shall be preferably by readily accessible means (e.g. a distinctively marked key). Selection of channel 16 by any means shall automatically set the transmitter output power to maximum. This power level may subsequently be reduced by manual user control if required.

Where an input panel on the equipment for entering the digits 0 to 9 is provided, this shall conform to Recommendation ITU-T E.161 [2].

The equipment shall have the following additional controls and indicators:

- on/off switch for the equipment with a visual indication that the equipment is in operation;
- a manual, non-locking push to talk switch to operate the transmitter with a visual indication that the transmitter is activated and facilities to limit the transmission time to a maximum of 5 minutes. A short audible alarm and a visual indication may be provided to show when the transmission will be automatically terminated within the next 10 s. It shall be possible to reoperate the push to talk switch and reactivate the transmitter after a 10 s period;
- a switch for reducing transmitter output power to no more than 1 W where the RF output power is more than 1 W;
- an audio frequency power volume control;
- a squelch control;
- a visual indication that the transmitter is activated.

The equipment shall also meet the following requirements:

- the user shall not have access to any control which, if wrongly set, might impair the technical characteristics of the equipment.

4.3 Microphone and loudspeaker

The equipment shall be fitted with an integral microphone and an integral loudspeaker.

During transmission the receiver output shall be muted.

4.4 Safety precautions

Measures shall be taken to protect the equipment against the effects of overcurrent or overvoltage.

Measures shall be taken to prevent damage to the equipment that might arise from an accidental reversal of polarity of the electrical power source.

No damage to the equipment shall occur when the antenna terminals are placed on open circuit or short circuit while transmitting for a period of at least 5 minutes in each case.

In order to provide protection against damage due to the build up of static voltages at the antenna terminals, there shall be a dc path from the antenna terminals to chassis not exceeding 100 k Ω .

The information in any volatile memory device shall be protected from interruptions in the power supply of up to 60 s duration.

4.5 Labelling

All controls, instruments, indicators and terminals shall be clearly labelled.

Details of any external power supply from which the equipment is intended to operate shall be clearly indicated on the equipment.

The equipment shall be clearly and indelibly marked on the exterior with the identification of the manufacturer, type designation of the equipment, the serial number of the unit.

The compass safe distance shall be stated on the equipment.

5 Technical requirements

5.1 Switching time

The channel switching arrangement shall be such that the time necessary to change over from using one of the channels to using any other channel does not exceed 5 s.

The time necessary to change over from transmission to reception or vice versa, shall not exceed 0,3 s.

5.2 Class of emission and modulation characteristics

The equipment shall use phase modulation, G3E (frequency modulation with a pre-emphasis of 6 dB/octave) for speech and G2B for DSC signalling.

The equipment shall be designed to operate satisfactorily with channel separations of either 25 kHz or 12,5 kHz and 25 kHz.

5.3 Battery capacity

The equipment shall have a minimum operating time of 4 hours with a 80, 10, 10 duty cycle (80 % Standby, 10 % Tx and 10 % Rx) at normal temperature (clause 6.10.1).

The minimum operating time shall be met when:

- the battery is fully charged; or
- when new dry cells are installed (when appropriate).

5.4 DSC functionality

The equipment shall comply with EN 300 338-5 [10] for all aspects of DSC functionality.

Continuous monitoring of channel 70 for DSC reception purposes may be provided but the equipment shall comply with all applicable clauses of the present document while channel 70 is monitored continuously.

6 General conditions of measurement

6.1 Arrangements for RF connections to the equipment

6.1.1 RF connections to integral antenna equipment

For equipment without an antenna connector, the manufacturer shall prepare the equipment with a temporary 50 Ω connector to be used as the RF input/output port.

6.1.2 RF connection to equipment with a detachable antenna

Equipment having an antenna connector shall be tested using the antenna connector as the RF input/output port.

In the case where equipment has more than one antenna connector, the connector normally used to connect the portable antenna to the equipment shall be used.

6.2 Arrangements for test signals applied to the receiver input

Test signal sources shall be connected to the receiver input in such a way that the impedance presented to the receiver input is 50 Ω , irrespective of whether one or more test signals are applied to the receiver simultaneously.

The levels of the test signals shall be expressed in terms of the emf at the terminals to be connected to the receiver.

The nominal frequency of the receiver is the carrier frequency of the selected channel.

DSC test signals (clause 9.14) shall be DSC calls in accordance with Recommendation ITU-R M.493-13 [3] with a signal level of +6 dB μ V (emf). The standard test signal for a VHF DSC decoder shall be a phase-modulated signal at VHF channel 70 with modulation index = 2. The modulating signal shall have a nominal frequency of 1 700 Hz and a frequency shift of \pm 400 Hz with a modulation rate of 1 200 baud.

6.3 Squelch

Unless otherwise specified, the receiver squelch facility shall be made inoperative for the duration of the conformance tests.