

**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**

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Foreword

This European Standard (Telecommunications series) has been produced by ETSI Technical Committee Electromagnetic compatibility and Radio spectrum Matters (ERM), and is now submitted for the Public Enquiry phase of the ETSI standards Two-step 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 both 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.

Referenced documents which are not found to be publicly available in the expected location might be found at <http://docbox.etsi.org/Reference>.

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 (2008), appendix 18: "Table of Transmitting Frequencies in the Band 156-174 MHz for Stations in the Maritime Mobile Service".
- [2] ITU-T Recommendation 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] ITU-R Recommendation M.493-13 (2009): "Digital selective-calling system for use in the maritime mobile service".
- [4] ITU-R Recommendation M.541-9 (2004): "Operational procedures for the use of digital selective-calling equipment in the maritime mobile service".
- [5] ETSI ETS 300 225: "Radio Equipment and Systems (RES); Technical characteristics and methods of measurement for survival craft portable VHF radiotelephone apparatus".
- [6] ITU-T Recommendation O.41 (1994): "Psophometer for use on telephone-type circuits".
- [7] ITU-R Recommendation SM.332-4: "Selectivity of receivers".
- [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] ITU-R Recommendation M.1084-4 (2001): "Interim solutions for improved efficiency in the use of the band 156-174 MHz by stations in the maritime mobile service".
- [10] ANSI C63.5 (1988): "American National Standard for Calibration of Antennas Used for Radiated Emission Measurements in Electro Magnetic Interference".
- [11] IEC 60489-3: "Methods of measurement for radio equipment used in the mobile services; Part 3: Receivers for A3E or F3E emissions" Second edition (1988) appendix F".
- [12] ETSI TR 102 273-1 (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 1: Uncertainties in the measurement of mobile radio equipment characteristics".

- [13] ETSI EN 300 338-5: "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".

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.

Not applicable.

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
emf	Electromotive force

3.3 Abbreviations

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

ad	amplitude difference
CSP	Channel SPacing
DSC	Digital Selective Calling
EUT	Equipment Under Test
fd	frequency difference
GMDSS	Global Maritime Distress and Safety System
IF	Intermediate Frequency
OATS	Open Area Test Site
rms	root mean square
SINAD	(Signal + Noise + Distortion)/(Noise + Distortion)
VHF	Very High Frequency

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 GPS or GNSS receiver.

The equipment shall have a minimum protection level of IP54.

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 ETS 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 ITU-R Recommendation M.1084-4 [9].

The equipment shall be so designed that use of channel 70 for purposes other than DSC is prevented (see ITU-R Recommendations M.493-13 [3] and M.541-9 [4]), 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 ITU-T Recommendation 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;
- 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 [13] for all aspects of DSC functionality.

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 ITU-R Recommendation 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.

6.4 Normal test modulation

For normal test modulation, the modulation frequency shall be:

- 25 kHz channels: 1 kHz and the frequency deviation shall be \pm 3 kHz.
- 12,5 kHz channels: 1 kHz and the frequency deviation shall be \pm 1,5 kHz.

For DSC conformance testing and maintenance purposes, the equipment shall have facilities not accessible to the operator to generate a continuous B or Y signal and dot pattern.

Additionally for conformance testing, the VHF equipment shall have facilities not accessible to the operator for generating an unmodulated carrier

6.5 Artificial antenna

When tests are carried out with an artificial antenna, this shall be a non-reactive, non-radiating 50 Ω load.

6.6 Arrangements for test signals applied to the transmitter input

For the purpose of the present document, the audio frequency modulating signal applied to the transmitter shall be produced by a signal generator applied to the connection terminals replacing the microphone transducer.

6.7 Test channels

Conformance tests for 25 kHz channel operation shall be made on channel 16.

Conformance tests for 12,5 kHz channel operation shall be made on channel 276.

Conformance tests for DSC shall be made on channel 70.