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Date: 11 February 2025

Origin: International

Latest date for receipt of comments: 5 March 2025

Project No. 2025/00176

Responsible committee: EPL/80 Maritime navigation and radiocommunication equipment and systems

Interested committees:

Title: BS IEC 62238 Maritime navigation and radiocommunication equipment and systems - VHF radiotelephone equipment incorporating Class "D" Digital Selective Calling (DSC) - Methods of testing and required test results

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Introduction

This draft standard is based on national and international discussions. Your comments on this draft are invited and will assist in the preparation of the consequent standard.

For international standards, comments will be reviewed by the relevant UK national committee before sending the consensus UK vote and comments to the international committee, which will then decide appropriate action. If the international standard is approved, it is usual for the text to be published as a British Standard.

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Template for comments and secretariat observations

Date: xx/xx/20xx	Document: ISO/DIS xxxx
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1	2	(3)	4	5	(6)	7
MB	Clause No./ Subclause No./Annex (e.g. 3.1)	Paragraph/Figure/ Table/Note	Type of comment	Commend (justification for change) by the MB	Proposed change by the MB	Secretariat observations on each comment submitted
	3.1	Definition 1	ed	Definition is ambiguous and needs clarifying.	Amend to read '...so that the mains connector to which no connection...'	
	6.4	Paragraph 2	te	The use of the UV photometer as an alternative cannot be supported as serious problems have been encountered in its use in the UK.	Delete reference to UV photometer.	



80/1146/CD

COMMITTEE DRAFT (CD)

PROJECT NUMBER: IEC 62238 ED2	
DATE OF CIRCULATION: 2025-02-07	CLOSING DATE FOR COMMENTS: 2025-04-04
SUPERSEDES DOCUMENTS: 80/1138/RR	

IEC TC 80 : MARITIME NAVIGATION AND RADIOCOMMUNICATION EQUIPMENT AND SYSTEMS	
SECRETARIAT: United Kingdom	SECRETARY: Mr Kim Fisher
OF INTEREST TO THE FOLLOWING COMMITTEES:	HORIZONTAL FUNCTION(S):
ASPECTS CONCERNED:	

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TITLE:

Maritime navigation and radiocommunication equipment and systems - VHF radiotelephone equipment incorporating Class "D" Digital Selective Calling (DSC) - Methods of testing and required test results

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

**Maritime navigation and radiocommunication equipment and systems -
VHF radiotelephone equipment incorporating Class "D" Digital Selective
Calling (DSC) - Methods of testing and required test results -**

FOREWORD

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IEC 62238 has been prepared by IEC technical committee 80: Maritime navigation and radiocommunication equipment and systems. It is an International Standard.

This second edition cancels and replaces the first edition published in 2003. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

- a) Incorporates changes to Recommendation ITU-R M.493-16, including automated procedures described in Annexes 3 and 4, audible alarms, requirements for an integral GNSS receivers, and means for resetting own-ship **MMSI**.
- b) Incorporates changes to Appendix 18 of the **ITU-R** Radio Regulations *Table of transmitting frequencies in the VHF maritime mobile band*.
- c) Incorporates relevant updates to **IMO** publications.
- d) Aligns the standard with ETSI EN 300 325 and EN 300 338 series related to Class D **DSC** radios.

The text of this International Standard is based on the following documents:

Draft	Report on voting
XX/XX/FDIS	XX/XX/RVD

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn, or
- revised.

INTRODUCTION

Equipment designed to this International Standard is intended to provide compatibility with the Global Maritime Distress and Safety System (GMDSS) for fitting to vessels to which the International Convention on the Safety of Life at Sea (SOLAS) 1974 does not apply. Such vessels are typically small commercial vessels, pleasure vessels, fishing vessels and others.

The equipment does not meet all the requirements of the International Maritime Organization (IMO) for SOLAS vessels. However, it does meet the IMO guidelines for non-SOLAS vessels MSC. Circ.803 Rev.1 [1] in that it is capable of maintaining a listening watch on VHF channel 16 simultaneously with a watch on DSC channel 70.

The equipment is further capable of both transmitting and receiving distress alerts by DSC on channel 70, thus providing for the safety of own ship together with the ability to assist other ships in distress.

The emphasis in this standard is on simplicity of operation. The VHF equipment uses DSC controllers according to Class D, which will typically be integrated in the VHF radio equipment but in any event will have the capability to select the radio channels automatically. An IEC 61162 (all parts) data interface is a requirement.

This international standard assumes that it takes no longer than 10 min for an operator to learn to use the equipment. This is achieved by the provision of clear simple menus with the most frequently used functions at the top of the menu tree.

Distress calls can only be initiated by means of a protected dedicated button. Furthermore, channel 16 will be selected automatically for radiotelephony after transmission of a distress or urgency call.

The vessel's position is included in the distress call automatically from an integral Global Navigation Satellite System (GNSS) receiver.

This edition has incorporated changes to Recommendation ITU-R M.493-16 (2023). User interface for simplified operation of shipborne equipment and Automated procedures for simplified operation in shipborne equipment, as defined in Annexes 3 and 4 of ITU-R Recommendation M.493, have also been included. This edition has been aligned with the ETSI standard EN 301 025 [2], including its incorporation pertinent parts of EN 300 338, so that these changes to ITU-R M.493 and its annexes might be interpreted in a consistent manner.

Distress and urgency alarms which are repeated or otherwise require no action by the operator have been made self-terminating consistent with ITU-R M.493, in response to complaints of excessive alarming made by users.

Routine ship-to-ship calls require only the input of the called MMSI and a channel number. For incoming calls, the radio should be easily configured by the operator to either automatically or manually select the channel number received in the message. Means are provided for the user to enter a temporary group MMSI to permit calling amongst a group of related vessels.

DSC operation is inhibited on a new equipment until the vessel's own MMSI has been entered as an aid to safety, in order to prevent the transmissions of DSC calls from an unidentifiable ship. Simplified means for resetting own-ship MMSI, such as when the vessel or the radio is sold, have been addressed. Restrictions on which MMSI digits will be allowed to be entered consistent with ITU-R requirements have also been added.

Equipment designed to this standard is fitted with a 50 Ω external antenna socket or connector for use on board vessels and operates in the bands between 156 MHz and 174 MHz allocated to the maritime mobile service. Units of receiver measurements have accordingly been changed from dB μ V to dBm in line with common industry practice, and to simplify measurements.

A capability for use of four-digit channels has been included in accordance with the ITU-R M.1084-5 Annex 4 [Clause 3](#).

Transmitter stability requirements have been changed from 10 ppm (1500 Hz) to 5 ppm (800 Hz) to improve spectrum efficiency and to align ship station transmitter tolerances with those of coast station transmitters.

Further reading:

IEC 63269:2022, *Maritime navigation and radiocommunication equipment and systems - Maritime survivor locating devices (man overboard devices) - Minimum requirements, methods of testing and required test results* IEC 63269:2022 [3]

ITU-R Recommendation M.1080-0:1997, *Digital selective calling system enhancement for multiple equipment installations* [4]

ETSI EN 300 338-1 (2021-05), *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 1: Common requirements* [5]

IMO MSC/Circ.862, *Clarifications of certain requirements in IMO performance standards for GMDSS equipment* [6]

ETSI EN 300 338-3 (2020-06), *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 3: Class D DSC* [7]

ETSI EN 300 338-6 Class M DSC (2019-10), *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 6: Class M DSC* [8]

ETSI EN 300 338-7 V1.0.0 (2021-07), *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 7: Implementation of Bridge Alert Management (BAM) in DSC radio equipment* [9]

ETSI TS 103 052 (V1.1.1) (03-2011), *Electromagnetic compatibility and Radio spectrum Matters (ERM); Radiated measurement methods and general arrangements for test sites up to 100 GHz* [10]

NMEA 0400, *Installation Standard for Marine Electronic Equipment on Vessels* [11]

Maritime navigation and radiocommunication equipment and systems - VHF radiotelephone equipment incorporating Class "D" Digital Selective Calling (DSC) - Methods of testing and required test results –

1 Scope

This document covers the minimum requirements for general communication for shipborne fixed installations using a [VHF](#) radiotelephone incorporating class "D" Digital Selective Calling.

These requirements include the relevant provisions of the ITU Radio Regulations, [ITU-R](#) Recommendations M.493 where class D is defined, [IMO](#) Resolution MSC.511(105) [\[12\]](#) relevant to Class D, and incorporate the relevant guidelines of the [IMO](#) as detailed in MSC/Circ.803 Rev.1, MSC/Circ. 862 and Resolution MSC.131(75) [\[13\]](#).

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

Recommended standards for equipment intended to work in high level electromagnetic environments are described and included in [Annex C](#).

This document specifies technical characteristics and methods of measurements for [VHF](#) radiotelephone with the following characteristics:

- operating in the channels and frequencies specified in the ITU Radio Regulations appendix 18 as applicable, allocated to the maritime mobile service;
- capable of operating on single frequency and two-frequency channels with manual control (simplex);
- supporting dual frequency simplex operation only;
- using phase modulation, G3E (frequency modulation with pre-emphasis of 6 dB/octave) for speech, and G2B for [DSC](#) signalling.

Full duplex operation is not supported.

NOTE Additional [VHF](#) channels for maritime use outside those defined by appendix 18 to the Radio Regulations can also be provided where permitted by administration.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. 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*

IEC 61162 (all parts), *Maritime navigation and radiocommunication equipment and systems - Digital interfaces*

ITU-R Recommendation M.493-16, Digital selective-calling system for use in the maritime mobile service

ITU R Recommendation 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

ITU Radio Regulations, Appendix 18, Table of transmitting frequencies in the band 156 - 174 MHz for stations in the maritime mobile service

NMEA 0183, Standard for Interfacing Marine Electronic Devices

NMEA 2000, Standard for Serial-Data Networking of Marine Electronic Devices

NMEA OneNet, Standard for IP Networking of Marine Electronic Devices

3 Terms, definitions and abbreviated terms

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

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- IEC Electropedia: available at <https://www.electropedia.org/>
- ISO Online browsing platform: available at <https://www.iso.org/obp>

3.1 Terms and definitions

3.1.1

B

one of the two signal elements used in **DSC** signalling as described in Recommendation ITU-R M.493.

3.1.2

carrier frequency

frequency to which the transmitter or receiver is tuned

3.1.3

channel designator

set of alpha-numeric characters displayed to indicate the radio frequency channel used for receive and transmit

3.1.4

class D

class of **DSC** intended to provide minimum facilities for **VHFDSC** distress, urgency and safety as well as routine calling and reception, not necessarily in full accordance with **IMO** GMDSS carriage requirements for **VHF** installations and as described in Recommendation ITU-R M.493.

3.1.5

dot pattern

test signal consisting of alternating B and Y signals

3.1.6

environmental profile

range of environmental conditions under which equipment within the scope of the present document is required to comply with the provisions of the present document

3.1.7

frequency deviation

difference between the instantaneous frequency of the modulated **RF** signal and the carrier frequency

3.1.8

Integral or integrated

essential part of the system, included in the package delivered with every unit

3.1.9

International mode

user-selectable mode in which the radio operates on internationally common channels specified by Appendix 18 of the **ITU-R** Radio Regulations

3.1.10

linear demodulation

FM demodulation with no audio filtering

3.1.11**linear demodulator**

FM demodulator with no audio filtering

3.1.12**modulation index**

ratio between the frequency deviation and the frequency of the modulation signal

3.1.13**National mode**

user-selectable mode in which the radio operates on radio frequency channels specified by a national Administration

3.1.14**operator or user**

person who operates or uses the radio Note 1 to entry: The terms can be used interchangeably.

3.1.15**RF front end**

circuitry between a receiver's antenna input up to and including the mixer stage

3.1.16**self-terminating alarm**

short audible indication that stops by itself without operator intervention

Note 1 to entry: The purpose of this audible indication is to inform the operator that a DSC message is received but does not require their immediate attention.

3.1.17**Y**

one of two signal elements used in DSC signalling as described in Recommendation ITU-R M.493

3.2 Abbreviated terms

AIS Universal shipborne automatic identification system

ATIS Automatic Transmitter Identification System

BIIT Built-in integrity test

CA Canada

CEPT European Conference of Postal and Telecommunications Administrations

CH channel

corr corrected

d.c. direct current

DSC Digital selective calling

ECC Electronic Communications Committee (CEPT)

e.m.f. electromotive force

EPIRB Emergency position-indicating radiobeacon

FM Frequency modulation

IF Intermediate frequency

IMO International Maritime Organization

ITU-R International Telecommunications Union Radiocommunications Sector

MMSI Maritime mobile service identity

MoB Man-overboard device

NL The Netherlands

PGN Parameter Group Number

ppm parts per million

PTT Push-To-Talk

QR Quick response code

RAIM Receiver autonomous integrity monitoring

RBW Resolution Bandwidth

RFRadio frequency

r.m.s. root mean square

RSSI Receive Signal Strength Indicator

UK United Kingdom

US United States

SINAD Signal + noise + distortion to noise + distortion

VDES [VHF](#) Data Exchange System

VDSMS [VHF](#) Digital Small Message Services in accordance with RTCM Standard 12301.1

VHF Very high frequency

VTSS Vessel traffic service

WRC World Radiocommunications Conference

4 General and operational requirements

4.1 General

Compliance shall be confirmed by inspection of the equipment and its technical documentation.

4.2 Composition

The equipment shall, as a minimum, include:

- a [VHF](#) radiotelephone transmitter;
- a [VHF](#) radiotelephone receiver;
- a capability to receive GNSS position by integral GNSS receiver as well as from an external GNSS interface (See also [5.4](#));
- a dedicated channel 70 watchkeeping facility for [DSC](#) decoder;
- a [DSC](#) encoder;
- a [DSC](#) decoder;
- a GNSS antenna which may be internal or external;
- an integral control unit or one or more separate control units;
- an internal or external loudspeaker (see also [4.5](#));
- a microphone.

The equipment shall be so designed that use of channel 70 for purposes other than [DSC](#) is prevented.

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

4.3 Controls and indicators

4.3.1 Controls

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

If the equipment can be operated from more than one position, the control unit provided at the position from where the vessel is normally navigated shall have priority and the individual control units shall be provided with an indicator showing whether the equipment is in operation.

The following controls or functions shall be provided:

- on/off switch for the entire installation with a visual indication that the installation is in operation;
- a manual non-locking push-to-talk (**PTT**) switch to operate the transmitter with a visual indication that the transmitter is activated;
- a switch for reducing telephony transmitter output power to 1 W, with a visual indication that low power is selected;

NOTE In the U.S.A., telephony transmitter power is automatically reduced to 1 W on channels 13 and 67, with override capability.

- an audio volume control;
- a squelch control;
- a control for dimming to extinction the equipment illumination with the exception of a visual indicator;
- controls for multiple watch facilities, if provided (see 5.5):
- a dedicated distress button. This button should not be any key of an ITU-T digital input panel or an ISO keyboard associated with the equipment and should be physically separated from functional buttons/keys used for normal operation. This button should be a single button for no other purpose than to initiate a distress alert.

The distress button shall be red in colour and marked "DISTRESS" if the lid or cover is not transparent, it should also be marked "DISTRESS".

The distress button shall be protected against inadvertent action by a spring-loaded lid or cover permanently attached to the equipment, e.g. by hinges.

Ergonomics shall be considered in the design and placement of controls. See [Annex I](#) for guidance on ergonomics - human performance standards in designing controls.

4.3.2 Radio channel selection

4.3.2.1 Selection

The equipment shall be capable of being configured by the manufacturer, but not by the user, to operate on any of the radiotelephone channels specified by Appendix 18 of the [ITU-R](#) Radio Regulations, including the four digit "10" and "20" channels. See [Annex D](#).

The equipment shall be capable of operating on Appendix 18 (other than NOTE B channels) channel numbers, with easy means of selection by the user (i.e. International mode). This shall be the default mode unless otherwise required by the Administration.

The equipment shall be capable of being preconfigured to operate on channels specified by an Administration (i.e. National mode), and shall be so configured where required by the Administration in which the radio is to be sold. In such cases, this shall be the default mode.

Users shall be easily and quickly able to switch between International and National mode. See [Annex E](#), [Annex F](#) and [Annex G](#).

Manufacturers may optionally include more than one National mode. Displays shall indicate whether the radio is operating in the International or National mode.

Equipment should display the selected channel table of operation (e.g. International, [NL](#), [UK](#), [US](#), [CA](#), [ATIS](#)).

The default mode for all equipment shall be to display channel numbers using the scheme specified by Appendix 18 of the [ITU-R](#) Radio Regulations. Radios may be optionally

configurable by the user to display channel numbers using the letter "A" to specify simplex use of ship station transmit frequency, and the letter "B" to specify simplex use of coast station (e.g. broadcast) transmit frequency for receive only by ships.

The equipment shall not be capable of operating on channels 75 or 76.

See also [4.12.3](#).

4.3.2.2 Display

Displays shall be legible under a range of various ambient lighting conditions, from direct daylight to darkness with an illumination or dimming capability as appropriate. See also [11.1](#).

Any visual display of the information content shall be clearly legible from typical user positions under all ambient light conditions.

Any display characters used for showing the channel designator, mode of operation etc. shall be additional to any display requirements specified in [11.1](#) for DSC purposes.

The display shall include an RSSI indicator, e.g. bargraph.

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.

4.4 Telephony transmitter control

A PTT 5 minutes timeout timer shall be provided to automatically terminate the transmitter when this timer expires. A short audible alarm and a visual indication may be provided to show that the transmission will be automatically terminated within the next 10 s. Once the transmission has terminated the transmitter shall not be reactivated without the release and re-application of the PTT button.

4.5 Handset and loudspeaker

The equipment shall be fitted with a handset or microphone, and an integral loudspeaker and/or a socket for an external loudspeaker. Where there are connections to external loudspeakers, these shall also relay acoustic alarms.

During transmission in simplex operation the receiver output shall be muted.

4.6 Power supply

The VHF radio should be capable of being connected to the ship's main source of electrical energy. The manufacturer shall specify the voltage range used by the equipment. See also [4.12](#) and [6.12.2](#).

During loss of power, the equipment shall not unintentionally transmit or change stored data. Temporary degradation or loss of function or performance is allowed, provided functionality is self-recoverable or can be restored by operation of user controls after the recovery of power.

4.7 Safety precautions

4.7.1 Excessive current and voltage

Provision shall be made for protecting the equipment from the effects of excessive current or voltage and from excessive rise of temperature in any part of the equipment.

4.7.2 Protection

Provision shall be made for protecting the equipment from damage if the power supply is subject to transient voltage changes and from damage due to the accidental reversal of the polarity of the power supply.

No connection of, or failure within, any external circuits shall disable the DSC equipment.

No damage to the equipment shall occur when the antenna terminals are placed on open circuit or short circuit for the period permitted by the push-to-talk switch in 4.4.

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

4.7.3 Earthing

Means shall be provided for earthing exposed metallic parts of the equipment.

4.7.4 Access

All parts and wiring in which direct or alternating voltages, or both, (other than RF voltages) combine to give a peak voltage greater than 50 V shall be protected against accidental access and shall be isolated automatically from all sources of electrical energy if the protective covers are removed.

Alternatively, the equipment shall be so constructed that access to such voltages can only be gained after having used a tool for this purpose (e.g. a spanner or screwdriver). In this case, warning labels shall be prominently displayed both within the equipment and on protective covers.

4.8 Memory

The information in programmable memory devices shall be protected from interruptions in the power supply of at least 10 hours duration.

Non-volatile memory shall be used for the following:

- own MMSI;
- configuration data inherent to the DSC process;
- all DSC call logs;
- the fact the equipment is turned on.

Furthermore, if the equipment was interrupted during an active sending distress automated procedure, the user shall be presented with the options to resume or cancel this procedure after power has been restored.

See also 4.6 and 11.19.

4.9 Labelling

All controls, instruments, indicators and terminals shall be clearly labelled in English or local language, and/or graphical symbols.

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

4.10 Warm up

After being switched on, the equipment shall, as soon as possible and within 5 seconds, indicate that it has been turned on and is initializing. The equipment should determine its position using either the integral GNSS receiver if fitted or the external GNSS interface within 5 minutes of switch on. If no position information is available after 5 minutes from switch on then the equipment should provide an audible alarm and visual indication on the screen and require operator intervention before proceeding. For first time use (cold start), 30 minutes is allowed. The channel indicator and/or idle display shall not indicate readiness until the equipment is fully operational. The equipment and any additional controller units shall be fully operational within 1 minute.

4.11 Software update

Means shall be provided to enable software used by the radio, including software controlling the selection of radio frequency channels, to be updated by manufacturer-controlled means, in a secure manner, including by secure remote means. Configuration versions shall be capable of being displayed.

4.12 User manual

4.12.1 General

The user manual shall include:

- the type of external connectors;
- the required information for correct siting of the antennas;
- the compass safe distance which shall be stated on the equipment or in the user document as described in IEC 60945;
- guidelines for proper installation, including all interconnections;
- a description of distress procedures and how alerts are canceled; and
- restrictions on cable connectors, cable length(s) and extensions, including external GNSS antenna cable, if any limitations exist.

Any graphical symbols on the radio user interface shall be clearly defined in the operation manual. See also [11.1](#).

The manual shall as a minimum be in English, and languages required in the country the radio is marketed or sold.

4.12.2 MMSI

The user manual or additional instruction shall include an explanation on how MMSIs are obtained, registered and registration maintained in the country the radio is marketed or sold. The manual or additional instruction shall also include procedures to be followed when radio or the vessel on which the radio is installed is resold.

The manual shall include an explanation of the means and procedures required for the owner of the radio to reset own-ship [MMSI](#) as described in [5.3](#).

NOTE The manufacturer can use [QR](#) codes for instructional purposes where it is practical to do so.

4.12.3 Radio channels

The user manual shall describe and explain the radio's capability of operating on channels required in the country the radio is marketed or sold, in addition to those channels which are internationally recognized. The manual shall also describe and explain the use of four-digit and two-digit channel numbering as well as any national channel numbering scheme which can be configured. See [4.3](#).

4.12.4 Radio frequency interference

The user manual shall advise on the use and interpretation of the [RSSI](#) presentation (e.g. bargraph) and other means to detect and identify the presence of harmful radio frequency interference. See [4.3](#).

4.12.5 Power supply

The [VHF/DSC](#) radio has distress alerting capability and requires care to be taken to install and test the equipment to ensure operation in the most robust manner possible. The manufacturer shall provide instructions for external connection to ship's power and may provide instructions for connecting to alternate or backup power sources.

4.12.6 How to use [DSC](#)

The user manual shall include an overview of [DSC](#) and its capabilities, including:

- the options available and how to use its various functions in the equipment;
- how a **DSC** radio check can be performed;
- what to do when in a distress situation;
- what pressing the distress alert button does and how its alert is handled by rescue coordination centres and by other ships receiving the alert;
- what the user should do when receiving a distress alert, and
- how to properly cancel an inadvertently transmitted distress alert and the consequences for failing to do so.

5 Technical requirements

5.1 Switching time

The channel switching arrangement by the operator 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 Facilities for **DSC** transmission and reception

The radio shall have an integrated **DSC** controller.

The operation of the **DSC** controller and radio combination shall comply with all the requirements of **11.10** for initiation and operation of distress calls.

5.3 Ships identity - **MMSI** and Group **MMSI**

The equipment shall have facilities for entering and storing its own 9-digit **MMSI** with the 10th digit set automatically to 0 in its use in any **DSC** message unless the equipment is designed to use the 10th digit in accordance with Recommendation ITU-R M.1080. The factory default for the **MMSI** shall be some indicator to the equipment that it is invalid.

The unit shall check that any programmed own-ship **MMSI** is between 200000000 and 799999999, or between 982000000 and 987999999, otherwise the unit shall reject the programming. See also **4.12**.

No **DSC** message shall be able to be sent or received without a correctly programmed own-**MMSI** since all **DSC** messages contain this number.

If there is no correctly programmed own-**MMSI** entered, at switch-on the radio shall display information to the user that there is no **MMSI** entered, **DSC** is disabled, the distress button will not work, or equivalent information. The radio shall also sound a warning alarm and display the reason for the alarm and the means to silence it. This aural alarm may self-terminate.

After the **MMSI** has been stored, it shall only be possible to change the **MMSI** with advice/cooperation from the manufacturer. Means shall be provided to enable the stored **MMSI** to be reset by the user without requiring the unit to be removed from the vessel. See also **4.12.2**.

The equipment shall provide at least 20 user-programmable group **MMSIs** to enable the equipment to recognize **DSC** messages addressed to either the ship's **MMSI** or the group **MMSIs**.

The ship's **MMSI** shall be readily accessible to the operator, displayed at equipment power-up, and via a maximum of two menu layers (see **11.9** and **11.50**).

5.4 Integrated GNSS receiver and a GNSS position data interface

5.4.1 General

These tests are designed to ensure that the distress alert position data is the most recent and accurate.

The equipment shall have an integrated GNSS receiver as a source for position. The integral GNSS receiver shall meet the following requirements of a receiver as specified in [IEC 61108 \(all parts\)](#) [14].

- Position accuracy; static and dynamic (5 s);
- Position update (5 s);
- Interference susceptibility;
- [RAIM](#)
- Status indications

[RAIM](#) is not required when a multi-system integral GNSS receiver is used.

5.4.2 Test with an integrated GNSS receiver and a GNSS position data interface

5.4.2.1 Source priority

The integral GNSS receiver shall be used as the default source for position.

5.4.2.2 Integral GNSS test

The radio shall be connected via the GNSS receiver to a locally received GNSS signal or from a GNSS simulator, and a Distress alert shall be initiated. A test [DSC](#) receiver shall correctly show the distress alert and the correct enhanced position as given by the simulation data.

5.4.2.3 Externally connected GNSS test

The radio shall be connected via the interface to a simulated position data stream different from the local position and shall also be connected via the GNSS receiver to a locally received GNSS signal. A distress alert shall then be initiated.

A test [DSC](#) receiver shall correctly show the distress alert and the correct enhanced position as given by the simulation data, not the position received from the equipment's locally received GNSS signal.

When multiple external GNSS sources are available, the user should be able to select which external source to use. If the selected external source fails, the selection should default to the integral GNSS.

5.4.3 GNSS receiver antenna

Equipment with an integrated GNSS antenna shall be capable of being connected to an external GNSS antenna.

5.4.4 Loss of position information

The equipment shall generate an audible and visual alarm when no GNSS position or position data from another source is available (see also [Annex B](#)).

When confirming the alarm, the display shall provide a field to enter the ship position manually. After manually entering the position, the next loss of position alarm shall occur after four hours. An alarm shall also occur after 23.5 hours after last entering the position, and the position data shall then be erased.

5.4.5 GNSS position data interface

Means shall be provided for manual entry of the geographical position information and of the time when this position information was valid. In addition, facilities for automatic entry and encoding of the geographical position, geographical area and time information (UTC) shall be provided.

As a minimum the equipment shall recognize the following sentences: GLL, RMC and GNS as defined in IEC 61162-1 or NMEA 0183. See also [5.6.3](#).

NOTE GGA can also be recognized for legacy purposes.

Position and time information shall be supported via at least one of the following: IEC 61162-1, IEC 61162-2, IEC 61162-3, IEC 61162-450, NMEA 0183, NMEA 2000 or NMEA OneNet. If PGNs are used with IEC 61162-3, NMEA 2000, IEC 61162-450, or NMEA OneNet, then [PGN 129029](#) - GNSS Position Data shall be used.

In case position information is accepted from several position sources simultaneously it shall be possible to select the preferred position source either manually or automatically.

An automatic selection algorithm (using quality, priority, etc.) shall be described by the manufacturer, and the current selected position source shall be displayed to the operator upon request.

5.5 Multiple watch facilities

5.5.1 General

The [VHF](#) radiotelephone equipment may be provided with multiple watch facilities on traffic channels but operation using [DSC](#) shall always take precedence. A continuous watch on channel 70 shall be implemented. Scanning techniques shall not be used on channel 70.

5.5.2 Scanning provisions

Equipment may have multiple watch facilities. If multiple watch facilities are provided, they shall as a minimum comply with the following:

- the equipment shall include a provision for the automatic scanning of a priority channel and one additional channel. Facilities for the automatic sequential change of the additional channel may be provided;
- the priority channel is that channel which will be sampled even if there is a signal on the additional channel and on which the receiver will lock during the time a signal is detected;
- the additional channel is that channel which will be monitored during the periods the equipment is not sampling or receiving signals on the priority channel;
- provision shall be included to switch the scanning facility on and off by means of a manually operated control. In addition, it shall be ensured that the receiver remains on the same channel as the transmitter for the entire duration of any communication, for example the scanning facility may be switched off automatically when the handset is off its hook;
- selection of the additional channel and selection, if provided, of the priority channel shall be possible at the operating position of the receiver or transceiver. If selection of the priority channel is not provided, the priority channel shall be channel 16; (see [IMO Circular MSC/Circ.803/Rev.1](#));
- the equipment shall be provided with a single manual control (e.g. push-button) in order to switch the equipment quickly for operation on the priority channel;
- at the operating position of the equipment, the selected additional channel shall be clearly indicated as being the operational channel of the equipment.

5.5.3 Scanning characteristics

The equipment shall be programmed with one channel as a priority channel. Then the equipment shall be tuned to the additional channel and the test signal complying with [6.1](#) shall be connected to the transceiver aerial input.

In the absence of a signal on the priority channel, and, during reception of a signal on the additional channel, the duration of each listening period on this channel shall be at least 850 ms. When the scanning facility is switched on, the priority channel shall be sampled with a sampling period of not more than 2 s.

When the scanning facility is in operation, the channel number of both channels on which the equipment is operating shall be indicated.

When the transmitter is engaged, the scanning activity shall be disabled.

If a signal is detected on the priority channel the receiver shall remain on this channel for the duration of that signal.

If a signal is detected on the additional channel, the sampling of the priority channel shall continue, thus interrupting the reception on the channel for periods as short as possible and not greater than 150 ms.

When the scanning facility is switched off, both transmitter and receiver shall be tuned automatically to the selected additional channel.

5.6 Built-in integrity test

5.6.1 BIIT requirement

In case a failure is detected in one or more of the following functions or data, the system shall react as given in [Table 1](#).

Table 1 – BIIT

Alarm ID	Description text	Description of BIIT	Reaction of the system
001	Tx malfunction	Radio fails to transmit, or no forward power is detected	Disable all transmission
002	VHF Antenna VSWR exceeds limit	Antenna VSWR exceeds 6 dB	Continue operations
003	Primary receiver failure	Optional, as declared by manufacture	As declared by manufacture
005	Channel 70 receiver failure	Optional, as declared by manufacture	As declared by manufacture
006	General failure	Optional, as declared by manufacture	As declared by manufacture
009	Integral/external GNSS position mismatch	Position error exceeds (e.g. 20 meters)	Continue operations using default data
014	High noise floor	Noise floor exceeds (e.g. -100 dBm)	Continue operations
015	No valid MMSI	No valid MMSI programmed	Disable any DSC messaging
026	No position sensor in use	Lack of position information from integral and external GNSS	Continue operations using default data

All BIIT failures shall be indicated to the operator on the display. The radio shall terminate the alerts when the conditions detected by the BIIT return to normal.

5.6.2 Confirmation of BIIT operation

Provisions of BIIT functionality may be confirmed as specified by the manufacturer.

5.6.3 Alarm conditions via the data port

The manufacturer shall output an ALR sentence and recognize the ACK sentence as defined in IEC 61162-1 or NMEA 0183, using the alarm ID defined in [Table 1](#). Alternatively, Alert PGN 126983 and Alert Response PGN 126986 in accordance with IEC 61162-3 or NMEA 2000 may be used.

6 General conditions of measurement

6.1 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 dBm at the terminals to be connected to the receiver.

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

6.2 Squelch

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

6.3 Transmission time limitation

Unless otherwise specified, the transmitter push-to-talk timer shall be deactivated for test purposes.

6.4 Normal test modulation

For normal test modulation, the modulation frequency shall be 1 kHz and the frequency deviation shall be ± 3 kHz.

For **DSC** 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 testing, the 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 purposes of this document, the audiofrequency 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

Tests shall be made on channel 16.

Tests for **DSC** operation shall be on channel 70.

6.8 Generation and examination of the digital selective call signal

6.8.1 Reception of **DSC** messages

For message detection and decoding:

- a) the **DSC** message detection and decoding shall follow the flowchart given in [Figure 1](#). [Figure 1](#) shows a schematic of the various tests and error checks that shall be performed before the message is accepted. The "bit detector" is the output of the **DSC** modem and provides the source of the 0 and 1 bitstream computed from the received signal. A **DSC** "word" consists of 10 bits, a 7-bit "symbol" and a 3-bit "number of zeros in the symbol" or "zero-count" value.

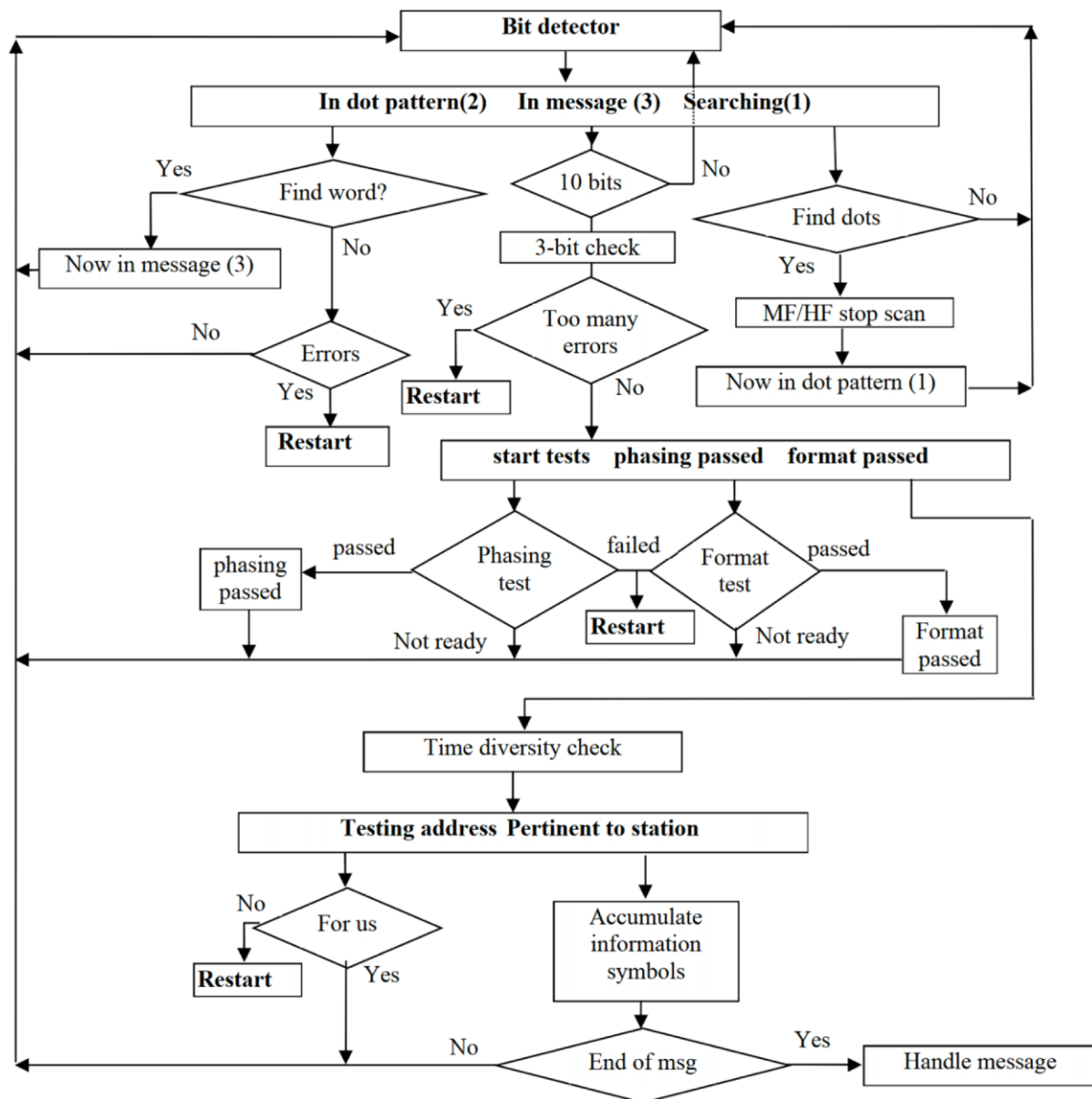


Figure 1 – Test and error checks

- b) the receiver shall not require a dot pattern preceding the phasing sequence for correct bit phasing and unambiguous determination of the positions of the characters within a **DSC** message sequence;
- c) the decoder shall use word recognition for the purposes of word synchronization. (Word synchronization is the stage at which the decoder is able to recognize that the dot pattern has completed and the 10-bit words of the message have started);
- d) upon word synchronization, the decoder shall use the 3-bit zero count to check the 7-bit information content of all received words. The 7-bit symbol shall be considered received in error if the 3-bit zero count is incorrect;
- e) the decoder shall reject the message if the format symbol cannot be received in any of its four positions error free;
- f) the decoder shall reject the message if the error-free format symbol does not have a value allowed by Recommendation ITU-R M.493 unless the equipment is specifically designed to handle other values;

- g) if the format symbol is either distress (112) or all ships (116), the message shall be rejected if the format symbol is not received correctly at least twice in either the DX or RX position;
- h) for those words that are sent duplicated in the five-word time diversity pattern, the symbol shall be considered received in error if both of the symbols are received in error or both are received error free and are not equal;
- i) the message shall be rejected if the format symbol is not distress (112) or all ships (116), and all five address symbols are not received correctly or if the address indicates that it is not for this station (it does not contain the station **MMSI** or group **MMSI** or the station is not in the specified geographic area);
- j) the equipment shall compute a local **ECC** if a set of received information symbols can be obtained error-free;
- k) if the **DSC** message is a distress alert, the equipment shall follow the decoding techniques for each individual message and successively attempt to correct any information characters received in error in previous messages with the corresponding correctly received characters in the latest message;
- l) the decoder shall recognize the end of sequence pattern as the termination of a standard **DSC** message, regardless of what follows, and shall be able to decode the standard part of the message;
- m) equipment shall be able to decode the standard part of the **DSC** message even when the data from Recommendation ITU-R M.821-1 [15] is received in error;
- n) if one of the four end of sequence symbols is not received error free at the end of the standard **DSC** message the message shall be rejected. However, if the end of sequence character is received correctly at the end of the enhanced extension the equipment shall not be prevented from using the latter end of sequence symbol to identify and accept the standard (and thus entire) message.

6.8.2 Error handling in the automated procedures

6.8.2.1 General

6.8.2 describes the handling of received **DSC** messages that contain errors in any of the information characters except the format, address (the destination **MMSI**, group **MMSI** or area), and end of sequence characters which shall be received correctly in order for the message to be accepted.

NOTE For the purposes of these tests "performing comparison error correction" between identical sets of information characters means that if one of a corresponding pair of information characters is in error, the information character in error is replaced by the information character that is not in error. A given information character is received in the DX and RX positions of the **DSC** message from which a final set of information characters is determined.

A **DSC** message shall initiate or be handled by an automated procedure if the format test passes, the destination address, and end of sequence information characters are able to be determined error free.

If an automated procedure is initiated by the reception of a **DSC** message that contains critical errors, the aural alarm shall self-terminate.

When an automated procedure initiated with critical errors first receives a subsequent message without critical errors or the procedure is first able to correct the critical errors by combining received messages, the normal initiating alarm shall sound.

A received **DSC** message shall be considered pertinent to an automated procedure if the received information characters are identical to the set of information characters normally used to identify pertinence.

In no case shall the reception of an identical **DSC** message introduce more errors into the information characters (and their display) that are used to identify the procedure.

Automated procedures shall indicate all displayed information characters that are in error. Individual elements of any

MMSIs and any position information that are in error shall be indicated by a special symbol (manufacturer defined) at the place of the error.

6.8.2.2 Distress automated procedures

6.8.2.2.1 DSC message with errors

A DSC message with errors in the ECC or information characters is considered a non-distress DSC message by an automated procedure unless:

- a) the format character is distress (112) which makes the message a distress alert; or
- b) the format character is all ships and the number of information characters excluding the enhanced position extension is 23; or
- c) the format character is area, group, or individual and the number of information characters excluding the enhanced position extension is 28 which makes the message a relay; and
- d) if b) is true and the telecommand 1 parameter is received in error and the end of sequence character is no acknowledgement requested, the DSC message shall be assumed to be a relay (it could be a distress alert acknowledgment) and an error in DSC message type shall be indicated.

A distress procedure handling an individually addressed distress relay shall not allow the sending of the acknowledgment if any one of the digits in the sender MMSI is in error.

Received distress automated procedures shall not allow the sending of any further distress DSC messages as long as any one of the current distress information characters remains in error. In that case the automated procedure shall only offer the operator the option of composing and sending a distress relay on behalf of someone else (the operator is then free to enter a best estimate of what the distress information shall be based upon the received distress information).

A distress automated procedure shall assume radio telephone if the communications parameter is received in error. The distress automated procedure shall indicate to the operator that it is making the assumption due to the error.

6.8.2.2.2 Distress procedure considered acknowledged

For a distress automated procedure to be considered acknowledged by a received distress DSC acknowledgment:

- a) the MMSI (or unknown) of the vessel in distress shall be received error free;
- b) if the MMSI of the vessel in distress is unknown, all the parameters of the distress information shall also be received error free.

6.8.2.2.3 Distress procedure correcting receive errors

A distress automated procedure shall correct receive errors by performing comparison error correction in the following manner:

- a) if the entire set of received information characters is identical to the previously received set of information characters, comparison error correction shall be performed on the entire set of information characters;
- b) if only the set of received distress information characters is identical to the distress information determined from the reception of previous DSC messages, comparison error correction shall only be performed on the set of distress information characters;
- c) if the new message has the enhanced position information characters, comparison error correction shall be performed on the enhanced position information characters, and if the enhanced position information characters are absent in the current set of distress information characters, the current set shall be updated with the new set of enhanced position information characters;
- d) if only the received distress event information characters are identical, comparison error correction shall only be performed on the distress event information characters.

6.8.2.3 Non-distress automated procedures

A non-distress automated procedure shall:

- a) not tune to the frequencies of subsequent communication if the **DSC** message is addressed to a group or all ships if the frequency information characters are received in error;
- b) not allow the acknowledgment of a non-distress **DSC** message that has errors in either the category, sender **MMSI**, or telecommand 1 information characters;
- c) not be acknowledged by a non-distress **DSC** acknowledgement that has errors in any one of the sender **MMSI**, telecommand 1, or frequency information characters.

6.9 Standard test signals for **DSC**

The standard test signal for a **VHFDSC** decoder shall be a phase-modulated signal at **VHF** channel 70 with modulation index = 2. The modulating signal shall have a nominal frequency of 1700 Hz and a frequency shift of ± 400 Hz with a modulation rate of 1 200 baud.

Standard test signals shall consist of a series of identical call sequences as specified in tables A1-4.1 to A1-4.9 of Recommendation ITU-R M.493-16.

Standard test signals shall be of sufficient length for the measurements to be performed or it shall be possible to repeat them without interruption when making the measurements.

6.10 Determination of the symbol error ratio in the output of the receiving part

The information content of the decoded call sequence displayed at the readout device of the receiving part shall be divided into blocks, each of which corresponds to one information symbol in the applied test signal (see 6.8). The total number of incorrect information symbols relative to the total number of information symbols shall be registered. In this standard, bit error ratio measurements are taken to be equivalent to symbol error ratio measurements.

6.11 Test conditions, power sources, and ambient temperatures

6.11.1 Normal and extreme test conditions

Tests shall be made under normal test conditions and also, where stated, under extreme test conditions (see 6.13.1 and 6.13.2 applied simultaneously).

6.11.2 Test power source

During testing, the equipment shall be supplied from a test power source capable of producing normal and extreme test voltages as specified in 6.12.2 and 6.13.2.

The internal impedance of the test power source shall be low enough for its effect on the test results to be negligible. For the purpose of testing, the power source voltage shall be measured at the input terminals of the equipment.

During testing, the power source voltages shall be maintained within a tolerance of ± 3 % relative to the voltage level at the beginning of each test.

6.12 Normal test conditions

6.12.1 Normal temperature and humidity

The normal temperature and humidity conditions for tests shall be a combination of temperature and humidity within the following ranges:

- temperature: +15 °C to +35 °C;
- relative humidity: Not exceeding 75 %

6.12.2 Normal power sources

6.12.2.1 Battery power source

Where the equipment is designed to operate from a battery, the normal test voltage shall be the nominal voltage of the battery (12 V, 24 V, etc.) specified by the manufacturer.

6.12.2.2 Other power sources

For operation from other power sources, the normal test voltage shall be that declared by the manufacturer.

6.13 Extreme test conditions

6.13.1 Extreme temperatures

For tests at extreme temperatures, measurements shall be made in accordance with 6.14, at a lower temperature of $-15\text{ }^{\circ}\text{C}$ and an upper temperature of $+55\text{ }^{\circ}\text{C}$.

6.13.2 Extreme values of test power sources

6.13.2.1 Battery power source

Where the equipment is designed to operate from a battery, the extreme test voltages shall be 1,3 times and 0,9 times the nominal voltage of the battery (12 V, 24 V, etc.) specified by the manufacturer.

6.13.2.2 Other power sources

For operation from other sources, the extreme test voltages shall be advised by the equipment manufacturer.

6.13.2.3 Tests to be performed

The tests in Table 2 shall be performed under extreme conditions:

Table 2 – Performance check under extreme conditions

Environment	Normal power supply	Extreme power supply
Dry heat	Performance check ^a	Performance check ^a
Damp heat	Performance check ^a	Performance check ^a
Low temperature	Performance check ^a	Performance check ^a
Normal temperature	Performance check ^a	Performance check ^a
^a For performance check see 7.3		

These tests may be carried out in combination with 7.5.

6.14 Procedure for tests at extreme temperatures

Unless otherwise stated the extreme test conditions means that the equipment shall be tested at the upper temperature and at the upper limit of the supply voltage applied simultaneously, and at the lower temperature and the lower limit of the supply voltage applied simultaneously.

The equipment shall be switched off during the temperature stabilizing periods.

Before conducting tests at the upper temperature, the equipment shall be placed in the test chamber and left until thermal equilibrium is reached. The equipment shall then be switched on in the high power transmit timeout timer is activated and the equipment is returned to standby mode. The equipment shall meet the requirements of this standard after this period.

For tests at the lower temperature, the equipment shall be left in the test chamber until thermal equilibrium is reached and shall then be switched to the standby or receive position for 1 min. The equipment shall then meet the relevant clauses of the present document.

6.15 Reference bandwidths for emission measurements.

The reference bandwidths used shall be as stated in Table 3 and Table 4.

Table 3 – Reference bandwidths to be used for the measurement of spurious emission

Frequency range	RBW
9 kHz to 150 kHz	1 kHz
150 kHz to 30 MHz	10 kHz
30 MHz to 1 GHz	100 kHz
1 GHz to 12,75 GHz	1 MHz

Table 4 – Reference bandwidths to be used close to the wanted emission for equipment operating below 1 GHz

Frequency offset from carrier	RBW
250 % of the CSP to 100 kHz	1 kHz
100 kHz to 500 kHz	10 kHz

6.16 Measurement uncertainty

Recommended values for maximum measurement uncertainty are given in [Annex H](#).

7 Environmental tests

7.1 General introduction

Environmental tests shall be carried out before tests are performed on the same equipment with respect to the other requirements of this standard.

7.2 Procedure

Unless otherwise stated, the equipment shall be connected to an electrical power source during the periods for which it is specified that electrical tests shall be carried out. These tests shall be performed using the normal test voltage (see [6.12.2](#)).

7.3 Performance check

Where the term "performance check" is used, this shall be taken to mean a visual inspection of the equipment, a test of the transmitter output power and frequency error, and the receiver sensitivity to show that the equipment is functioning and that there is no visible damage or deterioration.

- a) For the transmitter:
- b) The transmitter shall be connected to the artificial antenna (see [6.4](#)) and tuned to channel 16. The measurements shall be made in the absence of modulation with the power switch set at maximum. The output power shall be between 12.5 W and 25 W, and the frequency error shall be less than ± 800 Hz.
- c) For the radiotelephone receiver:
- d) A test signal (see [6.3](#)) with a level of -107 dBm shall be applied to the receiver input as in [9.3.2](#). The SINAD ratio at the receiver output shall be equal to or greater than 20 dB.
- e) For the DSC receiver:
- f) A standard DSC test signal (see [6.9](#)) shall be applied to the receiver input. The symbol error ratio in the decoder output shall be determined as described in [6.10](#) and the input level shall be reduced until the symbol error ratio is 10^{-2} . The level of the input signal (maximum usable sensitivity) shall be less than -107 dBm.

7.4 Vibration test

The vibration test shall be performed as in IEC 60945, except that the minimum vibration frequency shall be 5 Hz.

7.5 Temperature tests

The dry heat cycle shall be performed as in IEC 60945.

The damp heat cycle shall be performed as in IEC 60945.

The low temperature cycle shall be performed as in IEC 60945.

8 Transmitter

8.1 Frequency error

8.1.1 General

The frequency error is the difference between the measured carrier frequency and its nominal value.

8.1.2 Method of measurement

The carrier frequency shall be measured in the absence of modulation, with the transmitter connected to an artificial antenna (see 6.5) and tuned to channel 16.

Measurements shall be made under normal test conditions (see 6.12) and under extreme test conditions (see 6.13.1 and 6.13.2 applied simultaneously).

This test shall be carried out with the output power switch being set at both maximum and minimum.

8.1.3 Required results

The frequency error shall be within ± 800 Hz (normal conditions) or ± 1500 Hz (extreme conditions).

8.2 Carrier power

8.2.1 General

The carrier power is the mean power delivered to the artificial antenna during one radio frequency cycle in the absence of modulation.

The rated output power is the carrier power declared by the manufacturer.

8.2.2 Method of measurement

8.2.2.1 General

The transmitter shall be connected to an artificial antenna (see 6.4) and the power delivered to this artificial antenna shall be measured. The measurements shall be made on channel 16, the highest frequency channel and the lowest frequency channel under normal test conditions (see 6.12) and channel 16 under extreme test conditions (see 6.13.1 and 6.13.2 applied simultaneously).

During the test on channel 15, a check should be made that the power output falls to zero after the maximum continuous transmission time has elapsed (see 4.4).

8.2.2.2 Normal test conditions

The output power shall never exceed 25 W nor shall it be less than 12.5 W in the high power mode.

With the output power switch set at minimum (low power mode) the carrier power shall remain between 0,5 W and 1 W.

The maximum continuous transmission time shall be between 5 minutes and 6 minutes.

No transmission will occur during the channel change or whilst any frequency synthesizer used within the transmitter is out of lock.