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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

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Contents

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Foreword

This European Standard (EN) has been produced by ETSI Technical Committee Electromagnetic compatibility and Radio spectrum Matters (ERM).

The present document is part 6 of a multi-part deliverable. Full details of the entire series can be found in part 1 [i.1].

National transposition dates	
Date of adoption of this EN:	8 February 2017
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Modal verbs terminology

In the present document "**shall**", "**shall not**", "**should**", "**should not**", "**may**", "**need not**", "**will**", "**will not**", "**can**" and "**cannot**" are to be interpreted as described in clause 3.2 of the ETSI Drafting Rules (Verbal forms for the expression of provisions).

"**must**" and "**must not**" are **NOT** allowed in ETSI deliverables except when used in direct citation.

1 Scope

The present document states the minimum requirements for devices using Digital Selective Calling (DSC) Class M, for Man Overboard (MOB). The present document defines the requirements for equipment that uses DSC alerting and signalling in the maritime mobile bands and particularly the GMDSS distress and safety channels. Such equipment is not intended to provide any subsequent communications or telephony facilities.

The present document is part 6 of a multi-part deliverable that covers the channel access rules and technical requirements applicable to these devices.

2 References

2.1 Normative 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 referenced 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.

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

[1] Recommendation ITU-R M.493-14: "Digital selective-calling system for use in the maritime mobile service".

[2] ETSI EN 303 098: "Maritime low power personal locating devices employing AIS; Harmonised Standard covering the essential requirements of article 3.2 of the Directive 2014/53/EU".

[3] Recommendation ITU-R M.585-7: "Assignment and use of identities in the maritime mobile service".

[4] Recommendation ITU-R M.821-1: "Optional expansion of the digital selective-calling system for use in the maritime mobile service".

[5] CENELEC EN 61108-1: "Maritime navigation and radiocommunication equipment and systems - Global navigation satellite systems (GNSS) - Part 1: Global positioning system (GPS) - Receiver equipment - Performance standards, methods of testing and required test results".

[6] CENELEC EN 61108-2: "Maritime navigation and radiocommunication equipment and systems - Global navigation satellite systems (GNSS) - Part 2: Global navigation satellite system (GLONASS) - Receiver equipment - Performance standards, methods of testing and required test results".

[7] CENELEC EN 61108-3: "Maritime navigation and radiocommunication equipment and systems - Global navigation satellite systems (GNSS) - Part 3: Galileo receiver equipment - Performance requirements, methods of testing and required test results".

2.2 Informative 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 referenced document (including any amendments) applies.

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

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 EN 300 338-1: "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".

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in ETSI EN 300 338-1 [i.1] and the following apply:

acknowledged: automated procedure it indicates that the objective of the initial DSC message has been achieved

activation: initial triggering of the MoB device i.e. both parts of the two step procedure are performed

active mode: activated mode, transmitting in an emergency situation

class M: specific class of DSC functionality for use by man overboard devices

closed loop: individual transmission to own vessel

default: value selected or an action taken by the equipment software in the absence of any operator input

distress alert: name given to the single distress DSC message with the format symbol 112

distress DSC message: DSC message or acknowledgement containing the distress information

distress information: symbols within a DSC message describing a distress situation consisting of the MMSI of the vessel in distress, the nature of distress, the position of the vessel in distress, the UTC time of that position and the mode of subsequent communication

factory default: default value that is set by the manufacturer such that the field or behaviour is defined prior to any operator intervention

information characters: set of symbols in a DSC message that contains the items of interest for the recipient and is used to compute the ECC symbol that terminates the message

non distress DSC message: DSC messages or acknowledgements that do not have the format specifier or category of "distress"

open loop: transmitting to all ships (broadcast) 'using All ships call types'

symbol (as part of the DSC sentence): 7 binary bits of a 10 bit DSC word that have the information content

test mode: self testing mode using an individual test call to own vessel

word (as part of the DSC sentence): 10 binary bits that make up the coded entities of a transmitted DSC message

NOTE: The 10 bits consist of a 7 bit "symbol" that gives the information content and 3 bit error check that gives the number of 0 binary bits in the 7 bit symbol.

3.2 Abbreviations

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

AIS	Automatic Identification System
CIRM	Comite International Radio-Maritime
DSC	Digital Selective Calling
ECC	Error Check Character

GMDSS	Global Maritime Distress and Safety System
GMSK	Gaussian Minimum Shift Keying
GNSS	Global Navigation Satellite System
GPS	Global Positioning System
HF	High Frequency
ID	IDentity
ITU	International Telecommunications Union
ITU-R	ITU - Radiocommunications Sector
LBT	Listen Before Talk
MF	Medium Frequency
MMSI	Maritime Mobile Service Identity
MOB	Man Overboard
PM	Phase Modulation
UTC	Universal Time Co-ordinated
VHF	Very High Frequency
WGS	World Geodetic System

4 General requirements

4.1 General

Class M MOB devices are employed in situations of grave and imminent danger to persons that require immediate assistance from other vessels.

MOB devices shall be:

- Fitted with an internal electronic GNSS position fixing device
- Fitted with a transceiver operating on VHF DSC channel 70
- Fitted with an Automatic Identification System (AIS) transmitter operating in accordance with ETSI EN 303 098 [2] to provide radio location
- Fitted with audio and visual indicators to designate operation of the MOB device, intrinsically safe MOB devices shall be fitted with a minimum of visual indicators
- Capable of manual and automatic activation and manual deactivation

4.2 Frequency of operation

The MOB device shall operate on 156,650 MHz (Channel 70), 160,975 MHz (AIS 1) & 161,025 MHz (AIS 2) only.

4.3 Class of emission

DSC: G2B Phase Modulation (PM) with digital information with a sub-carrier.

AIS: F1D GMSK 9600 baud.

4.4 Controls

The MOB device shall be initially activated by the use of two simple, but independent mechanical actions, neither of which on its own shall activate the MOB device.

It shall only be possible to activate the MOB device after a seal or other mechanical restraint has been removed from the first mechanical action. An immersion sensor may replace the second mechanical action. Where the second action is replaced by an immersion sensor then the first action shall be an arm function thus to ensure the device is armed for automatic activation when submerged.

For MOB devices without an arm function, it shall not be possible to reattach a removed seal or restraint. After activation, it shall be simple to de-activate the equipment and the means to deactivate the MOB device shall be clearly marked.

4.5 Indicators

4.5.0 General

The MOB device shall be provided with a visual and with the exception of intrinsically safe MOB devices audible indications that designate the operation of the MOB device as specified in clauses 4.5.1 and 4.5.2.

The visual indicator shall be sufficiently bright to be seen in bright sunlight.

4.5.1 Audible indicators

The audible indicator shall signal:

- When the MOB device is first activated
- Prior to any DSC transmission

4.5.2 Visual Indicators

The visual indicator shall clearly distinguish the following states:

- The MOB device has been activated and is transmitting in active mode.
- The MOB device has GNSS data and is transmitting in active mode.
- The MOB device is undergoing test and is transmitting in test mode.
- The MOB device has completed a test or has been deactivated locally.
- The MOB device cannot complete a test because it has not been properly programmed with own vessel MMSI.
- The MOB device has received a DSC acknowledgement and the DSC transmitter has been deactivated.

4.6 Labelling

The MOB device shall be provided with a label, or labels, permanently affixed to the exterior, containing the following information:

- Self ID of the MOB device (see clause 4.7) and manufacturer serial number.
- Open loop devices shall be marked DSC-MOB-O.
- Closed loop devices shall be marked DSC-MOB-C.
- Adequate instructions to enable the equipment to be activated and deactivated.
- The type of battery as specified by the manufacturer of the MOB device.
- A warning to not block the GNSS antenna.
- The compass safe distance as measured in ETSI EN 303 098 [2], clause 7.10.
- A warning to the effect that the MOB device should not be operated except in an emergency.
- The date on which the battery will need to be replaced. A Simple means shall be provided for changing this date when the battery is replaced.

4.7 Instructions

User operating instructions shall be provided with the equipment and shall include the following warnings:

- "WARNING - This equipment is for use in an emergency only. It is not intended for routine tracking of persons or property nor routine recovery of divers."
- "WARNING - If a self-test is performed more frequently than once a month, then the battery life may be reduced."

4.8 Self ID

The MOB device shall have a freeform number identity (self ID) coded in accordance with Recommendation ITU-R M.585-7 [3].

The self ID for the MOB device is 972xxyyyy, where xx = manufacturer ID 01 to 99; yyyy = the sequence number 0000 to 9999 allocated by the manufacturer. Manufacturers IDs are issued by CIRM. Manufacturers shall only use manufacturer IDs that have been issued to them by CIRM, except for training trials and conformance testing purposes where the ID xx=00 can be used.

After being programmed by the manufacturer, it shall not be possible for the user to change the self ID of the MOB device.

The self ID shall be held in non-volatile memory.

4.9 Own vessel MMSI

The MOB device shall be capable of being programmed with the MMSI of its own vessel or group.

It shall be possible for a MOB device's own vessel MMSI to be re-programmed in the field, for example when MOB devices are moved from one vessel to be stowed on another vessel. It shall be possible for users to re-programme the own vessel MMSI without locating devices having to be returned to the manufacturer.

The own vessel MMSI shall be held in non-volatile memory.

If the own vessel MMSI is not entered or not valid the locating device shall indicate this during test.

4.10 Battery requirement

The battery provided as a power source shall be a primary battery and have sufficient capacity to operate the MOB device within the requirements of the present document for an uninterrupted period of at least 12 hours, at a temperature of -20 degrees Centigrade (± 3 degrees Centigrade).

5 DSC Operation

5.1 Listen Before Talk (LBT) Protocol

5.1.0 General

For closed loop transmission LBT is not applied. Transmission commences immediately and there is no prioritized wait applied.

For all subsequent open loop transmissions the MOB device shall apply the prioritized wait scheme described in clause 3.1.8 of annex 4 of Recommendation ITU-R M.493-14 [1] except that it shall not transmit after 1 second if channel 70 remains busy. MOB devices transmit at significantly lower power than do ships and shore stations, therefore to increase the probability of their messages being received as well as to reduce unwanted interference on channel 70, a locating device shall never transmit whilst channel 70 is busy.

To determine if channel 70 is busy the MOB device shall listen for and decode DSC symbols as defined in table 1 of Recommendation ITU-R M.493-14 [1]; it is not sufficient to use squelch alone. Channel 70 is determined 'busy' when carrier is detected and a stream of valid symbols is decoded. Whilst a stream of valid symbols is decoded the 'wait period' timer is continuously restarted. Therefore transmission can only be attempted if valid symbols are not being decoded within the wait period.

5.1.1 Active Mode Wait Period Calculation

All active mode transmissions shall be prioritized as 'distress' messages. The wait period is calculated as 50 + R×50 milliseconds, where R is a random number between 0 and 1. Once R has been determined the wait period shall not be re-calculated until the wait period timer has expired. So that the wait period remains fixed even if the 'wait period' timer is restarted. It is not re-calculated until the next time a transmission is required.

5.1.2 Test Mode Wait Period Calculation

All test mode transmissions shall be prioritized as 'routine and test' messages. The wait period is calculated as 200 + R×200 milliseconds, where R is a random number between 0 and 1. Once R has been determined, the wait period shall not be re-calculated until the wait period timer has expired. So that the wait period remains fixed even if the 'wait period' timer is restarted. It is not re-calculated until the next time a transmission is required.

5.2 DSC messages

5.2.1 Active mode

5.2.1.0 General

The DSC MOB device may operate in open loop or closed loop modes.

Prior to release of the initial transmission a delay for a period of between 10 and 30 seconds shall be implemented, to allow users to deactivate the MOB device in the case of inadvertent activation. During this period an audible and visual indication in accordance with clause 4.5 has to be provided.

5.2.1.1 Closed loop operation

Messages from and to closed loop MOB devices using VHF DSC are defined in Tables A1-4.3, A1-4.4 of Recommendation ITU-R M.493-14 [1].

On initial activation, the closed loop MOB device shall transmit a DSC message formatted as a distress alert relay on behalf of another ship, as specified in Table A1-4.3 of Recommendation ITU-R M.493-14 [1] with the nature of distress set to 110 (MOB) and the subsequent communications field set to symbol 126 (no information). The destination maritime identity may be either an individual station or a group. The position (message 2) and time (message 3) fields in the initial DSC message shall be replaced by the digits 9 and 8 respectively, in accordance with paragraphs 8.2.3 and 8.2.4 of Recommendation ITU-R M.493-14 [1].

As soon as the internal electronic position fixing device is able to provide an accurate position and time, the closed loop MOB device shall transmit a further distress alert relay on behalf of another ship with the position and time from the position fixing device automatically inserted into the message. The position expansion sequence of Recommendation ITU-R M.821-1 [4] shall be used. The AIS transmitter begins transmitting MOB messages at this time. The AIS transmissions will continue until the MOB device is manually switched off or the battery is exhausted.

After the initial DSC transmission, the DSC receiver in the closed loop MOB device shall turn on and monitor the DSC channel for acknowledgment messages for 30 minutes. If a DSC distress alert relay acknowledgment message is not received, the closed loop MOB device shall operate with a duty cycle of at least one message every 5 minutes. The actual transmitter duty cycle shall be a randomly selected time of between 4,9 and 5,1 minutes. If, after a 12 minute period, a DSC distress alert relay acknowledgment message has not been received, the MOB device shall then switch from closed loop to open loop mode by transmitting a DSC message coded as an all ships distress alert as specified in Table A1-4.1. The nature of distress field shall be set to symbol 110 (man overboard) and the subsequent communications field set to symbol 126 (no information). Position and time shall be automatically inserted from the internal electronic position fixing device. After this transmission, the DSC receiver shall turn on and monitor the DSC channel for acknowledgment messages for 5 minutes. After 30 minutes have elapsed without an acknowledgment message being received, the MOB device's duty cycle should then change to 10 minutes. The actual transmitter duty cycle shall be a randomly selected time of between 9,9 and 10,1 minutes. This will continue until an acknowledgment message is received, the batteries are exhausted or the MOB device is switched off. After each transmission, the DSC receiver shall turn on and monitor the DSC channel for acknowledgment messages for 5 minutes.

5.2.1.2 Open loop operation

Messages from and to open loop MOB devices using VHF DSC are defined in Tables A1-4.1, A1-4.2 of Recommendation ITU-R M.493-14 [1]. On initial activation, the open loop MOB device shall transmit a DSC message formatted as a distress alert as specified in Table A1-4.1. The nature of distress field shall be set to symbol 110 (man overboard) and the subsequent communications field set to symbol 126 (no information). The position (message 2) and time (message 3) fields in the initial DSC message shall be replaced by the digits 9 and 8 respectively, in accordance with paragraphs 8.2.3 and 8.2.4 of Recommendation ITU-R M.493-14 [1].

As soon as the internal electronic position fixing device is able to provide an accurate position and time, the open loop MOB device transmits a further distress alert with the position and time from the position fixing device automatically inserted into the message. The position expansion sequence of Recommendation ITU-R M.821-1 [4] shall be used. The AIS transmitter begins transmitting MOB messages at this time. The AIS transmissions will continue until the MOB device is manually switched off or the battery is exhausted.

After the initial DSC transmission, the DSC receiver in the open loop MOB device shall turn on and monitor the DSC channel for acknowledgment messages for 30 minutes.

If a DSC Distress Alert Acknowledgment message is not received, the open loop MOB device shall operate with a duty cycle of at least one message every 5 minutes for a period of 30 minutes. The actual transmitter duty cycle shall be a randomly selected time of between 4,9 and 5,1 minutes.

After 30 minutes have elapsed without an acknowledgment message being received, the open loop MOB device's duty cycle should then change to 10 minutes. The actual transmitter duty cycle shall be a randomly selected time of between 9,9 and 10,1 minutes. This will continue until an acknowledgment message is received, the batteries are exhausted or the MOB device is switched off. After each transmission, the DSC receiver shall turn on and monitor the DSC channel for an acknowledgment messages for 5 minutes.

5.2.1.3 Distress self cancel

MOB devices shall be capable of transmitting a distress self cancel message, as described in clause 8.6 and Table A1-4.2 of Recommendation ITU-R M.493-14 [1].

The action of switching off a MOB device that has previously sent a Distress Alert as specified in Table A1-4.1 of Recommendation ITU-R M.493-14 [1] and that has not been acknowledged, shall cause the MOB device to transmit the distress self cancel message.

5.2.2 Test mode

When activated in test mode the locating device will not transmit until it has a valid GNSS position fix. As soon as the integral GNSS receiver is able to provide an accurate position and time, the locating device shall transmit an AIS test message burst formatted in accordance with clause B.2 of ETSI EN 303 098 [2].

Following the transmission of the AIS test message burst the locating device shall transmit a DSC test message. This message shall be formatted as a safety (108) call, as specified in table A1-4.7, of Recommendation ITU-R M.493-14 [1], with the format specifier set to 120 and message 2 (frequency or position number) is set to 126 (no information). The destination MMSI is the own vessel MMSI (clause 4.9) and can be either an individual or a group MMSI. If the own vessel MMSI is invalid or not programmed the locating device shall not transmit but shall indicate the problem to the user (see clause 4.5.2).

If a position fix is not obtained within 5 minutes of the test mode activation the locating device shall abandon the test without transmitting.

After the Test Message transmission, the DSC receiver in the locating device (DSC Rx) shall operate and monitor channel 70 for a period of 2 minutes. Within that period it should receive a DSC test acknowledgement message, formatted in accordance with table A1-4.7 of Recommendation ITU-R M.493-14 [1] and with matching self ID. On receipt of this acknowledgement the locating device shall indicate correct reception of the ack. The locating device shall then exit test mode and deactivate.

5.3 Action on receipt of acknowledgment messages to alerts

If a DSC distress alert acknowledgement message, formatted in accordance with Table A1-4.2 of Recommendation ITU-R M.493-14 [1] as response to a DSC distress alert message, or a DSC distress alert relay acknowledgment message, formatted in accordance with Table A1-4.4 of Recommendation ITU-R M.493-14 [1] as response to a DSC distress alert relay message, is received by the MOB device, the DSC transmitter shall be switched off and no further DSC transmissions shall take place. The MOB device shall indicate reception of the acknowledgment message (see clause 4.5.2).

AIS transmissions shall continue until the device is deactivated.

6 Internal electronic position fixing device

The GNSS compliant receiver shall meet the following requirements of CENELEC EN 61108 series (GPS [5], GLONASS [6] or Galileo [7] as applicable):

a) position accuracy as stated in clause 4.3.3.2 of CENELEC EN 61108 [5], [6] and [7];

b) receiver sensitivity and dynamic range as stated in clause 4.3.7 of CENELEC EN 61108 [5], [6] and [7];

c) position update and resolution as stated in clause 4.3.9 of CENELEC EN 61108 [5], [6] and [7];

d) provide a resolution of one ten thousandth of a minute of arc and use the WGS-84 datum or a datum that differs from WGS-84 by no more than ±40 cm worldwide.

The manufacturer shall provide evidence that an internal GNSS device cold start is forced at every DSC-MOBinitial activation (cold start refers to the absence of time dependent or position dependent data in memory, which might affect the acquisition of the GNSS position).

History

Document history			
V1.1.0	November 2016	EN Approval Procedure	AP 20170208: 2016-11-10 to 2017-02-08
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