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Interested committees:

Title: BS IEC 61097-9 Global maritime distress and safety system (GMDSS) –

Part 9: Shipborne transmitters and receivers for use in the MF and HF bands suitable for telephony, digital selective calling (DSC) and reception of Maritime Safety Information and Search and Rescue related information – Operational and performance required test results

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- iii) requires additional national guidance or information

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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.	

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80/1054/CD, 80/1070A/CC

IEC TC 80 : MARITIME NAVIGATION AND RADIOCOMMUNICATION EQUIPMENT AND SYSTEMS

SECRETARIAT:

United Kingdom

SECRETARY:

Mr Kim Fisher

OF INTEREST TO THE FOLLOWING COMMITTEES:

PROPOSED HORIZONTAL STANDARD:



Other TC/SCs are requested to indicate their interest, if any, in this CD to the secretary.

FUNCTIONS CONCERNED:

☐ EMC☐ ENVIRONMENT☐ QUALITY ASSURANCE☐ SAFETY

This document is still under study and subject to change. It should not be used for reference purposes.

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Recipients of this document are invited to submit, with their comments, notification of any local regulations or technical reasons that may exist and should be considered should this proposal proceed, recognizing that failure to address such requirements could result in the need for new or existing "In Some Countries" clauses. (See [AC/22/2007](#) or new [GUIDANCE DOC](#)).

TITLE:

Global maritime distress and safety system (GMDSS) – Part 9: Shipborne transmitters and receivers for use in the MF and HF bands suitable for telephony, digital selective calling (DSC) and reception of Maritime Safety Information and Search and Rescue related information – Operational and performance requirements, methods of testing and required test results

NOTE FROM TC/SC OFFICERS:

This CD has been prepared by MT19 subsequent to comments received on 80/1054/CD (80/1070A/CC).

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

GLOBAL MARITIME DISTRESS AND SAFETY SYSTEM (GMDSS) –**Part 9: Shipborne transmitters and receivers for use in the MF and HF bands suitable for telephony, digital selective calling (DSC) and reception of Maritime Safety Information and Search and Rescue related information – Operational and performance requirements, methods of testing and required test results**

FOREWORD

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IEC 61097-9 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 1997. This edition constitutes a technical revision.

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

- a) the text has been updated to incorporate the provisions of the new IMO performance standards given in Resolution MSC.512(105) and new ITU-R recommendations given in

M.493-16. These provisions in particular add new requirements for reception of maritime safety information and for the automatic connection system;

- b) the provisions for digital selective calling which were previously in IEC 61097-3 have been incorporated;
- c) the provisions for watch keeping receivers which were previously in IEC 61097-8 have been incorporated;
- d) new requirements have been added for software maintenance in 4.10 in support of IMO recommendations;
- e) new annexes A, B and C have been added for digital selective calling;
- f) new annexes D and G have been added for bridge alert management;
- g) new annex E and I have been added for maritime safety information;
- h) a new annex F has been added for the automatic connection system;
- i) a new annex H has been added for equipment manuals.
- j) a new annex J has been added for remote control operation;
- k) previous annexes A, B and C have been deleted as of no longer relevance.

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/standardsdev/publications.

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

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

GLOBAL MARITIME DISTRESS AND SAFETY SYSTEM (GMDSS) –

Part 9: Shipborne transmitters and receivers for use in the MF and HF bands suitable for telephony, digital selective calling (DSC) and reception of Maritime Safety Information and Search and Rescue related information – Operational and performance requirements, methods of testing and required test results

1 Scope

This part of IEC 61097 specifies the minimum operational and performance requirements and methods of testing with required test results for transmitters and receivers capable of voice communication and digital selective calling for the GMDSS operating in either the medium frequency band only or in medium and high frequency bands allocated in the ITU Radio Regulations to the Maritime Mobile Service, as required by Chapter IV of SOLAS 1974 as amended. It is based on IMO resolution MSC.512(105) and takes account of Recommendation ITU-R M.493 for digital selective calling including the automatic connection system.

It also takes account of the general requirements given in IMO resolution A.694(17) and is associated with IEC 60945. When a requirement in this standard is different from IEC 60945, the requirement of this standard shall take precedence. It further takes account, as appropriate, of requirements for the presentation of navigation-related information on shipborne navigational displays given in IMO resolution MSC.191(79) as amended and is associated with IEC 62288, and the requirements of IMO resolution MSC.302(87) for Bridge Alert Management and is associated with IEC 62923-1 and IEC 62923-2.

This document also specifies the reception of maritime safety information and search and rescue related information by HF based on IMO resolution MSC.508(105).

NOTE 1 All text of this document the wording of which is identical to that in IMO Resolutions and to that in the relevant ITU-R Recommendations is printed in *italics* and is prefixed by references in brackets.

NOTE 2 This document introduces requirements, tests and their required results in the context of Digital Selective Calling (DSC) as defined by ITU-R recommendations such as ITU-R M.493, and in the context of Bridge Alert Management (BAM) as defined by IMO MSC.302(87) and IEC 62923-1. Certain terms, such as “alert”, “warning” and “priority” may have different meanings depending on the context where the term is used. The meaning of specific terms used in this document are as defined in the context of DSC unless specifically expressed otherwise. For example: expression “BAM alert” is used to indicate that the term “alert” is used in the context of BAM in that instance. Annex D provides further specifications on mapping of signals between the context of DSC and the context of BAM.

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 61162-1, *Maritime navigation and radiocommunication equipment and systems – Digital interfaces – Part 1: Single talker and multiple listeners*

IEC 61162-2, *Maritime navigation and radiocommunication equipment and systems – Digital interfaces – Part 2: Single talker and multiple listeners, high-speed transmission*

IEC 61162-450, *Maritime navigation and radiocommunication equipment and systems – Digital interfaces – Part 450: Multiple talkers and multiple listeners – Ethernet connection*

IEC 62288, *Maritime navigation and radiocommunication equipment and systems – Presentation of navigation-related information on shipborne navigational displays – General requirements, methods of testing and required test results*

IEC 62923-1, *Maritime navigation and radiocommunication equipment and systems – Bridge alert management – Part 1: Operational and performance requirements, methods of testing and required test results*

IEC 62923-2, *Maritime navigation and radiocommunication equipment and systems – Bridge alert management – Part 2: Alert and cluster identifiers and other additional features*

IMO Resolution MSC.512(105), *Performance standards for shipborne MF and MF/HF radio installations capable of voice communication, digital selective calling and reception of Maritime Safety information: Search and Rescue related information*

IMO Resolution MSC.508(105), *Performance standards for the reception of maritime safety information and Search and Rescue related information by MF (NAVTEX) and HF*

Recommendation ITU-R M.493-16:2023, *Digital selective-calling system for use in the maritime mobile service*

Recommendation ITU-R M.540-2:1990, *Operational and technical characteristics for an automated direct-printing telegraph system for promulgation of navigational and meteorological warnings and urgent information to ships*

Recommendation ITU-R M.541-11:2023, *Operational procedures for the use of digital selective calling equipment in the maritime mobile service*

Recommendation ITU-R M.625-4:2012, *Direct-printing telegraph equipment employing automatic identification in the maritime mobile service*

Recommendation ITU-R M.688, *Technical characteristics for a high frequency direct-printing telegraph system for promulgation of high seas and NAVTEX-type maritime safety information*

Recommendation ITU-R M.1173-1, *Technical characteristics of single-sideband transmitters used in the maritime mobile service for radiotelephony in the bands between 1 606.5 kHz (1 605 kHz Region 2) and 4 000 kHz and between 4 000 kHz and 27 500 kHz*

3 Terms and definitions and abbreviated terms

3.1 Terms and definitions

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

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

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

3.1.1**acknowledged**

indication that the objective of the initial DSC call has been achieved when used to describe an automated procedure

3.1.2**active**

automated procedure which has control of the general receiver and transmitter and is thus able to engage in subsequent communications and receive DSC calls on both the watch receiver and general receiver

3.1.3**automated procedure**

set of actions necessary to complete the objective of an initiating DSC call or non-DSC communication event

3.1.4**BAM alert**

alert defined by the concept of Bridge Alert Management (BAM)

3.1.5**critical errors**

set of information characters obtained from one or more received DSC calls if the automated procedure needs information characters from that set in order to proceed or perform any task, but the required information characters are in error

EXAMPLE An acknowledgement cannot be composed to an individual DSC call that has errors in the sender's MMSI.

3.1.6**default**

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

3.1.7**distress alert**

single distress DSC call with the format specifier symbol 112

3.1.8**distress alert attempt**

set of distress alerts sent by a vessel when in distress

3.1.9**distress DSC message**

DSC message or acknowledgement containing the distress information

3.1.10**distress event**

unique distress situation identified by three parameters of the distress information

Note 1 to entry. The parameters are the MMSI of the vessel in distress and the nature of distress. The third parameter is the mode of subsequent communication which is only applicable for obsolete equipment.

3.1.11**distress information**

symbols within a DSC call 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

125 Note 1 to entry. The mode of subsequent communication is only applicable for obsolete equipment.

126 **3.1.12**

127 **Dx/Rx**

128 notation used to describe the time diversity structure of DSC calls

129 **3.1.13**

130 **engaged**

131 indication that the equipment is busy handling an automated procedure

132 **3.1.14**

133 **factory default**

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

136 **3.1.15**

137 **general receiver**

138 receiver used for the reception of all subsequent communications and on HF the reception of
139 DSC acknowledgements on the duplex DSC channels

140 **3.1.16**

141 **identical**

142 set of information characters where all pairs of corresponding information characters are equal
143 or, if a pair of corresponding information characters is not equal, one of the pair is in error

144 **3.1.17**

145 **information characters**

146 set of symbols in a DSC call that contains the items of interest for the recipient and is used to
147 compute the ECC symbol that terminates the message

148 **3.1.18**

149 **initial DSC message**

150 DSC message that starts an automated procedure

151 **3.1.19**

152 **non-distress DSC message**

153 DSC messages or acknowledgments that do not contain the distress information

154 **3.1.20**

155 **objective**

156 goal or intent of the item when in reference to a DSC message or automated procedure

157 Note 1 to entry: Usually, this goal or intent is to establish subsequent communications or request information.

158 **3.1.21**

159 **on hold**

160 automated procedure which does not have access to the transmitter and general receiver and
161 therefore cannot engage in subsequent communications and is only able to receive DSC
162 messages on the watch receiver

163 **3.1.22**

164 **operator options**

165 any choices the operator can make while the automated procedure is engaged

166 **3.1.23**

167 **parallel event handling**

168 background process of handling a received DSC message that is not pertinent to the active
169 automated procedure

3.1.24**pertinent to the station**

any DSC message that would start an automated procedure if the equipment were in standby

3.1.25**self-terminating audible indication**

term used to describe a brief self-terminating sound which is repeated once every 30 seconds until confirmation or self-terminating after 5 minutes indicating the reception of a DSC call of a category other than distress or urgency or a repetition of a call of categories distress or urgency already received;

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

3.1.26**snooping**

situation where a station receives and handles DSC messages pertinent to other stations as if it were that station

3.1.27**standby**

status of an equipment not handling an automated procedure, either active or on hold, but being able to receive DSC calls

3.1.28**symbol**

<as part of the DSC sentence> 7 bits of a 10-bit DSC word that have the information content

3.1.29**top level**

items, buttons, or functions present and visible without requiring any action by the operator (such as scrolling, opening up menus, or removing any obscuring covers)

3.1.30**watch receiver**

separate receiver in DSC radios that continuously monitors the DSC distress frequencies on MF/HF, 2 187,5 kHz on MF

Note 1 to entry: On MF/HF, it is sometimes referred to as the scanning receiver.

3.1.31**word**

<as part of the DSC sentence> 10 bits that make up the coded entities of a transmitted DSC message

Note 1 to entry: The 10 bits consist of a 7 bit “symbol” that gives the information content and three bit zero count for the purposed of error testing

3.2 Abbreviated terms

ACS	automatic connection system
AGC	automatic gain control
BAM	bridge alert management
BER	bit error rate
CAM	central alert management
CCRS	consistent common reference system
DROBOSE	distress relay on behalf of someone else

215	DSC	digital selective calling
216	e.m.f.	electromotive force
217	ECC	error check character
218	EPFS	electronic position fixing system
219	EUT	equipment under test
220	HF	high frequency
221	HMI	human machine interface
222	MF	medium frequency
223	MMSI	maritime mobile service identity
224	NBDP	narrow band direct printing
225	RF	radio frequency
226	RMS	root mean square
227	SER	symbol error rate
228	SINAD	signal + noise + distortion/ noise + distortion
229	STS	standard test signal
230	TE	test equipment

231 **4 Performance requirements**

232 **4.1 General**

233 (See 10.4.1, 13.11)

234 *(MSC.512(105)/A1) The MF or MF/HF radiotelephone, digital selective calling (DSC) and*
 235 *reception of maritime safety information (MSI) and search and rescue (SAR) related information*
 236 *installation carried to meet any of the requirements of SOLAS regulations IV/9, 10 or 11, in*
 237 *addition to meeting the requirements of the Radio Regulations, the relevant ITU-R*
 238 *Recommendations and the general requirements set out in resolutions A.694(17) as specified*
 239 *in IEC 60945 and MSC.191(79) as amended as specified in IEC 62288 shall comply with the*
 240 *following minimum requirements.*

241 *(MSC.512(105)/A2.1) The installation which may consist of more than one piece of equipment*
 242 *shall be capable of operating on single-frequency channels or on single- and two-frequency*
 243 *channels.*

244 *(MSC.512(105)/A2.2) The equipment shall provide for the following categories of calling using*
 245 *both voice and DSC:*

- 246 *1 distress, urgency and safety;*
- 247 *2 general radiocommunications; and*
- 248 *3 ship operational requirements.*

249 *(MSC.512(105)/A2.3) The equipment shall provide capabilities for the reception and processing*
 250 *of MSI and SAR related information.*

251 *(MSC.512(105)/A2.4) The equipment shall comprise at least:*

- 252 *.1 a transmitter/receiver, including antenna(e);*
- 253 *.2 an integral main control unit and/or one or more separate control units, or control functions*
 254 *in an integrated communication system, with the possibility of separate slave control units;*

.3 a microphone with a press-to-transmit switch, which may be combined with a telephone in a handset;

.4 an internal or external loudspeaker;

.5 an integral or separate capability for reception and presentation of MSI and SAR related information;

.6 an integral or separate DSC facility;

.7 a dedicated DSC watchkeeping facility to maintain a continuous watch on distress channels. Where a scanning receiver is employed to watch more than one DSC channel, all selected channels shall be scanned within two seconds and the dwell time on each channel shall be adequate to allow detection of the dot pattern which precedes each DSC call. The scan shall only stop on detection of a 100 baud dot pattern; and

.8 an integral or separate facility to establish a connection between stations of the maritime mobile service by simple means using DSC conforming to Recommendation ITU-R M.493.

4.2 Power supplies

(See 10.4.2)

(MSC.512(105)/A3.1) The MF or MF/HF radio installation shall be powered from the ship's main source of electrical energy. In addition, it shall be possible to operate the installation from an alternative source of electrical energy including a reserve source of energy.

(MSC.512(105)/A3.2) If it is necessary to delay the application of voltage to any part of the transmitter after switching on, this delay shall be provided automatically.

(MSC.512(105)/A3.3) If the transmitter or receiver or both include parts which are required to be heated in order to operate correctly, for example crystal ovens, the power supplies to the heating circuits shall be so arranged that they can remain operative when other supplies to or within the equipment are switched off. If a special switch for the heating circuits is provided, its functions shall be clearly indicated; it shall normally be in the "on" position and be protected against inadvertent operation. The correct operating temperature shall be reached within a period of five minutes after the application of power.

4.3 Control and indicators

4.3.1 Operational controls

(See 10.4.3)

(MSC.512(105)/A4.1.1) It shall be possible to initiate distress alerts and conduct distress and safety communications from the position, or in the vicinity of the position, from which the ship is normally navigated.

(MSC.512(105)/A4.1.2) The equipment shall provide a standard interface to enable the selections of frequencies and setting of MMSI to be called from a remote control unit (e.g. INS) by using standardized interfaces (see 4.4). Details of remote operation are described in Annex J.

(MSC.512(105)/A4.1.3) The equipment shall provide functionality to establish connection with other stations of the mobile maritime service by simple means using DSC the "Automatic Connection System" conforming to Recommendation ITU-R M.493.

(MSC.512(105)/A4.1.4) The equipment shall provide visual and audible indication of any distress alert or alerts received on board at the position from which the ship is normally navigated, which may be different from the position of the primary control of the equipment.

4.3.2 Transmitter controls

(See 10.4.4)

299 (MSC.512(105)/A4.2.1) *Provision shall be made for indicating the antenna current or*
300 *power delivered to the antenna. Failure of the indicating system shall not interrupt the antenna*
301 *circuit.*

302 (MSC.512(105)/A4.2.2) *Manually tuned equipment shall be fitted with a sufficient number*
303 *of indicators to permit accurate and rapid tuning.*

304 (MSC.512(105)/A4.2.3) *Operation of the transmit/receive control shall not cause*
305 *unwanted emissions.*

306 (MSC.512(105)/A4.2.4) *All adjustment and controls necessary for switching the*
307 *transmitter to operate on 2 182 kHz and 2 187,5 kHz shall be clearly marked, in order that these*
308 *operations may be performed readily.*

309 **4.3.3 Receiver controls**

310 (See 10.4.5)

311 (MSC.512(105)/A4.3) *The receiver shall be provided with automatic gain control.*

312 **4.3.4 DSC controls and indicators**

313 (See 10.4.6)

314 (MSC.512(105)/A4.4.1) *It shall be possible to initiate and make distress and safety calls*
315 *from the position from which the ship is normally navigated. The means for initiating a distress*
316 *call shall be as prescribed in 4.5.*

317 (MSC.512(105)/A4.4.2) *Initiation of DSC distress calls shall take precedence over any*
318 *other operation of the facility.*

319 (MSC.512(105)/A4.4.3) *Self-identification data shall be stored in the DSC unit. It shall not*
320 *be possible for the user to easily change these data (See 4.8).*

321 (MSC.512(105)/A4.4.4) *Means shall be provided to enable routine testing of the DSC*
322 *facilities without radiation of RF signals.*

323 (MSC.512(105)/A4.4.5) *Provision shall be made for alerts with specific audible signals*
324 *and visual indications to indicate receipt of a distress or urgency call or a call having a distress*
325 *category. It shall not be possible to disable this alert. Provision shall be made to ensure that it*
326 *can be reset only manually (See D.3).*

327 The user manual shall include instructions for routine testing for the DSC.

328 **4.4 Interfaces**

329 (See 10.4.7)

330 (MSC.512(105)/A5.1) *Where the equipment is part of an integrated communication system*
331 *(ICS), integrated navigation system (INS), integrated bridge system (IBS) or connected to a*
332 *navigation system, this shall not impair any of the GMDSS functions of the system or the*
333 *equipment itself.*

334 (MSC.512(105)/A5.2) *Equipment shall provide an interface for bridge alert management (BAM)*
335 *in accordance with resolution MSC.302(87) on Performance standards for bridge alert*
336 *management.*

(MSC.512(105)/A5.3) The equipment shall provide an interface to report a ship identifier and location data from a received distress alert, MSI or SAR related information to a navigation display system in order to enable a graphical display and possible linking to available target information.

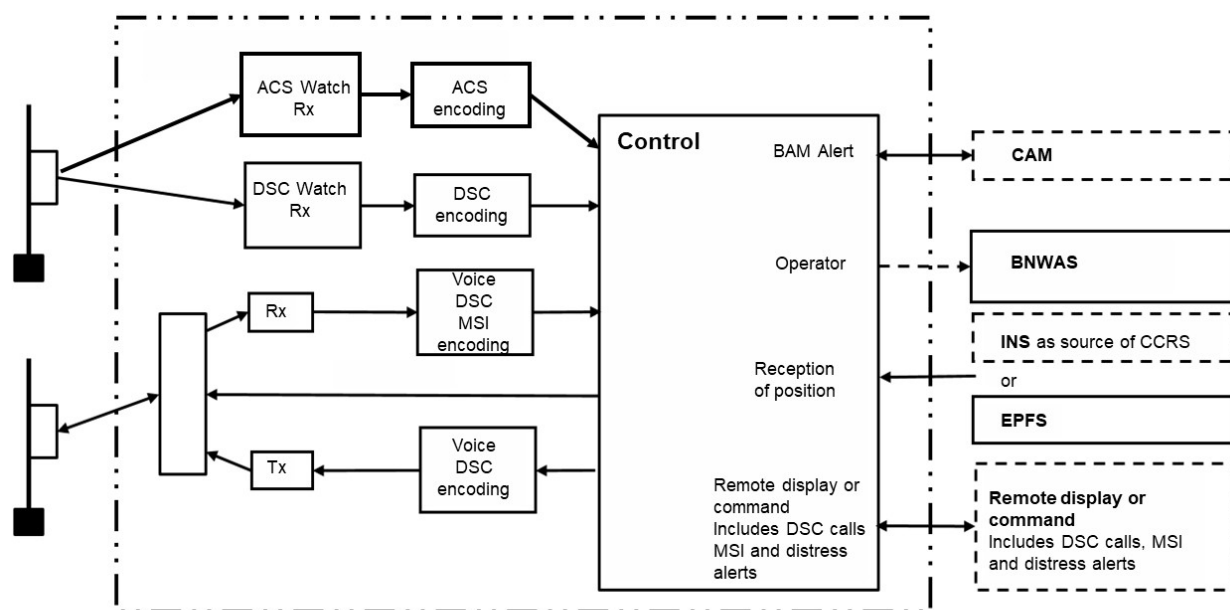
(MSC.512(105)/A5.4) All interfaces provided for communication with other navigation and communication equipment shall comply with the relevant international standards.

(MSC.512(105)/A6.1) Human-machine interface (HMI) shall provide all functions necessary to carry out all communication procedures including those required by the GMDSS.

(MSC.512(105)/A6.2) Visual indications and visual presentations of text and graphics of the system shall conform to resolution MSC.191(79) as amended as specified in IEC 62288.

Data interfaces shall be compatible with at least one of IEC 61162-1, IEC 61162-2 or IEC 61162-450. The manufacturer shall specify which alternative of IEC 61162 each physical interface supports.

Logical interfaces are shown in Figure 1. The manufacturer shall specify if any of the provided logical interfaces share the same physical interface.



NOTE

Solid line indicates mandatory part

Figure 1 – Interfaces of the equipment

As a minimum, the sentences GLL, GGA, RMC and GNS shall be recognised for input of position information. See Table 1.

The sentences ZDA together with validity information from at least one of GLL, GGA, RMC or GNS shall be recognised for providing UTC for automatic MSI reception by HF MSI receiver. See Table 1.

Additionally, for remote display and/or command purposes, the equipment shall be capable of outputting and inputting the sentences DSC, DSE and SFI (see Table 2 and Table 3).

The equipment shall also be capable of communicating with the sentences NRM and NRX as described in Annex I and with the electrical signal characteristics given in IEC 61162-1. The equipment shall also be capable of responding to query sentences as defined in IEC 61162-1 for the NRM and NRX sentences (see Table 2 and Table 3).

Optionally, if provided, the equipment may include an interface to report operator activity in order that the BNWAS can reset the dormant period (see Table 4). The EVE sentence as specified IEC 61162-1 shall be output in response to user-interaction with the DSC under conditions described in the user manual.

Sentences used by the BAM interface are listed in Table 5 and Table 6.

No connection of, or failure within any connected equipment shall affect the required performance of the equipment covered by this document.

Table 1 – Sentences input to the equipment for position information

Mnemonic	Interface (see Figure 1)	Name	Comment
GLL GGA GNS ^a RMC ^a	INS, as source of CCRS or EPFS	Geographic position – latitude/longitude	
ZDA	INS, as source of CCRS or EPFS	UTC	
^a IEC 61108-7 Ed.1			

Table 2 – Sentences output from the equipment

Mnemonic	Interface (see Figure 1)	Name	Comment
DSC DSE	Remote display or command	Digital selective calling information	Report a received DSC call, detail information
SFI	Remote display or command	Scanning frequency information	Report setting of DSC
NRX ^a	Remote display or command	MSI received message	Reports received Maritime Safety Information
NRM ^a	Remote display or command	MSI receiver mask	Reports configuration masks that control which messages are stored, printed and sent to the INS port of the HF-MSI receiver
^a See Annex I			

Table 3 – Sentences input to the equipment

Mnemonic	Interface (see Figure 1)	Name	Comment
DSC	Remote display or command	Digital selective calling information	Specifies details of a DSC call initiation
SFI	Remote display or command	Scanning frequency information	Used to set scanning frequencies of DSC
NRM ^a	Remote display or command	MSI receiver mask	Used to set configuration masks that control which messages are stored, printed and sent to the INS port of the HF-MSI receiver. Also used to request of currently stored messages
^a See Annex I			

Table 4 – Sentences output from the equipment for BNWAS

Mnemonic	Interface (see Figure 1)	Name	Comment
EVE	BNWAS, as watch alert device	Operator activity	Reset dormant period of the BNWAS

Table 5 – Sentences output from the equipment for CAM

Mnemonic	Interface (see Figure 1)	Name	Comment
ALC	CAM	Cyclic BAM alert list	List of current BAM alerts
ALF	CAM	BAM alert sentence	Details of a new BAM alert
ARC	CAM	BAM alert command refused	BAM Alert command not accepted

Table 6 – Sentences input to the equipment for CAM

Mnemonic	Interface (see Figure 1)	Name	Comment
ACN	CAM	BAM alert command	BAM alert command e.g. acknowledge
HBT	CAM	Heartbeat	Supports reliable alert related communication

The talker identifier for MF/HF equipment shall be CT. The HF-MSI receiver shall use talker identifier CR.

4.5 Distress controls

(See 10.4.8)

(MSC.512(105)/A2.5) A distress alert shall be activated only by means of a dedicated distress button. This button shall not be any key of an ITU-T digital input panel or an ISO keyboard provided on the equipment and shall be physically separated from functional buttons/keys used for normal operation. This button shall be a single button for no other purpose than to initiate a distress alert.

(MSC.512(105)/A2.6) The dedicated distress button shall:

.1 be clearly identified, red in colour and marked "DISTRESS". Where a non-transparent protective lid or cover is used, it shall also be marked "DISTRESS"; and

.2 be protected against inadvertent operation. The required protection of the distress button shall consist of a spring-loaded lid or cover permanently attached to the equipment by, for example, hinges. It shall not be necessary for the user to remove additional seals or to break the lid or cover in order to operate the distress button. The operation of the distress button shall generate a visible and audible indication. The distress button shall initiate a distress alert when kept pressed for at least three seconds. A flashing light and an intermittent acoustic signal shall start immediately. After the three seconds the transmission of the distress alert is initiated and the indication shall become steady and the acoustic signal shall stop. If the distress button is released before a distress alert is initiated, the light shall go out and the acoustic signal shall stop.

(MSC.512(105)/A2.7) The distress alert initiation shall require at least two independent actions. The lifting of the protective lid or cover is considered as the first action. Pressing the distress button as specified above is considered as the second independent action.

(MSC.512(105)/A2.8) The equipment shall indicate the status of the distress alert transmission.

(MSC.512(105)/A2.9) It shall be possible to interrupt and initiate distress alerts at any time and to interrupt repetitive transmissions of distress messages. Such operation shall not interrupt the transmission of a distress alert or distress message in progress but shall prevent repetitive transmissions of a distress message.

(MSC.512(105)/A2.10) Valid GNSS position and timing data from either an internal or external source shall be available to the equipment at all times. The loss of position information shall generate a visible or audible indication.

All adjustments and controls necessary for switching the transmitter and receiver to operate on the distress and safety channels applicable to the equipment shall be clearly marked in order that this operation can be performed easily.

4.6 Control panel priority

(See 10.4.9)

If the accessible controls are located on a separate control panel and if there are two or more control panels, one of the control panels shall have priority over the others. If there are two or more control panels, when any control panel is in use, this shall be clearly indicated on all of the other control panels.

4.7 Labels

(See 10.4.10)

Labels shall be in accordance with IEC 60945.

Those of the following distress frequencies:

DSC
distress
(kHz)

Telephony
distress
(kHz)

2 187,5	2 182,0
4 207,5	4 125,0
6 312,0	6 215,0
8 414,5	8 291,0
12 577,0	12 290,0
16 804,5	16 420,0

applicable to the equipment, shall be clearly indicated, either on the front panel of the equipment or on an instruction label supplied with the equipment.

4.8 Safety precautions

(See 10.4.11)

The information in user programmable memory devices shall be protected from interruptions in the power supply of up to at least 24 h duration. Any software required to facilitate operation in accordance with this standard shall be permanently installed within the equipment.

Key parameters relating to the equipment and any software necessary for its initial activation or reactivation shall be stored in solid state non-volatile memory. Facilities shall be provided to protect all operational software incorporated in the equipment. It shall not be possible during routine use for the operator to augment, amend or erase any software in the equipment required for operation in accordance with this standard.

Means shall be provided to monitor the operational software of the equipment automatically at appropriate regular intervals, and to activate an alert in the event of failure.

4.9 Manuals

(See Annex H)

In addition to the requirements of IEC 60945, the manufacturer shall make the declarations/provided information in the user/installation manual in Annex H.

4.10 Software maintenance

(See 10.4.12)

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.

NOTE IEC 63154 contains guidance on cyber security for maritime navigation and radiocommunication equipment.

It shall be possible for the user to view the software versions in use.

4.11 Bridge Alert management (BAM)

The equipment shall implement BAM functionality compliant to IMO MSC.302(87) and IEC 62923. The equipment shall fulfil the requirements applicable for BAM function type P as described in IEC 62923-1. Further requirements specific to BAM are described in Annex G.

5 Transmitter

5.1 Frequencies and classes of emission

(See 11.1, 11.7)

(MSC.512(105)/B1.1) For MF only equipment, the radiotelephone and DSC transmitter shall be capable of transmitting on all frequencies allocated in the bands between 1 605 kHz and 4 000 kHz, but at least the frequency 2 182 kHz for voice and the DSC frequency 2 187.5 kHz, as well as the DSC frequency 2 177 kHz used for routine calls shall be readily accessible to the operator.

(MSC.512(105)/B1.2) For MF/HF equipment the transmitter shall be capable of transmitting on all frequencies allocated to the maritime mobile service in the frequency band 1 605 kHz to 27 500 kHz. As a minimum, the following frequencies shall be readily accessible to the operator: the voice frequencies 2 182, 4 125, 6 215, 8 291, 12 290 and 16 420 kHz; and the DSC frequencies 2 187.5, 4 207.5, 6 312, 8 414.5, 12 577 and 16 804.5 kHz and the DSC routine calling frequencies in the 2 MHz, 4 MHz, 6 MHz, 8 MHz, 12 MHz and 16 MHz bands as defined by the ITU-R Radio Regulations.

(MSC.512(105)/B1.3) Radiotelephone frequencies are designated in terms of the carrier frequency; DSC frequencies are designated in terms of the assigned (centre) frequency. When DSC signals are transmitted using a transmitter in the J2B mode the (suppressed) carrier frequency shall be adjusted so as to have the DSC signal transmitted on the assigned frequency. The selected transmitter frequency shall be clearly identifiable on the control panel of the equipment.

(MSC.512(105)/B1.4) The transmitter shall be capable of transmitting upper side band using classes of emission J3E and either J2B or F1B. The modulation shall change automatically according to the designation of the frequency selected.

(MSC.512(105)/B1.4.1) When switching to the pre-set distress frequencies 2 182, 4 125, 6 215, 8 291, 12 290 and 16 420 kHz, the appropriate class of emission in accordance with the Radio Regulations shall be selected automatically.

(MSC.512(105)/B1.4.2) When switching to the assigned (centre) frequencies for DSC specified in paragraphs B1.1 and B1.2 above, classes of emission F1B or J2B shall be selected automatically.

(MSC.512(105)/B1.5) It shall be possible for the user to select transmission frequencies independent of any receiver setting. This does not preclude the use of transceivers.

(MSC.512(105)/B1.6) It shall be possible to change the transmitter quickly from operation on any frequency to operation on any other frequency, and in any event within a period not exceeding five seconds. The equipment shall not be able to transmit during channel switching operations.

(MSC.512(105)/B1.7) Means shall be provided to automatically control the modulation level to prevent over modulation.

5.2 Frequency accuracy and stability

(See 11.2, 11.4)

(MSC.512(105)/B2) The transmitter frequency shall be provided with a frequency tolerance (+/- 10 Hz) which ensures reception of the voice and DSC signal.

(M.1173-1/A.1-5) The unwanted frequency modulation of the carrier shall be sufficiently low to prevent harmful distortion.

5.3 Output power

(See 11.3, 11.12, 11.6, 11.16)

504 *(MSC.512(105)/B3.1) During normal modulation, the peak envelope power in the case of J3E*
505 *emissions, or the mean power in the case of J2B or F1B emissions, shall be at least 60 W at*
506 *any frequency within the specified frequency range.*

507 *NOTE 1 In some areas of the world a 60 W value is not adequate to ensure reliable communications. A value greater*
508 *than 60 W can be required in these areas.*

509 *(MSC.512(105)/B3.2) If the rated output power exceeds 400 W in the MF band, provision should*
510 *be made for reducing the output to 400 W or less.*

511 *NOTE 2 The Radio Regulations No.52.127 specify a 400 W maximum power for equipment operating in the MF band*
512 *in region 1.*

513 *(M.1173-1/A.1-1) For class J3E emissions the power of the carrier shall be at least 40 dB below*
514 *the peak envelope power.*

515 The output power when the transmitter is switched off by means of a keying signal shall
516 be -150 dB relative to the power output or -93 dBm, whichever is the higher power level.

517 **5.4 Transmitter input**

518 (See 11.5, 11.6, 11.7, 11.8)

519 For the transmission of voice signals, the transmitter shall have a microphone input, suitable to
520 produce an output power level within -3 dB and -9 dB relative to full output power when a
521 sound level of 94 dBA is applied to the microphone.

522 *(M.1173-1/A.1-3) The transmitter audio-frequency band shall be 350 Hz to 2 700 Hz with a*
523 *permitted amplitude variation of 6 dB.*

524 **5.5 Permissible warming-up period**

525 (See 11.2)

526 *(MSC.512(105)/B4) The equipment shall be capable of operation within one minute after*
527 *switching on.*

528 **5.6 Continuous operation**

529 (See 11.13)

530 *(MSC.512(105)/B5.1) The transmitter shall be capable of continuous voice operation at rated*
531 *power without causing any reduction in performance or damage to the equipment.*

532 *(MSC.512(105)/B5.2) The transmitter shall have a visual indication that the transmitter is*
533 *activated and shall provide a facility integrated in the power amplifier to limit the continuous*
534 *transmission time to a maximum of five minutes.*

535 **5.7 Safety precautions**

536 (See 11.15)

537 *(MSC.512(105)/B7.1) The equipment shall be so designed and constructed that, when the*
538 *transmitter is providing power to the antenna, the transmitter is protected against damage*
539 *resulting from disconnection of the antenna or short-circuiting of antenna terminals. If this*
540 *protection is provided by means of a safety device, that device shall automatically be reset*
541 *following removal of the antenna open-circuit or short-circuit conditions.*

(MSC.512(105)/B7.2) In case the standing wave ratio (SWR) becomes too high, the power of the transmitter can be automatically reduced without stopping the transmission and an appropriate alert shall be initiated.

5.8 Power of out of band emissions

(See 11.8)

(M.1173-1/A.1-6) When class H3E or J3E emissions are used, the power of any unwanted emission supplied to the antenna transmission line on any discrete frequency shall, when the transmitter is driven to full peak envelope power, be in accordance with the Table 7:

Table 7 – Power of out-of-band emissions

Separation Δ in kHz between the frequency of the out-of-band emission and a frequency 1 400 Hz above the carrier	Minium attenuation below maximum peak envelope power dB
$1,5 < \Delta \leq 4,5$	31
$4,5 < \Delta \leq 7,5$	38
$7,5 < \Delta \leq 12$	43 without exceeding the power of 50 mW

5.9 Power of conducted spurious emissions

(See 11.9)

The power of any conducted spurious emission shall be in accordance with Table 8.

Table 8 – Conducted spurious emissions

Frequency range	Minimum attenuation below peak envelope power in transmit mode – dB	Power in the transmit stand-by mode nW
9 kHz to 2 GHz	43 without exceeding the power of 50 mW	2
>2 GHz to 4 GHz	43 without exceeding the power of 50 mW	20

5.10 Residual hum and noise

(See 11.10)

The residual hum and noise power excluding the carrier shall be at least 40 dB below the peak envelope power.

5.11 Residual frequency modulation on DSC

(See 11.11)

The residual frequency modulation shall not be greater than –26 dB.

6 Receiver

6.1 Frequencies and classes of emission

(See Clause 12, Clause 13)

(MSC.512(105)/C1.1) For MF equipment only, the receiver shall be capable of being tuned throughout the bands between 1 605 kHz and 4 000 kHz. The frequency for 2 182 kHz for voice and the DSC frequency 2 187.5 kHz as well as the DSC routine frequency 2 177 kHz shall be readily accessible to the operator.

(MSC.512(105)/C1.2) For MF/HF the receiver shall be capable of being tuned throughout the bands between 1 605 kHz and 27 500 kHz. As a minimum, the following frequencies shall be readily accessible to the operator: the carrier frequencies 2 182, 4 125, 6 215, 8 291, 12 290 and 16 420 kHz for radiotelephony; and the DSC frequencies 2 187.5, 4 207.5, 6 312, 8 414.5, 12 577 and 16 804.5 kHz and the DSC routine frequencies in the 2 MHz, 4 MHz, 6 MHz, 8 MHz, 12 MHz and 16 MHz bands as defined by the ITU-R Radio Regulations.

(MSC.512(105)/C1.3) Radiotelephone frequencies shall be designated in terms of the carrier frequency and DSC frequencies shall be designated in terms of the assigned (centre) frequency. The selected receiver frequency shall be clearly identifiable on the control panel of the equipment.

(MSC.512(105)/C1.4) The receiver shall be capable of receiving upper side-band signals as appropriate for classes of emission J3E, J2B and F1B.

(MSC.512(105)/C1.5) The class of emission shall be selectable by not more than one control.

(MSC.512(105)/C1.6) It shall be possible for the user to select reception frequencies independent of any transmitter setting. This does not preclude the use of transceivers.

(MSC.512(105)/C1.7) The receiver shall be capable of being tuned to different frequencies quickly, and in any event within a period not exceeding five seconds.

6.2 Frequency tolerance and accuracy

(See 12.2)

(MSC.512(105)/C2) The receiver frequency shall be provided with a frequency tolerance (+/- 10 Hz) which ensures reception of the voice and DSC signal.

6.3 Usable sensitivity

(See 12.5, 13.2, 13.8)

(MSC.512(105)/C3) For classes of emission J3E and F1B the sensitivity of the receiver shall be equal to or better than 6 μ V e.m.f. at the receiver input for a signal-to-noise and distortion (SINAD) ratio of 20 dB. For DSC an output character error rate of 10^{-2} or less shall be obtained for a signal-to-noise ratio of 12 dB.

6.4 Receiver output

(See 12.1, 12.6)

(MSC.512(105)/C4.1) For the reception of voice signals, the receiver shall be suitable for use with a loudspeaker and a telephone handset and shall be capable of providing power of at least 2 W to loudspeaker and at least 1 mW to the handset.

Facilities shall be provided to enable the loudspeaker to be switched off when reception is by headphones or telephone handset. Automatic facilities shall be provided to turn off the loudspeaker during duplex operation, when provided.

(MSC.512(105)/C4.2) An output, earth free, shall be provided for DSC signals if the corresponding facility is not integrated.

6.5 Permissible warming-up period

(See 12.2)

(MSC.512(105)/C5.1) The equipment shall be capable of operating within one minute after switching on.

6.6 Immunity to interference

(See 12.7, 12.8, 12.9, 12.10, 12.11, 12.12, 12.14, 12.18, 13.3, 13.4, 13.5, 13.6, 13.7)

(MSC.512(105)/C7.1) The immunity to interference of the receiver shall be such that the wanted signal is not seriously affected by unwanted signals.

6.7 Antenna static protection

(See 12.19, 13.10)

In order to provide protection against damage due to static voltages which may appear at the input of the receiver, there shall be a d.c. path from the antenna terminal to ground not exceeding 100 k Ω .

6.8 Noise reducer

(See 10.4.5)

If a device is provided in the receiver to reduce the effects of impulsive noise, a switch shall be provided to disable its function.

6.9 Audio gain control and automatic gain control (AGC)

(See 12.15, 12.16, 12.17)

The receiver shall be provided with a control of audio frequency gain and with an AGC.

6.10 Unwanted frequency modulation

(See 12.3)

The frequency peak deviation shall not exceed ± 5 Hz

6.11 Audio frequency pass band

(See 12.4)

The audio frequency pass band shall at least contain 350 Hz to 2 700 Hz.

6.12 Conducted spurious emissions into the antenna

(See 12.13, 13.9)

The power of any discrete component shall not exceed 2 nW from 9 kHz to 2 GHz, and 20 nW from 2 GHz to 4 GHz.

7 Digital selective calling facility

7.1 DSC capabilities

(See 10.4.13)

(MSC.512(105)/D1.1) The facility shall conform to the provisions of the relevant ITU-R Recommendations pertaining to the DSC system (Recommendations ITU-R M.493 and ITU-R M.541).

(MSC.512(105)/D1.2) The DSC facility shall comprise:

.1 means to decode and encode DSC messages;

.2 means necessary for composing the DSC message;

.3 means to verify the prepared message before it is transmitted;

.4 means to display, the information contained in a received call in plain language;

The display shall have a minimum of 160 characters in two or more lines.

.5 facilities to automatically update the ship's position and the time at which the position was determined from a suitable electronic position-fixing aid which may be an integral part of the equipment. For equipment which does not have an integral position-fixing aid, such facilities shall include a suitable interface conforming to the appropriate international standards (see 4.4);

.6 means for the manual entry of position and the time at which the position information was determined shall be provided; and

.7 means to activate an alert when:

.1 no position data is received from the electronic position-fixing aid; or

.2 in the case of manual input, the position information is over four hours old.

Any position information not updated for more than 23.5 hours shall be erased.

7.2 Distress message storage

(See 10.4.14)

(MSC.512(105)/D2.1) Sufficient capacity shall be provided to enable at least 20 received distress messages to be stored in the DSC facility.

(MSC.512(105)/D2.2) These calls shall be marked as read when they are printed or displayed.

7.3 DSC characteristics

The technical description of DSC is given in Annex 1 of Recommendation ITU-R M.493-16:2023.

The required operation of DSC is given in Annex A.

For BAM related requirements specific to DSC, see Annex G.

8 Facility for the reception of MSI

8.1 General

(See Annex E)

(MSC.512(105)/E) The facility can be an integral part or a separate part of the MF/HF-Radio. It shall conform to the Performance standards for the reception of maritime safety information and search and rescue related information by MF (NAVTEX) and HF (resolution MSC.508(105)).

(MSC.508(105)/A1.2) In addition to meeting the requirements of the Radio Regulations, the receiver for HF-MSI shall comply with Recommendation ITU-R M.688.

679 (MSC.508(105)/2.1) The equipment shall comprise radio receivers of at least one frequency
680 band, a signal processor and either:

681 .1 an integrated printing device; or

682 .2 a dedicated display device, printer output port and a non-volatile message memory; or

683 .3 a connection to an integrated navigation system and a non-volatile message memory.

684 (540/All.2) The equipment shall be capable of receiving messages in the collective B-mode of
685 the direct printing system specified in ITU-R Recommendation M.625-4:2012, Annex I,4.

686 8.2 Controls and indicators

687 (See E.4)

688 (MSC.508(105)/3) Details of the coverage areas and message categories which have been
689 excluded by the operator from reception and/or display shall be readily available.

690 The settings for coverage areas and message categories shall be applied to all operating
691 frequencies of the receiver.

692 (540/All.2.1) Both the B_1 characters identifying the different transmitter coverage areas and
693 the B_2 characters identifying the different types of messages are defined by IMO and chosen
694 from table I of ITU-R Recommendation M.625, combination numbers 1-26.

695 a) Ship equipment shall be capable of automatically rejecting unwanted information using
696 character B_1 .

697 b) Ship equipment shall be capable of disabling print-out, transmission to the INS port or
698 display of selected types of messages using character B_2 with the exception of messages
699 with B_2 characters A, B, D and L.

700 c) If any facility is rejected (transmitter coverage area) or disabled (type of message) the extent
701 of any such limitation shall be clearly indicated to the user.

702 (540/All.2.2) $B_3 B_4$ is a two-character serial number for each B_2 , starting with 01 except in
703 special cases where the serial number 00 is used.

704 (540/All.3) The printer, display, message store or INS port output shall only be activated if the
705 preamble $B_1 B_2 B_3 B_4$ is received without errors.

706 (540/All.4) Facilities shall be provided to avoid printing, storage or display of the same
707 message several times on the same ship, when such a message has already been satisfactorily
708 received.

709 (540/All.5) The necessary information for these measures shall be deduced from the
710 sequence $B_1 B_2 B_3 B_4$.

711 (540/All.6) A message shall always be printed, stored, displayed and INS port output if $B_3 B_4 =$
712 00.

713 (540/All.2.3) The characters ZCZC $B_1 B_2 B_3 B_4$ need not be printed/displayed.

714 Means for enabling print-out and output to the INS port of messages received without headers
715 $B_1 B_2 B_3 B_4$ shall be provided (see Annex E).

716 NOTE It is possible that HF-MSI messages will be received which do not include $B_1 B_2 B_3 B_4$ characters.

8.3 Receiver

(See E.5)

(MSC.508(105)/4.2.1) The receiver sensitivity shall be equal to or better than e.m.f. of 6 μ V at the receiver input to produce an NBDP output character error rate of not greater than 10^{-2} .

(MSC.508(105)/4.2.2) A UTC clock, accurate to at least one second, and associated with a reprogrammable memory which contains the frequency sequence and UTC broadcast schedules of all stations, shall control the HF receiver to provide automatic MSI reception.

(MSC.508(105)/4.2.3) The receiver shall be capable of being alerted by digital selective calling and tuned to the HF-MSI frequency to receive unscheduled broadcasts automatically.

The recognised receive frequencies shall include at least 4 210 kHz, 6 314 kHz, 8 416.5 kHz, 12 579 kHz, 16 806.5 kHz, 19 680.5 kHz, 22 376 kHz and 26 100.5 kHz.

8.4 Display device and printer

(See E.4, E.6)

(MSC.508(105)/5.1) The display device and/or printer shall be able to display a minimum of 32 characters per line.

(MSC.508(105)/5.2) If a dedicated display device is used, the following requirements shall be met:

.1 an indication of newly received unsuppressed messages shall be immediately displayed until acknowledged or until 24 hours after receipt; and

.2 newly received unsuppressed messages shall also be displayed.

New search and rescue (SAR) messages with the B₂ characters D shall be displayed immediately that they are received and stored, and shall cause an alert to be set. SAR messages shall be displayed until they are acknowledged by the cancellation of the alert.

The reception and storage of new messages other than SAR messages shall be clearly indicated to the user.

(MSC.508(105)/5.3) The display device shall be able to display at least 16 lines of message text.

(MSC.508(105)/5.4) The design and size of the display device shall be such that displayed information is easily read under all conditions by observers at normal working distances and viewing angles.

(MSC.508(105)/5.5) If automatic line feed entails division of a word, this shall be indicated in the displayed/printed text.

(MSC.508(105)/5.6) When displaying received messages on a display device, a clear indication of the end of a message shall be given by automatically adding line feeds after the message or including some other form of delineation. The printer or printer output shall automatically insert line feeds after completing print of the received message.

(MSC.508(105)/5.7) The equipment shall display/print an asterisk if the character is received corrupted.

(MSC.508(105)/5.8) Where the printer is not integrated, it shall be possible to select the following data to be output to a printer:

- .1 all messages as they are received;
- .2 all messages stored in the message memory;
- .3 all messages received on specified frequencies, from specified locations or having specified message designators;
- .4 all messages currently displayed; and
- .5 individual messages selected from those appearing on the display.

8.5 Storage

8.5.1 Non-volatile message memory

(See E.7.1)

(MSC.508(105)/6.1.1) It shall be possible to record at least 200 messages of average length 500 characters (printable and non-printable) in non-volatile message memory. It shall not be possible for the user to erase messages from memory. When the memory is full, the oldest messages shall be overwritten by new messages.

It shall be possible to record individual messages up to 8000 characters in length.

(MSC.508(105)/6.1.2) The user shall be able to tag individual messages for permanent retention. These messages can occupy up to 25 % of the available memory and shall not be overwritten by new messages. When no longer required, the user shall be able to remove the tag on these messages which can then be overwritten in normal course.

8.5.2 Message identifications

(See E.7.2)

(MSC.508(105)/6.2.1) The equipment shall be capable of internally storing at least 200 message identifications.

(MSC.508(105)/6.2.2) After between 60 h and 72 h, a message identification shall automatically be erased from the store (unless tagged for permanent retention). If the number of received message identifications exceeds the capacity of the store, the oldest message identification shall be erased.

(MSC.508(105)/6.2.3) Only message identifications which have been satisfactorily received shall be stored; a message is satisfactorily received if the error rate is below 4 %.

8.5.3 Programmable control memories

(See E.7.4)

(MSC.508(105)/6.3) Information for location (B_1) and message (B_2) designators, as described in Recommendation ITU-R M.540, in programmable memories shall not be erased by interruptions in the power supply of less than 6 h.

8.6 Alert

(See E.4.3)

(MSC.508(105)/7) The receipt of search and rescue information ($B_2 = D$) shall give an alert at the position from which the ship is normally navigated. It shall only be possible to reset this alert manually.

795 If an additional alert is provided at the equipment to indicate, for example, the reception of
796 navigational and/or meteorological warnings, the user shall have the possibility to disengage
797 this alert function. Manufacturer shall define the additional audible indications if provided.

798 For BAM related requirements specific to MSI-receiver, see Annex G.

799 **8.7 Test facilities**

800 (See E4.5)

801 *(MSC.508(105)/8) The equipment shall be provided with a facility to test that the radio*
802 *receiver, the display device/printer and non-volatile message memory are functioning correctly.*

803 The user manual shall include instructions for routine testing for the MSI reception.

804 **8.8 Interfaces**

805 *(MSC.508(105)/9.1) The equipment shall include at least one interface for the transfer of*
806 *received data to other navigation or communication equipment (see 4.4).*

807 *(MSC.508(105)/9.2) All interfaces provided for communication with other navigation or*
808 *communication equipment shall comply with the relevant international standards (see 4.4).*

809 *(MSC.508(105)/9.3) If there is no integrated printer, the equipment shall include a standard*
810 *printer interface.*

811 *(MSC.508(105)/9.4) The equipment shall include an interface for alert management in*
812 *accordance with the Performance standards for bridge alert management (resolution*
813 *MSC.302(87)) (see 4.4).*

814 **9 Automatic connection system**

815 **9.1 General**

816 (See Annex F)

817 *(MSC.512(105)/F) The function for automatic connection system can be an integral part or a*
818 *separate unit of the MF/HF station.*

819 The required operation of ACS is given in Annex F.

820 **9.2 Transmitter**

821 (See F.3)

822 *(MSC.512(105)/F1) The system shall be able to send a DSC call on DSC routine calling*
823 *frequencies in all or selected bands either by the user or by a predefined automatic algorithm.*
824 *The call sent out shall provide a provisional transmit frequency as defined by the ITU-R Radio*
825 *Regulations.*

826 **9.3 Receiver**

827 (See F.4)

828 *(MSC.512(105)/F2.1) A dedicated receiver which can be the same receiver as that used as*
829 *DSC watch receiver to monitor the DSC distress frequencies or an additional receiver shall*
830 *scan the DSC routine calling frequencies as defined by the ITU-R Radio Regulations.*

If the DSC watch receiver has an ACS reception function, it shall not interfere with reception of distress, urgency and safety calls.

The equipment shall automatically set the dot pattern length to 200 bits for all ACS calls and ACS acknowledgements addressed to ship and coast stations.

(MSC.512(105)/F2.2) The scanning process shall only stop when a scanning receiver is employed to watch more than one DSC channel, all selected channels shall be scanned within two seconds and the dwell time on each channel shall be adequate to allow detection of the dot pattern which precedes each DSC call. The scan shall only stop on detection of a 100 baud dot pattern.

(MSC.512(105)/F2.3) The system shall be able when receiving a DSC call requesting a connection to confirm if the proposed frequency/channel is available. In case the proposed frequency/channel is not available, or the noise level is not adequate, the system shall propose an appropriate frequency/channel in the band with the lowest noise by using a defined DSC call and using the transmitter defined in 9.2.

(MSC.512(105)/F2.4) If the requested frequency is confirmed the system shall switch automatically to the confirmed frequency.

10 Methods of testing and required test results

10.1 Test conditions

10.1.1 Normal and extreme test conditions

Tests shall be made under normal test conditions and also, where stated, under extreme test conditions as specified in IEC 60945, of dry heat and upper limit of supply voltage applied simultaneously and low temperature and lower limit of supply voltage applied simultaneously.

10.1.2 Procedure for tests at extreme temperatures

For tests at extreme temperatures, the EUT shall be placed in a test chamber and left until thermal equilibrium is reached. The EUT shall then be switched on for 5 min, after which it shall meet the requirements of this standard.

10.1.3 Test power source

During each test the EUT shall be supplied from a test power source, capable of producing normal and extreme test voltages. For the purpose of tests, the voltage of the power source shall be measured at the input terminals of the EUT. During tests, the power supply voltages shall be maintained within ± 3 % relative to the voltage level at the beginning of each test.

10.2 General requirements

The equipment shall comply with the general requirements contained in IEC 60945, as applicable to the equipment category, for example “protected”, “exposed”.

For the purposes of IEC 60945 a performance check and performance test is:

a) with the transmitter connected to an artificial antenna (10.3.5) the transmitter shall be tuned to 2 182 kHz and operated in the J3E mode. For frequency error the test signal of 11.2.2 for SSB shall be applied to the transmitter input. For output power the test signal of 11.3.2 for SSB shall be applied to the transmitter input; and

b) with the AGC operative, the receiver shall be adjusted to 2 182 kHz in the J3E mode and the J3E test signal (10.3.2) shall be applied. The level of the input signal shall be adjusted until

the SINAD at the output of the receiver is 20 dB and the output power is at least the standard output power of 12.1.3.

The output frequency shall be within ± 10 Hz and the output power shall be within 60 W PEP and 400 W PEP. The level of the receiver input signal shall be less than 22 dB μ V.

The test shall be performed on 2 182 kHz if the transmitter is designed to work in the 1 605 kHz – 4 000 kHz band only, or 8 291 kHz for J3E if the equipment is designed to work on all maritime bands in the 1 605 kHz – 27 500 kHz range

The level of the input signal shall be not greater than +22 dB μ V at 2 182 kHz or not greater than +17 dB μ V at 8 291 kHz.

10.3 General conditions of measurement

10.3.1 Arrangements for test signals applied to the receiver input

For the purpose of testing, the receiver shall meet the requirements of this standard when connected as described below at the point at which the antenna is normally connected.

The 50 Ω network may be substituted, at the request of the manufacturer, by a network consisting of a 10 Ω resistor in series with a 250 pF capacitor for frequencies below 4 MHz. This shall in no way imply that the receiver should operate satisfactorily only with antennas having these impedance characteristics. The arrangement used shall be stated in the test report.

Test signals shall be connected through a network so that the impedance presented to the receiver antenna input is 50 Ω , except as permitted in 10.3.5, irrespective of whether one or more signals are applied to the receiver simultaneously. In the case of multiple test signals, steps shall be taken to prevent any undesirable effects due to interaction between the signals in the generators or other sources.

The level of the test input signals shall be expressed in terms of the electromotive force (e.m.f.) which would exist at the output terminals of the source including the associated network.

10.3.2 Normal test signals applied to the receiver input

Except where otherwise stated, radio frequency test signals applied to the receiver input shall be as given below:

- Class of emission J3E:

- an unmodulated signal 1 000 Hz $\pm$ 0,1 Hz above the carrier frequency to which the receiver is tuned.

- Class of emission F1B:

- for DSC a signal on the assigned frequency modulated as appropriate.

10.3.3 Arrangements for test signals applied to the transmitter input

Unless otherwise stated, the transmitter audio frequency modulation signal shall be supplied by a generator to an interface connected to the microphone input and this interface shall be provided by the manufacturer.

10.3.4 Normal test signals applied to the transmitter

Test signals for transmitter testing are specified in each appropriate test.

10.3.5 Artificial antennas

For the purpose of testing, the transmitter shall meet the requirements of this standard at the output of the antenna matching device when connected to the artificial antennas listed below. This shall in no way imply that the transmitter shall only work with antennas having these characteristics.

– 1 605 kHz to 4 000 kHz:

The artificial antenna shall consist of a resistance of 10 Ω and a capacitance of 250 pF connected in series.

– 4 MHz to 27,5 MHz:

The artificial antenna shall consist of a resistance of 50 Ω .

10.3.6 Testing frequencies

The frequencies used during each test shall be stated in the test report.

10.3.7 Bit error rate testing

BER testing is very time consuming especially when looking for a specific level such as a BER of 10^{-2} . It is therefore recommended that tests are made with the correct level signals and a pass or fail result is recorded in the test report, except for sensitivity tests in 12.5, where the absolute result is used as a reference for later tests.

10.3.8 Measurement uncertainty

Maximum values of absolute measurement uncertainties shall be as follows:

RF frequency	$\pm 1 \times 10^{-8}$
RF power (PEP in 10 Ω 250 pF)	$\pm 2,5$ dB
(PEP in 50 Ω)	$\pm 1,5$ dB
Adjacent channel power	± 5 dB
Conducted spurious of transmitter	± 4 dB
Audio output power	$\pm 0,5$ dB
Sensitivity at 20 dB SINAD	± 3 dB
Conducted emission of receiver	± 3 dB
Two-signal measurement	± 4 dB
Three-signal measurement	± 3 dB
Radiated emission of transmitter	± 6 dB
Radiated emission of receiver	± 6 dB

10.4 Tests by inspection

10.4.1 General

(See 4.1)

Check the manufacturer's documentation and provided test reports and with these confirm that the MF or MF/HF radiotelephone, digital selective calling (DSC) and reception of maritime safety information (MSI) and search and rescue (SAR) related information installation carried is capable of meeting any of the requirements of SOLAS regulations IV/9, 10 or 11.

Confirm further that in addition to meeting the requirements of the Radio Regulations, the relevant ITU-R Recommendations and the general requirements set out in resolutions A.694(17)

950 as specified in IEC 60945 and MSC.191(79) as amended as specified in IEC 62288 the
951 equipment complies with the following minimum requirements.

952 Inspect the manufacturers equipment documentation and confirm that the set of equipment
953 under test which may consist of more than one piece of equipment is capable of operating on
954 single-frequency channels or on single- and two-frequency channels.

955 Inspect the manufacturers equipment documentation and the equipment under test and confirm
956 that the equipment provides the following categories of calling using both voice and DSC:

- 957 1) distress, urgency and safety;
- 958 2) general radiocommunications; and
- 959 3) ship operational requirements.

960 Inspect the manufacturer's equipment documentation and the equipment under test and confirm
961 that the equipment provides capabilities for the reception and processing of MSI and SAR
962 related information.

963 Inspect the manufacturer's equipment documentation and the equipment under test and confirm
964 that the equipment comprises at least:

- 965 1) a transmitter/receiver, including antenna(e);
- 966 2) an integral main control unit and/or one or more separate control units, or control functions
967 in an integrated communication system, with the possibility of separate slave control units;
- 968 3) a microphone with a press-to-transmit switch, which may be combined with a telephone in
969 a handset;
- 970 4) an internal or external loudspeaker;
- 971 5) an integral or separate capability for reception and presentation of MSI and SAR related
972 information;
- 973 6) an integral or separate DSC facility;
- 974 7) a dedicated DSC watchkeeping facility to maintain a continuous watch on distress channels.
975 Where a scanning receiver is employed to watch more than one DSC channel, all selected
976 channels are to be scanned within two seconds and the dwell time on each channel shall
977 be adequate to allow detection of the dot pattern which precedes each DSC call. The scan
978 only stops on detection of a 100 baud dot pattern; and
- 979 8) an integral or separate facility to establish a connection between stations of the maritime
980 mobile service by simple means using DSC conforming to Recommendation ITU-R M.493.

981 **10.4.2 Power supplies**

982 (See 4.2)

983 Inspect the manufacturer's documentation including the installation manual and confirm that it
984 describes that the MF or MF/HF radio installation is to be powered from the ship's main source
985 of electrical energy. Confirm further and that it is documented that the installation should be
986 carried out in such a way that the operation from an alternative source of electrical energy
987 including a reserve source of energy complies with SOLAS requirements.

988 Inspect the manufacturer's documentation and confirm that if it is necessary to delay the
989 application of voltage to any part of the transmitter after switching on, that this delay is provided
990 automatically and no manual intervention by the user is required.

991 If the transmitter or receiver or both include parts which are required to be heated in order to
992 operate correctly then inspect the manufacturer's documentation and test the equipment to
993 confirm:

- 994 a) that the power supplies to the heating circuits is so arranged that they can remain operative
995 when other supplies to or within the equipment are switched off;
- 996 b) that if a special switch for the heating circuits is provided, its functions is clearly indicated
997 and that it is normally in the "on" position and protected against inadvertent operation;
- 998 c) that the correct operating temperature is reached within a period of five minutes.

10.4.3 Operational controls

(See 4.3.1)

Confirm that the manufacturer's standard kit provides all required material for the installation of a distress alert button to enable the initiation of distress alerts and conduct distress and safety communications from the position, or in the vicinity of the position, from which the ship is normally navigated and that this is described in the installation manual.

Confirm that the equipment has a standard interface, according IEC 61162 to enable the selections of frequencies and setting of MMSI to be called from a remote control unit (e.g. INS) by using standardized interfaces. (See Annex J)

Confirm that the equipment provides the functionality to establish connection with other stations of the mobile maritime service by simple means using DSC the "Automatic Connection System" conforming to Recommendation ITU-R M.493.(See Clause 15)

Confirm that the equipment provides visual and audible means to indicate the reception of any distress alert or alerts on board at the position from which the ship is normally navigated, which may be different from the position of the primary control of the equipment and that this is described in the installation manual.

10.4.4 Transmitter controls

(See 4.3.2)

Confirm that means are provided to indicate the antenna current or power delivered to the antenna and verify that a failure of the indicating system shall not interrupt the antenna, the manufacturer may provide a detailed description of the indication system to support the verification.

When the equipment can be tuned manually, confirm that it provides a sufficient number of indicators to permit accurate and rapid tuning.

Test that the operation of the transmit/receive control does not cause unwanted emissions exceeding the limits defined in 11.8.

Confirm that all adjustment and controls necessary for switching the transmitter to operate on 2 182 kHz and 2 187,5 kHz are clearly marked, in order that these operations can be performed readily.

10.4.5 Receiver controls

(See 4.3.3, 6.8)

Conform that the receiver provides automatic gain control.

Confirm that if a device is provided in the receiver to reduce the effects of impulsive noise, a switch is provided to disable its function.

1033 10.4.6 DSC controls and indicators

1034 (See 4.3.4)

1035 Confirm that the manufacturer's standard kit provides all required material for the installation of
1036 a distress alert button to enable the initiation of distress alerts and conduct distress and safety
1037 communications from the position, or in the vicinity of the position, from which the ship is
1038 normally navigated and that this is described in the installation manual.

1039 Confirm that the initiation of DSC distress calls takes precedence over any other operation of
1040 the facility.

1041 Confirm that the self-identification (MMSI) data is stored in the DSC unit and that it is not
1042 possible for the user to easily change these data.

1043 Confirm by inspection of the manufacturer's documentation and of the equipment that means
1044 are provided to enable routine testing of the DSC facilities without radiation of RF signals.

1045 Confirm that provision is made for alerts with specific audible signals and visual indications to
1046 indicate receipt of a distress or urgency call or a call having a distress category and that these
1047 are in accordance with Table D.2. Confirm that it is not possible to disable this alert. Conform
1048 that provision has been made to ensure that it can be reset only manually (See D.3).

1049 Confirm that the user manual includes instructions for routine testing for the DSC.

1050 10.4.7 Interfaces

1051 (See 4.4)

1052 Confirm by test that if the equipment is part of an integrated communication system (ICS),
1053 integrated navigation system (INS), integrated bridge system (IBS) or connected to a navigation
1054 system, this does not impair any of the GMDSS functions of the system or the equipment itself.

1055 Confirm by measurement that the equipment has an interface for bridge alert management
1056 (BAM) in accordance with resolution MSC.302(87) on Performance standards for bridge alert
1057 management.

1058 Confirm by inspection of the equipment, the relevant manual and measurement that the
1059 equipment has an interface to report a ship identifier and location data from a received distress
1060 alert, MSI as well as SAR related information to a navigation display system in order to enable
1061 a graphical display and possible linking to available target information.

1062 Confirm inspection of the equipment, the relevant manual and measurement that all interfaces
1063 provided for communication with other navigation and communication equipment are in
1064 compliance with at least one of IEC 61162-1, IEC 61162-2 or IEC 61162-450.

1065 Confirm inspection of the equipment, the relevant manual that the human-machine interface
1066 (HMI) provides all functions necessary to carry out all communication procedures including
1067 those required by the GMDSS.

1068 Confirm by inspection of the equipment that the visual indications and visual presentations of
1069 text and graphics of the system conforms to resolution MSC.191(79) as amended as specified
1070 in IEC 62288.

1071 Confirm inspection of the equipment, the relevant manual and measurement that the data
1072 interfaces are compatible with at least one of IEC 61162-1, IEC 61162-2 or IEC 61162-450.
1073 Confirm that the manufacturer has specified in the relevant manual which alternative of IEC
1074 61162 each physical interface supports.

1075 Confirm that the manufacturer has specified in documentation the logical interfaces which are
1076 provided and which are sharing the same physical interface and verify by measurement the
1077 implementation.

1078 Confirm by inspection of the relevant manual that as a minimum, the IEC 61162-1 sentences
1079 GLL, GGA, RMC and GNS are recognised for reception of position information.

1080 Confirm by inspection of the relevant manual that as a minimum, the IEC 61162-1 sentence
1081 ZDA is recognised for providing UTC for automatic MSI reception by HF MSI receiver.

1082 Confirm by inspection of the relevant manual and test that additionally, for remote display and/or
1083 command purposes, the equipment is capable of transmitting and receiving the sentences DSC,
1084 DSE and SFI.

1085 Confirm that by inspection of the equipment, the relevant manual and test that it is also capable
1086 of communicating with the sentences NRM and NRX as described in Annex I and with the
1087 electrical signal characteristics given in IEC 61162-1. Confirm further that the equipment is also
1088 capable of responding to query sentences as defined in IEC 61162-1 for the NRM and NRX
1089 sentences (see Table 2 and Table 3) and that the equipment is also capable of communicating
1090 with the sentences NRM and NRX as described in Annex I and with the electrical signal
1091 characteristics given in IEC 61162-1. Confirm further that the equipment is also capable of
1092 responding to query sentences as defined in IEC 61162-1 for the NRM and NRX sentences (see
1093 Table 2 and Table 3).

1094 If the equipment provides an interface to report operator activity in order that the BNWAS can
1095 reset the dormant period (see Table 4) then confirm by inspection of the document and
1096 equipment and measurement. Check that the EVE sentence as specified IEC 61162-1 is send
1097 out in response to user-interaction with the DSC under the conditions as described in the user
1098 manual.

1099 Confirm that by inspection of the equipment, the relevant manual and test that sentences used
1100 by a BAM interface are in Table 5 and Table 6 and that BAM operation is in accordance with
1101 the description as noted in Annex G.

1102 Confirm that by inspection of the equipment, the relevant manual and test that no connection
1103 of, or failure within any connected equipment has any negative affect on the required
1104 performance of the DSC equipment.

1105 Confirm that by inspection of the equipment, the relevant manual and test that the talker
1106 identifier for MF/HF equipment is CT and that the HF-MSI receiver uses the talker identifier CR.

1107 **10.4.8 Distress controls**

1108 (See 4.5)

1109 Confirm by measurement of the equipment and inspection of the manual that a distress alert is
1110 activated only by means of a dedicated distress button.

1111 Confirm that this button is not any key of an ITU-T digital input panel or an ISO keyboard
1112 provided on the equipment and is physically separated from functional buttons/keys used for
1113 normal operation. Confirm that this button is a single button for no other purpose than to initiate
1114 a distress alert.

1115 Confirm by inspection of the equipment that the button:

- 1116 • is clearly identified, red in colour and marked "DISTRESS". Where a non-transparent
1117 protective lid or cover is used, this lid is also be marked "DISTRESS";

- 1118 • it is protected against inadvertent operation. That the protection of the distress button is
1119 made of a spring-loaded lid or cover permanently attached to the equipment by, for example,
1120 hinges. That it is not necessary for the user to remove additional seals or to break the lid or
1121 cover in order to operate the distress button.

1122 Confirm that:

- 1123 • the operation of the distress button generates a visible and audible indication;
1124 • the distress button initiates a distress alert when kept pressed for at least three seconds
1125 and a flashing light and an intermittent acoustic signal are started immediately and that after
1126 the three seconds the transmission of the distress alert is initiated and that the indication
1127 becomes steady and the acoustic signal stops;

1128 Confirm that if the distress button is released before a distress alert is initiated, the light goes
1129 out and the acoustic signal stops.

1130 Confirm by inspection of the equipment that the distress alert initiation required at least two
1131 independent actions and that the lifting of the protective lid or cover is considered as the first
1132 action and that the pressing the distress button as specified above is considered as the second
1133 independent action.

1134 Confirm by testing of the equipment that the equipment is indicating the status of the distress
1135 alert transmission.

1136 Confirm by testing of the equipment that it is possible to interrupt and initiate distress alerts at
1137 any time and to interrupt repetitive transmissions of distress messages.

1138 Confirm by testing that such operation does not interrupt the transmission of a distress alert or
1139 distress message in progress but prevents repetitive transmissions of a distress message.

1140 Confirm by inspection of the relevant documentation that the manufacturer describes that a
1141 valid GNSS position and timing data from either an internal or external source are to be
1142 available to the equipment at all times.

1143 Confirm by testing of the equipment that the loss of position information generates a visible as
1144 well as audible indication.

1145 Confirm equipment inspection and testing that all adjustments and controls necessary for
1146 switching the transmitter and receiver to operate on the distress and safety channels applicable
1147 to the equipment are clearly marked in order that this operation is performed easily.

1148 **10.4.9 Control panel priority**

1149 (See 4.6)

1150 Confirm by inspection and testing that if accessible controls are located on a separate control
1151 panel and if there are two or more control panels, one of the control panels has priority over
1152 the others.

1153 Confirm by inspection and testing that if there are two or more control panels, the control panel
1154 in use is clearly indicated on all of the other control panels.

1155 **10.4.10 Labels**

1156 (See 4.7)

1157 Confirm by inspection that labels are in accordance with IEC 60945.

1158 Confirm by inspection that the applicable frequencies for DSC distress and telephony distress
1159 are clearly indicated, either on the front panel of the equipment or on an instruction label
1160 supplied with the equipment.

1161 **10.4.11 Safety precautions**

1162 (See 4.8)

1163 Confirm by inspection and testing that the information in user programmable memory devices
1164 is protected from interruptions in the power supply of up to at least 24 h duration.

1165 Confirm by inspection of the manufacturer's documentation that any software required to
1166 facilitate operation is permanently installed within the equipment.

1167 Confirm by inspection of the manufacturer's documentation that key parameters relating to the
1168 equipment and any software necessary for its initial activation or reactivation is stored in solid
1169 state non-volatile memory.

1170 Confirm by inspection of the manufacturer's documentation that facilities are provided to protect
1171 all operational software incorporated in the equipment.

1172 Confirm by inspection and testing that It is not possible during routine use for the operator to
1173 augment, amend or erase any software in the equipment required for operation in accordance
1174 with the standard.

1175 Confirm by inspection of the equipment that means are provided to monitor the operational
1176 software of the equipment automatically at regular intervals, and to activate an alert in the event
1177 of failure.

1178 **10.4.12 Software maintenance**

1179 (See 4.10)

1180 Confirm by inspection of the equipment and manufacturer's documentation that means are
1181 provided to enable software used by the radio including software controlling the selection of
1182 radio frequency channels, to be updated by manufacturer-controlled means.

1183 Confirm by inspection that it is possible for the user to view the software versions in use.

1184 **10.4.13 DSC capabilities**

1185 (See 7.1)

1186 Confirm by inspection of manufacturer's documentation that the equipment conforms to the
1187 provisions of ITU-R Recommendations ITU-R M.493 and ITU-R M.541.

1188 Confirm by inspection that the equipment comprises:

- 1189 • means to decode and encode DSC messages;
- 1190 • means necessary for composing the DSC message;
- 1191 • means to verify the prepared message before it is transmitted;
- 1192 • means to display, the information contained in a received call in plain language;
- 1193 • a display for a minimum of 160 characters in two or more lines;
- 1194 • facilities to automatically update the ship's position and the time from an electronic position-
1195 fixing aid either an integral part of the equipment or by means of an interface;
- 1196 • means for the manual entry of position and the time.

1197 Confirm by inspection and testing that means are provided to activate an alert when:

- 1198 • no position data is received from the electronic position-fixing aid; or
- 1199 • in the case of manual input, the position information is over 4h old.

1200 Confirm by inspection and testing that any position information not updated for more than 23,5
1201 h is erased.

1202 **10.4.14 Distress message storage**

1203 (See 7.2)

1204 Confirm by inspection and testing that there is capacity to store at least 20 received distress
1205 messages and that these calls are marked as read when they are printed or displayed.

1206 **11 Transmitter**

1207 **11.1 Frequencies and classes of emission**

1208 (See 5.1)

1209 The transmitter shall provide upper side-band signals only or upper side-band and frequency
1210 shift keying signals in accordance with 5.1.

1211 **11.2 Frequency error**

1212 **11.2.1 General**

1213 (See 5.2, 5.5)

1214 The frequency error of the transmitter is:

1215 – for SSB telephony:

1216 The difference between the measured frequency minus 1 000 Hz and the nominal value of
1217 the frequency for the particular telephony frequency;

1218 – for DSC:

1219 The difference between the measured Y-state frequency and the nominal assigned
1220 frequency minus 85 Hz and the difference between the measured B-state frequency and the
1221 nominal assigned frequency plus 85 Hz.

1222 **11.2.2 Methods of test**

1223 The frequency shall be measured with the transmitter connected to an artificial antenna as
1224 defined in 10.3.5

1225 – SSB telephony:

1226 The transmitter shall be modulated with a signal of 1 000 Hz $\pm$ 0,1 Hz. The 1 000 Hz signal
1227 shall be subtracted from the measured frequency to obtain the transmitter frequency.

1228 – DSC:

1229 The digital input shall first be connected to a digital 0 and then to a digital 1.

1230 Measurements shall be carried out at the highest and lowest frequency available in the
1231 transmitter for telephony and the digital DSC interface.

1232 The tests shall be performed under both normal and extreme test conditions, as defined in
1233 IEC 60945, of dry heat and upper limit of supply voltage applied simultaneously and low
1234 temperature and lower limit of supply voltage applied simultaneously.

11.2.3 Required results

The transmitter frequencies, after the warming-up period specified in 5.5, shall be within ± 10 Hz of the frequencies defined in 5.1.

11.3 Output power and intermodulation products

11.3.1 General

(See 5.3)

The output power shall be set automatically by the equipment according to frequency band and mode of operation as declared by the manufacturer.

If the transmitter is capable of a higher output power than 400 W, means shall be provided to limit the power automatically to a value of 400 W or less, when the transmitter is switched to the MF band.

The output power is the value of peak envelope power delivered by the transmitter to the artificial antenna in telephony SSB mode or the value of the mean power delivered by the transmitter to the artificial antenna in DSC mode.

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

11.3.2 Methods of test

The transmitter shall be connected to the appropriate artificial antenna as specified in 10.3.5.

– SSB telephony:

The transmitter shall be modulated by a test signal consisting of two audio frequency tones, applied simultaneously to the microphone input, at frequencies of 1 100 Hz and 1 700 Hz. The level of the tones shall be adjusted so that they produce equal output power. The level of the input test signal shall be increased until the transmitter power output is not more than 1,5 dB below the rated output power as declared by the manufacturer. The level of the input signal shall then be increased by 10 dB.

The peak envelope power and the intermodulation products shall be measured.

The input signal shall then be decreased by 20 dB, and measurement of the intermodulation products is repeated.

– DSC:

The transmitter shall be modulated by a generator producing a continuous dot pattern. The mean power and the difference between the power of the Y-state frequency and the power of the B-state frequency shall be measured, and the output spectrum recorded.

The tests shall be performed under both normal and extreme test conditions, as defined in IEC 60945, of dry heat and upper limit of supply voltage applied simultaneously and low temperature and lower limit of supply voltage applied simultaneously.

Measurements shall be carried out at the highest and lowest frequency available in the transmitter for telephony and the digital DSC interface.

11.3.3 Required results

– Output power in the range 1 605 kHz – 4 000 kHz for all modulation modes:

At any frequency in the band 1 605 kHz – 4 000 kHz the peak envelope power or mean power as appropriate, shall be more than 60 W and not exceed 400 W, and shall be within $\pm 1,5$ dB of the rated output power.

– Output power in the range 4 MHz – 27,5 MHz for all modulation modes: