

INTERNATIONAL STANDARD

**Global maritime distress and safety system (GMDSS) –
Part 4: INMARSAT-C ship earth station and INMARSAT enhanced group call
(EGC) equipment – Operational and performance requirements, methods of
testing and required test results**

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Part 4: INMARSAT-C ship earth station and INMARSAT enhanced group call
(EGC) equipment – Operational and performance requirements, methods of
testing and required test results**

INTERNATIONAL
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**GLOBAL MARITIME DISTRESS AND
SAFETY SYSTEM (GMDSS) –****Part 4: INMARSAT-C ship earth station and
INMARSAT enhanced group call (EGC) equipment –
Operational and performance requirements,
methods of testing and required test results**

FOREWORD

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International Standard IEC 61097-4 has been prepared by IEC technical committee 80: Maritime navigation and radiocommunication equipment and systems.

This second edition cancels and replaces the first edition published in 1994. This edition constitutes a technical revision.

The main changes with respect to the previous edition are:

- the IMO references and requirements have been updated to the new performance standards for Inmarsat-C ship earth stations adopted in 1995;
- the requirements for interfaces have been updated to the current version of IEC 61162-1;
- the general requirements have been updated to the current version of IEC 60945;

- Annex B concerning radiated unwanted emissions has been updated to current requirements.

The text of this standard is based on the following documents:

FDIS	Report on voting
80/487/FDIS	80/497/RVD

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

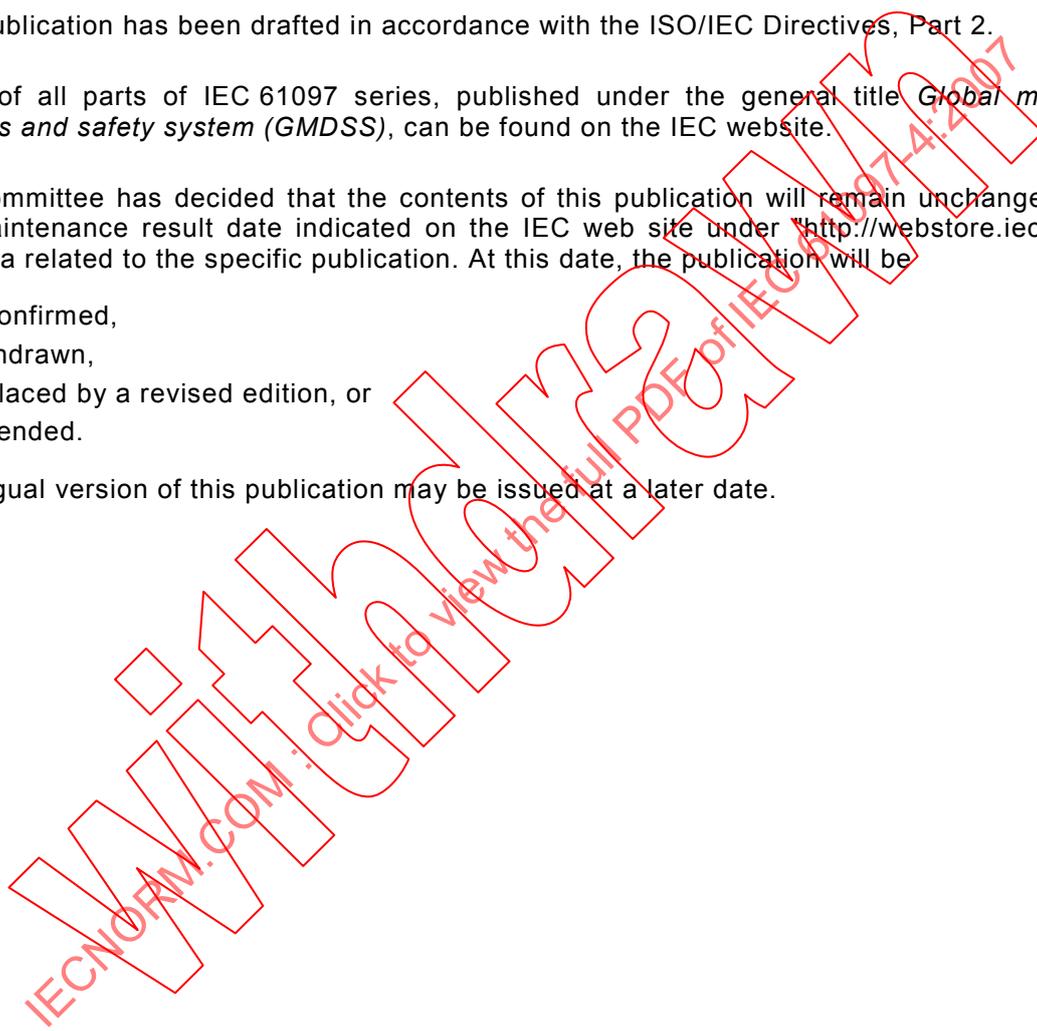
This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all parts of IEC 61097 series, published under the general title *Global maritime distress and safety system (GMDSS)*, can be found on the IEC website.

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

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

A bilingual version of this publication may be issued at a later date.



GLOBAL MARITIME DISTRESS AND SAFETY SYSTEM (GMDSS) –

Part 4: INMARSAT-C ship earth station and INMARSAT enhanced group call (EGC) equipment – Operational and performance requirements, methods of testing and required test results

1 Scope

This part of IEC 61097 specifies the performance requirements and methods of testing for INMARSAT-C ship earth stations (SES) capable of transmitting and receiving direct printing communications, and for enhanced group call (EGC) equipment, for use in the GMDSS. The available variants are:

- Class 0: An EGC receiver, either stand-alone or an element of a GMDSS installation in accordance with the INMARSAT design and installation guidelines (DIGs) for GMDSS installations.
- Class 1: A basic SES providing shore-to-ship and ship-to-shore message transfer only.
- Class 2: As class 1 but with EGC as an alternative to shore-to-ship transfer using a shared receiver.
- Class 3: As class 1 but with EGC using an independent receiver.

The standard complies with IMO performance requirements stated in the normative references, INMARSAT technical characteristics and test procedures, and IEC 60945 general requirements except where modifications are explicitly stated in this standard. Technical characteristics essential to GMDSS operation as defined by the IMO are identified.

All text of this standard, whose wording is identical to that in IMO SOLAS Convention 1974 as amended in 1988 and Resolutions A.807(19), A.664(16), and A.694(17) is printed in *italics* and reference made to the Resolution/Recommendation and subclause number.

This standard covers equipment construction and testing. Matters relating to installation may also be found in the normative references listed in clause 2. Those to be found in IMO Resolutions A.807(19) and A.664(16) are reproduced in annex A.

Responsibility for type approval of INMARSAT-C and INMARSAT-EGC is vested in INMARSAT by IMO Resolutions A.807(19) and A.664(16). Therefore, this standard does not reproduce INMARSAT test procedures in full, but refers to where they are given in INMARSAT documentation cited in the normative references to this standard.

NOTE For the purposes of this standard the terms INMARSAT-C, INMARSAT Standard-C and Standard-C refer to the same equipment.

2 Normative references

The following referenced documents are indispensable for the application 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 60945:2002, *Maritime navigation and radiocommunication equipment and systems – General requirements – Methods of testing and required test results*

ISO 2022, *Information technology – Character code structure and extension techniques*

International Convention for the safety of life at sea (SOLAS), Regulations IV/7, IV/8, IV/9 and IV/10 of the 1988 amendments concerning radiocommunications for the GMDSS

IMO Resolution A.807(19):1995, *Performance Standards for INMARST--C ship earth stations capable of transmitting and receiving direct-printing communications as amended by Resolution MSC.68(68) Annex 4*

IMO Resolution A.664(16):1989, *Performance standards for enhanced group call equipment*

IMO Resolution A.694(17):1991, *General requirements for shipborne radio equipment forming part of the global maritime distress and safety system (GMDSS) and for electronic navigational aids*

IMO: *NAVTEX Manual*

INMARSAT-C System definition manual (SDM):

- Volume 3, Part 2, Chapter 2, *Mobile earth station technical requirements*
- Volume 3, Part 2, Chapter 5, *Ship earth station technical requirements*
- Volume 3, Part 2, Chapter 8, *Technical requirements for an EGC receiver*

INMARSAT: Recommended test procedures (RTP) for the type approval of INMARSAT-C mobile earth stations

INMARSAT: Design and installation guidelines (DiGs) for INMARSAT-C ship earth stations and enhanced group call receivers

Recommendation ITU-R M.540-2¹⁾:1990, *Operational and technical characteristics for an automated direct-printing telegraph system for promulgation of navigational and meteorological warnings and urgent information to ships*

3 Performance requirements

3.1 Introduction

Subclauses 3.2 through 3.4 of this part of IEC 61097 describe performance requirements directly attributable to IMO Resolutions A.807(19), A.664(16) and A.694(17) as listed in the normative references. Subclause 3.5 is provided to highlight those requirements of IEC 60945 which are not included in the normal INMARSAT requirements for INMARSAT-C SES type approval. Subclause 3.6 describes other requirements, additional to the normal INMARSAT-C type approval requirements, which are required to make the equipment suitable for GMDSS applications.

3.2 Non-operational requirements common to all classes of INMARSAT-C SES and INMARSAT-EGC

3.2.1 General requirements

3.2.1.1 (A.807(19) A1.1/A.664(16) A1.1) *The INMARSAT Standard-C ship earth station installation capable of transmitting and receiving direct-printing communications, and the enhanced group call equipment to be used in the INMARSAT system shall comply with the general requirements set out in Assembly resolution A.694(17) as detailed in IEC 60945.*

1) Formerly CCIR Recommendation 540-2.

3.2.1.2 (A.807(19) 2/A.664(16) 2) *The ship earth station and the EGC equipment shall be type-approved by INMARSAT and shall comply with the environmental conditions specified in its technical requirements for INMARSAT Standard-C ship earth stations except as detailed in IEC 60945.*

3.2.1.3 (A.807(19) 4) *In order to permit a warning of potential radiation hazards to be displayed in appropriate locations, a label shall be attached to the radome indicating the distances external to the radome at which radiation levels of 100 W/m², 25 W/m² and 10 W/m² exist. However, the distances which are within the radome need not be indicated.*

3.2.1.4 (A.807(19) A5.2/A.664(16) A4.2) *Changing from one source of supply to another or any interruption of up to 60 s duration of the supply of electrical energy shall not require the equipment to be manually re-initialized and shall not result in loss of received messages stored in the memory.*

3.3 Operational requirements for all classes of INMARSAT-C SES including those with INMARSAT-EGC

The equipment shall comply with regulations IV/8 through IV/10 of SOLAS 1974, as amended, which prescribe the capabilities of INMARSAT ship earth stations to meet the GMDSS requirements for ships in the various sea areas. The four capabilities are:

3.3.1 (IV/8.1.5.1/IV/9.1.3.3 and IV/10.1.4.3): *Means of initiating the transmission of ship-to-shore distress alerts.*

3.3.2 (IV/10.1.1.1): *Transmitting and receiving distress and safety communications using direct-printing telegraphy.*

3.3.3 (IV/10.1.1.2): *Initiating and receiving distress priority calls.*

3.3.4 (IV/9.3.2/IV/10.1.1.4): *Transmitting and receiving general radiocommunications, using either radiotelephony or direct-printing telegraphy.*

NOTE In the case of this equipment only direct-printing telegraphy applies.

3.3.5 In addition, classes 2 and 3 INMARSAT-C SES shall comply with the operational requirements for INMARSAT-EGC receivers (see 3.4).

Operational requirements common to INMARSAT-C equipment are:

3.3.6 (A.807(19) 3.1): *No control external to the equipment shall be available for alteration of the ship station identity.*

3.3.7 (A.807(19) 3.2): *It shall be possible to initiate and make distress calls from the position from which the ship is normally navigated and from at least one other position designated for distress alerting.*

3.3.7.1 (A.807(19) 3.3): *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.*

3.3.7.2 (A.807(19) 3.4): *The dedicated distress button shall:*

- 1 *be clearly identified; and*
- 2 *be protected against inadvertent operation.*

3.3.7.3 (A.807(19) 3.5): *The distress alert initiation shall require at least two independent actions.*

3.3.7.4 (A.807(19) 3.6): *The equipment shall indicate the status of the distress alert transmission.*

3.3.7.5 (A.807(19) 3.7): *It shall be possible to interrupt and initiate distress messages at any time.*

3.3.7.6 It shall be possible to select the content of, but not initiate a distress alert using the equipment keyboard or other means, before depressing one of the dedicated buttons to initiate the distress alert. It shall also be possible to activate an undesignated (see Note) distress alert by depressing one of the buttons, at any time.

NOTE Undesignated - unspecified emergency distress alert, i.e. the default setting. All other selectable alerts are "designated".

3.3.7.7 (A.807(19) 3.8): *Facilities shall be provided 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 IEC 61162.*

NOTE As a minimum, the equipment should support the sentences GGA, GLL, GNS, RMC and ZDA according to IEC 61162-1.

3.3.7.8 (A.807(19) 3.9): *Provision shall also be made for manual entry of position information and of the time at which the position was determined.*

3.3.7.9 (A.807(19) 3.10): *An alarm shall be activated when no position data is received from the electronic position-fixing aid or, in the case of manual input, the position information is over 4 hours old. Any position information not updated for more than 24 hours shall be clearly identified."*

3.4 Operational requirements for INMARSAT-EGC receivers including those incorporated in an INMARSAT-C SES

The equipment shall comply with regulations IV/7 and IV/10 of SOLAS 1974, as amended, which prescribe the capabilities of EGC receivers to meet the GMDSS requirements for ships in the various sea areas. The two capabilities are:

3.4.1 (IV/7.1.5): *A radio facility for reception of maritime safety information by the INMARSAT enhanced group calling system.*

3.4.2 (IV/10.1.1.3): *An INMARSAT ship earth station capable of maintaining watch for shore-to-ship distress alerts, including those directed to specifically defined geographical areas.*

Operational requirements common to all EGC receivers are:

3.4.3 (A.664(16) A1.2): *The equipment shall be capable of producing a printed copy of received information. Received EGC messages may be stored, with indication that the message has been received, for later printing, except for the vital messages referred to in 3.2 (3.4.6) and 3.5 (3.4.9) which shall be printed out upon receipt.*

3.4.4 (A.664(16) A1.3): *The enhanced group call installation may be either separate or combined with other installations. Elements of other installations, e.g. the antenna, low noise amplifier and down converter of the ship earth system, may be shared for the reception of enhanced group call messages.*

3.4.5 (A.664(16) A3.1): *Means shall be provided to enter the ship's position and area code manually so that area group calls can be received. Optionally, and additionally, the ship's*

position, as determined by the navigational equipment may be entered automatically and the area code automatically derived therefrom.

3.4.6 (A.664(16) A3.2): *Provision shall be made for a specific aural alarm and visual indication at the position from which the ship is normally navigated to indicate receipt of a distress or urgency call or a call having distress category. It shall not be possible to disable this alarm and it shall only be possible to reset it manually and then only from the position where the message is displayed or printed.*

3.4.7 (A.664(16) A3.3): *The equipment shall indicate when it is not correctly tuned or synchronized to the enhanced group call carrier.*

3.4.8 (A.664(16) A3.4): *Any message shall be printed regardless of the character error rate of its reception. The equipment shall print a low-line mark if a character is received mutilated.*

3.4.9 (A.664(16) A3.5): *Acceptance or rejection of service codes (same as for the NAVTEX system, see ITU-R Recommendation M.540-2 and the IMO NAVTEX manual) shall be under the operator's control except that equipment shall be unable to reject relevant navigational and meteorological warnings, search and rescue information, and certain special warnings, which are directed to a geographical area in which the ship is operating.*

3.4.10 (A.664(16) A3.6): *Means shall be provided not to reprint the same message after it has been received without error.*

3.4.11 (A.664(16) A3.7): *The printing device shall be capable of printing at least the standard IA number 5 character set. Other character sets are optionally used according to ISO 2022.*

3.4.12 (A.664(16) A3.8): *The printing device shall be able to print at least 40 characters per line.*

3.4.13 (A.664(16) A3.9): *The signal processor and printing device shall ensure that if a word cannot be accommodated in full on one line, it shall be transferred to the next line. The printing device shall automatically feed five lines after completing the printed messages.*

3.5 Performance related requirements from IEC 60945

The equipment shall comply with those clauses of IEC 60945 appropriate to its equipment class. The subclauses of IEC 60945 referenced below, amend or augment the corresponding requirements of the INMARSAT-C SDM.

- 3.5.1 (4.1 of IEC 60945) General**
- 3.5.2 (4.2 of IEC 60945) Design and operation**
- 3.5.3 (4.3 of IEC 60945) Power supply**
- 3.5.4 (4.4 of IEC 60945) Durability and resistance to environmental conditions**
- 3.5.5 (4.5 of IEC 60945) Interference**
- 3.5.6 (4.6 of IEC 60945) Safety precautions**
- 3.5.7 (4.7 of IEC 60945) Maintenance**
- 3.5.8 (4.8 of IEC 60945) Equipment manuals**
- 3.5.9 (4.9 of IEC 60945) Marking and identification**
- 3.6 Other requirements additional to those of volume 3 of the INMARSAT-C SDM**

The requirements listed below augment or amend the indicated sections of the INMARSAT-C SDM.

3.6.1 (Volume 3, Part 2, Chapter 2, Section 7.3.1) Message display facilities shall be suitable for displaying received distress-related messages. It is recommended that the display facilities should comply with the corresponding requirements for INMARSAT-EGC equipment in 3.4.8, 3.4.11, 3.4.12 and 3.4.13 of this standard.

3.6.2 Any programming material or software that forms part of the SES and which is necessary for meeting the GMDSS requirements shall be permanently installed in the SES. Any software needed to fulfil any distress and safety requirements of the GMDSS shall not be stored on any medium which can be accessed, modified or corrupted.

3.6.3 (Volume 3, Part 2, Chapter 5, Section 8.3) To enable compliance with IMO Resolution A.807(19) A3.2, the SES shall include facilities for initiating and making distress calls from at least two positions.

3.6.4 Any ancillaries associated with INMARSAT-C equipment, such as visual display units, keyboards and printers, shall be available immediately on demand to service GMDSS functional requirements. These ancillaries shall also be provided with fixing arrangements to prevent unauthorized removal or disconnection.

4 Technical characteristics

4.1 Introduction

IMO Resolutions A.807(19) and A.664(16) appoint INMARSAT as the type approval authority for INMARSAT-C SES and INMARSAT-EGC. The INMARSAT-C SDM is, therefore, the primary source of technical characteristics for INMARSAT-C SES and INMARSAT-EGC equipment for use in the GMDSS, but the following amendments and additions shall apply.

4.2 Environmental and electromagnetic compatibility requirement

All INMARSAT-C equipment covered by this standard shall comply with environmental and electromagnetic compatibility requirements specified in A.694(17) as detailed in IEC 60945. This subclause includes a summary of the required technical characteristics for INMARSAT-C and INMARSAT-EGC equipment, in the form of tabulated and referenced lists of technical characteristics obtained from the table of contents of the INMARSAT SDM Volume 3, Part 2, Chapters 2, 5 and 8 (tables 1 and 2 in this standard), and the corresponding INMARSAT environmental requirements as amended by IEC 60945 (table 3).

4.3 Radiated spurious emissions

The radiated spurious emission requirement is described in Annex B.

Table 1 – INMARSAT-C SES technical characteristics

INMARSAT-C SDM, Volume 3, Part 2, Chapters 2 and 5		
CH2	CH5	
2		General requirements
	2.1	Classes of INMARSAT-C mobile earth stations
	2.2	INMARSAT-C ship earth station definition
	2.3	Mobile earth station functions
	2.4	Mandatory capabilities
3		RF subsystem requirements
	3.1	General requirements
	3.2	Antenna requirements
	3.2.1	Gain
	3.2.2	Polarization
	3.2.3	Axial ratio
	3.3	Receiver RF requirements
	3.3.1	Gain-to-noise temperature ratio
	3.3.2	Received signal levels
	3.3.3	Immunity to out-of-band signals
	3.3.4	Receiver tuning
	3.4	Transmitter RF requirements
	3.4.1	EIRP
	3.4.2	Transmitted spectrum
	3.4.3	Transmitter "Off" power level
	3.4.4	Spurious outputs
	3.4.5	Harmonic output EIRP
3.4.6	Phase noise	
3.4.7	Transmitter tuning	
3.4.8	Frequency accuracy and stability	
3.4.9	Duty cycles	
4		Receiver performance
	4.1	To-mobile signal characteristics
	4.2	To-mobile channel modulation characteristics
	4.3	Receiver selectivity
	4.4	Demodulator performance
	4.5	Continuous reception output performance
	4.6	Acquisition performance
	4.6.1	NCS/LES tuning
	4.6.2	Re-acquisition after burst mode transfers
	4.6.2.1	2-frame slot mode
4.6.2.2	3-frame slot mode	
4.6.3	Re-acquisition after message transfers	

Table 1 (continued)

INMARSAT-C SDM, Volume 3, Part 2, Chapters 2 and 5		
CH2	CH5	
5		Transmitter performance
5.1		From-mobile message and signalling channel modulation characteristics
5.2		Operation with first-generation satellites
5.3		Signalling channel characteristics
5.4		Message channel
6		Access control requirements
6.1		General
6.2		TDMA performance
6.2.1		TDMA synchronization
6.2.2		Random access and retransmission slot selection
6.2.3		Signalling channel access restrictions
6.2.4		Message channel access restrictions
6.3		NCS common channel selection
6.3.1		General
6.3.2		Expansion of NCS common channel
6.3.3		Stand alone operation
6.3.4		Spot beam operation
6.4		Mobile station identities
6.5		Ocean region registration procedures
6.5.1		Logging in
6.5.2		Logging out
6.6		Idle and busy conditions
6.6.1		Priorities
6.6.2		Off-line operation
6.6.3		Forced clearing
7		Message processing requirements
7.1		General
7.2		Character codes
7.3		Display devices
7.3.1		Message display (DTE)
7.3.2		Status display
7.4		Keyboard (DTE)
7.5		Ship earth station memory capacity requirements
7.5.1		Message storage (DCE)
7.5.2		Non-volatile memory (DCE)
7.6		The DTE-DCE interface
7.6.1		Technical requirements
7.6.2		Message transfer
7.6.3		Control codes

Table 1 (continued)

INMARSAT-C SDM, Volume 3, Part 2, Chapters 2 and 5		
CH2	CH5	
8		Alerting functions
	8.1	Signalling channel priorities for distress communication
	8.2	Distress alert generator
	8.3	Distress alert activation
9		Testing functions
	9.1	Fail-safe features
	9.2	Self monitoring functions
	9.3	Performance verification and commissioning testing
	9.3.1	General
	9.3.2	Performance verification testing
10		Electromagnetic compatibility
	10.1	General
	10.2	Limits for mains conducted spurious emissions
11		Environmental conditions
	11.1	Purpose
	11.2	Environmental conditions for Inmarsat-C SESs

Table 2 – INMARSAT-EGC technical characteristics

INMARSAT-C SDM, Volume 3, Part 2, Chapters 2 and 8		
CH2	CH8	
1		Introduction
	1.1	Enhanced group calls
	1.2	EGC receiver
	1.3	System definition documentation
	1.4	Type approval
2		General requirements
	2.1	Mandatory capabilities
3		RF subsystem requirements
	3.1	General
	3.2	Antenna requirements
	3.2.1	Gain
	3.2.2	Polarization
	3.3	Receiver RF requirements
4		Receiver performance
	4.1	To-mobile signal characteristics
	4.2	To-mobile channel modulation characteristics
	4.3	Receiver selectivity
	4.4	Demodulator performance
	4.5	Output performance

Table 2 (continued)

INMARSAT-C SDM, Volume 3, Part 2, Chapters 2 and 8		
CH2	CH8	
5		Transmitter performance (Not applicable)
6		Access control requirements
	6.3	NCS common channel selection
	6.3.1	General
7		Message processing requirements
	7.1	General
	7.2	Character codes
	7.3	Display devices
	7.3.1	Message display
	7.3.2	Status display
7.4		Keyboard (DTE)
	7.4.1	Operator controls
	7.5	EGC receiver memory capacity requirements
	7.5.1	Message buffer
	7.5.2	Non-volatile memory
7.6		The DTE-DCE interface
	7.7	EGC receiver addressing
	7.7.3	Geographical area addressing
	7.7.4	Message sequencing
	7.7.5	Error detection
	7.7.6	Distress/Urgency call alarm
8		Alerting functions (Not applicable)
9		Testing functions
	9.1	Fail-safe features
	9.2	Self-monitoring functions
10		Electromagnetic compatibility
11		Environmental conditions
	11.1	Purpose
12		Optional features
	12.1	Reception of SafetyNET or FleetNET service only
	12.2	Navigational interface

Table 3 – Environmental conditions for INMARSAT-C SESs and INMARSAT-EGC equipment suitable for GMDSS use

Models of INMARSAT-C SESs and INMARSAT-EGC equipment which are to be submitted for type approval for GMDSS use within the INMARSAT system shall be designed so as to operate over the following range of environmental conditions, which are consistent with the requirements as indicated of either:

- i) *INMARSAT-C SDM*, Volume 3, Part 2, Chapter 2 + Chapter 5 or Chapter 2 + Chapter 8 (EGC) section 11.2 (referred to below as "INMARSAT"), or,
- ii) INMARSAT modified by IEC 60945 using the most stringent combined set of conditions, or,
- iii) IEC 60945.

NOTE 1 EME – Externally mounted equipment
 IME – Internally mounted equipment

NOTE 2 The letters a) to m) directly mirror the lettering used in the *INMARSAT-C SDM*, Volume 3, Part 2, Chapter 5, section 11.2 and also Volume 3, Part 2, Chapter 8, section 11.2 (EGC).

a)	Ambient temperature	"INMARSAT" modified by 8.2/8.3 of IEC 60945
b)	Relative humidity	8.3 of IEC 60945
c)	Spray	"INMARSAT"
d)	Ice	"INMARSAT"
e)	Precipitation	"INMARSAT"
f)	Wind	"INMARSAT"
g)	Solar radiation	"INMARSAT"
h)	Prime power variations	"INMARSAT"
	AC mains supply	"INMARSAT"
	DC mains supply	"INMARSAT"
	Battery supply	"INMARSAT" modified by 4.3.2 of IEC 60945
j)	Vibration	8.7 of IEC 60945
k)	Antenna inclinations	"INMARSAT"
l)	Induced acceleration	"INMARSAT"
m)	Velocity	"INMARSAT"

5 Methods of testing and required test results

5.1 Introduction

5.1.1 General

All tests carried out under INMARSAT control as per the applicable INMARSAT SDM will be acceptable and need not be repeated for compliance with this standard.

5.1.2 Performance requirements

The equipment shall be tested for compliance with the performance requirements described in clause 3 (reference in parenthesis) using the methods prescribed in 5.2 through 5.6.

5.1.3 Technical characteristics

The equipment shall be tested for compliance with the technical characteristics listed in clause 4 using the methods prescribed in the INMARSAT documentation, but using the environmental conditions defined in table 3, as indicated in 5.7.

5.2 Tests of non-operational requirements for all classes of INMARSAT-C SES and INMARSAT-EGC

INMARSAT test items given below relate to INMARSAT recommended test procedures (RTP) – 1993.

The given order of tests is logical regarding equipment build state and test location, but is not critical and may be changed if required.

5.2.1 (3.2.1.3) Test by inspection.

5.2.2 (3.2.1.4) With the equipment operating normally, and with a received message stored in the SES, the power shall be removed for a period of 60 s, and then restored. On restoration of the power the SES shall continue to operate normally, remain logged to the previous ocean region, and the stored message shall contain no additional errors.

5.3 Tests of operational requirements for all classes of INMARSAT-C SES (including those with INMARSAT-EGC)

5.3.1 (3.3.1) per INMARSAT test item S8-B (distress alert transmission; Volume 3, Part 2, Chapter 5, section 8.3)

5.3.2 (3.3.2) per INMARSAT test items:

- 7-A (character codes; Volume 3, Part 2, Chapter 2, section 7.2)
- S7-B (display devices; Volume 3, Part 2, Chapter 5, section 7.3)
- 7-C (keyboard; Volume 3, Part 2, Chapter 2, section 7.4)
- 22-A (to-mobile message transfer; Volume 1, Chapter 2, section 8.1.1)
- 23-A (distress alert transmission; Volume 3, Part 2, Chapter 5, section 8)
- 23-B (distress alert message transfer; Volume 3, Part 2, Chapter 5, section 8)

Tests 22-A, 23-A and 23-B shall be conducted with the message priority bit set to a "1" (distress priority).

5.3.3 (3.3.3) per INMARSAT test items 22-A, 23-A, 23-B (as in 5.3.2 above).

5.3.4 (3.3.4) per INMARSAT test items 22-A, 23-A, 23-B, as indicated in 5.3.2 above, but with the message priority bit set to "0" (routine priority).

5.3.5 (3.3.5) Tested in 5.4.

5.3.6 (3.3.6) Test by inspection.

5.3.7 (3.3.7) Covered by test 5.6.3.

5.4 Tests of operational requirements for INMARSAT-EGC receivers (including those incorporated in an INMARSAT-C SES)

5.4.1 (3.4.1) Covered by tests 5.4.3 to 5.4.13 inclusive below.

5.4.2 (3.4.2) Covered by tests 5.4.6 and 5.4.9 below.

5.4.3 (3.4.3) per INMARSAT test items:

- E-4B (output devices; Volume 3, Part 2, Chapter 8, section 7.3)
- E-4D (memory capacity; Volume 3, Part 2, Chapter 8, section 7.7.3/7.5)
- E-4E (receiver addressing; Volume 3, Part 2, Chapter 8, section 7.7)
- E-5A (distress messages; Volume 3, Part 2, Chapter 8, section 7.7.6).

5.4.4 (3.4.4) Test by inspection.

5.4.5 (3.4.5) Test by inspection.

5.4.6 (3.4.6) per INMARSAT test item E-5A (distress messages: Volume 3, Part 2, Chapter 8, section 7.7.6).

5.4.7 (3.4.7) per INMARSAT test item E-2C (receiver tuning: Volume 3, Part 2, Chapter 8, section 6.3.1).

5.4.8 (3.4.8) per INMARSAT test item E-4F (error detection: Volume 3, Part 2, Chapter 8, section 7.7.5).

5.4.9 (3.4.9) per INMARSAT test item E-4E (receiver addressing: Volume 3, Part 2, Chapter 8, section 7.7).

5.4.10 (3.4.10) per INMARSAT test item E-4F (error detection: Volume 3, Part 2, Chapter 8, section 7.7.5) plus the following tests in the sequence given.

- 1) A numbered message is received twice: print-out shall be made only from the first reception.
- 2) A message with the same sequence number as in test 1 above, is received, but with one character changed: no print-out shall be made.
- 3) The same message with a new sequence number shall be received, but with one character error: print-out shall be made with that character replaced by a low line-mark.
- 4) The message as in test 3 above, with the same sequence number shall be received correctly: print-out shall be made.

5.4.11 (3.4.11) per INMARSAT test item E-4B (output devices: Volume 3, Part 2, Chapter 8, section 7.3).

5.4.12 (3.4.12) per INMARSAT test item E-4B (output devices: Volume 3, Part 2, Chapter 8, section 7.3).

5.4.13 (3.4.13) per INMARSAT test item E-4B (output devices: Volume 3, Part 2, Chapter 8, section 7.3).

5.5 Tests of performance related requirements from IEC 60945

5.5.1 (3.5.1) Test by inspection and evidence from the manufacturer.

5.5.2 (3.5.2) Test as in 4.2 of IEC 60945 and by inspection.

5.5.3 (3.5.3) Test as in 4.3 of IEC 60945.

5.5.4 (3.5.4) Test as in 5.7 of this standard plus tests as in the relevant IEC 60945 subclause below:

- 8.12 Corrosion

Note possible waver procedure, as described in 4.1.1 of IEC 60945.

5.5.5 (3.5.5) Test as in the following clauses of IEC 60945:

Clause 9 Electromagnetic emission

Clause 10 Immunity to electromagnetic environment

Clause 11 Special purpose tests

5.5.6 (3.5.6) Test by inspection.

5.5.7 (3.5.7) Test as in Clause 12 of IEC 60945 and by inspection.

5.5.8 (3.5.8) Test by inspection.

5.5.9 (3.5.9) Test by inspection.

5.6 Tests of other requirements additional to those of the INMARSAT-C SDM

5.6.1 (3.6.1) Test by inspection.

5.6.2 (3.6.2) Test by inspection and evidence from the manufacturer or confirmation by INMARSAT.

5.6.3 (3.6.3) Test by inspection and as per INMARSAT test item S8-B (distress alert activation: Volume 3, Part 2, Chapter 5, section 8.3).

5.6.4 (3.6.4) Test by inspection.

5.7 Tests of technical characteristics

Tables 4 and 5 identify the tests in the INMARSAT documentation corresponding to the technical requirements identified in tables 1 and 2. For each test, the principal INMARSAT-C SDM subclause references are indicated: subclause references appearing in tables 1 and 2 but not in tables 4 and 5 relate to requirements addressed and verified indirectly in the INMARSAT test schedules. All tests shall be conducted under the environmental conditions prescribed in table 3. Where table 3 requires tests under both "P" and "T" the extremes of voltage and temperature shall be applied simultaneously.

A: normal ambient temperature (15 °C to 35 °C)

T: extreme temperature defined in table 3

H: relative humidity defined in table 3

P: primary power defined in table 3

V: vibration defined in table 3

Table 4 – INMARSAT-C SES schedule of tests

INMARSAT RTP, Table 1							
Item test designation		A	T	H	P	V	INMARSAT SDM Volume 3, Part 2, Chapter 2
1	Antenna						
1-A	Gain profile	X					3.2.1, 3.3.1, 3.4.1
1-B	Polarization and axial ratio	X					3.2.2, 3.2.3
2	Receiving system						
2-A	Noise temperature	X					3.3.1
2-B	G/T calculations						3.3.1
2-C	Tuning	X	X				3.3.4, 6.3.1
2-D	Selectivity	X	X	X			4.3
3	Transmitting system						
3-A	Output power and f^* response	X	X	X	X		3.4.1, 3.4.9
3-B	EIRP calculations						3.4.1
3-C	Transmitted spectrum	X					3.4.2
3-D	Transmitter off power level	X	X	X	X		3.4.3
3-E	Spurious outputs	X	X	X		X	3.4.4 ¹⁾
3-F	Harmonic outputs	X	X				3.4.5
3-G	Phase noise	X	X			X	3.4.6
3-H	Tuning	X	X				3.4.7
3-I	Frequency accuracy and stability	X	X	X	X		3.4.8
4	Receiver performance						
4-A	Packet error rate	X	X	X	X	X	3.3.3, 4.4, 4.5
4-B	Carrier and frame acquisition	X	X	X	X	X	4.4, 4.6
5	Transmitter performance						
5-A	Modulation characteristics	X	X		X		5.1
5-B	First-generation operation	X					5.2
5-C	Signalling channel characteristics	X					5.3
5-D	Message channel characteristics	X					5.4
6	Access control						
6-A	General access control	X					6.1
6-B	TDMA synchronization	X	X				6.2.1
6-C	Random access	X					6.2.2
6-D	Common channel selection	X					6.3
6-E	Region registration procedures	X					6.5
6-F	Idle and busy conditions	X					6.6

Table 4 (continued)

INMARSAT RTP, Table 1							
Item test designation		A	T	H	P	V	INMARSAT SDM Volume 3, Part 2, Chapter 2
7	Message processing						
7-A	Character codes	X					7.2
7-B	Display devices	X	X	X	X	X	7.3
7-C	Keyboard	X	X	X	X	X	7.4
7-D	SES memory capacity	X	X		X		7.5
7-E	DCE/DTE interface characteristics	X	X		X		7.6.1
7-F	Control codes	X					7.6.3
8	Distress alerting functions						
S8-A	Distress message generator	X					8.2 Chapter 5
S8-B	Distress alert activation	X	X	X	X	X	8.3 Chapter 5
9	Testing functions						
9-A	Fail safe and monitoring	X	X				9.1, 9.2
9-B	Performance verification and commissioning	X					9.3 Chapter 5
10	Electromagnetic compatibility						
10-A	Mains conducted spurious emissions	X					10.2
11	Physical characteristics						
11-A	Vibration frequency response	X					11.2 Chapter 5
11-B	Rain test	X					11.2 Chapter 5
<p>NOTE A: normal ambient temperature (15 °C to 35 °C) T: extreme temperature defined in table 3 H: relative humidity defined in table 3 P: primary power defined in table 3 V: vibration defined in table 3</p> <p>* f is frequency.</p> <p>1) Replaced by Annex B.</p>							

Table 5 – INMARSAT-EGC schedule of tests

INMARSAT RTP, Table 1							
Item test designation		A	T	H	P	V	INMARSAT SDM Volume 3, Part 2, Chapter 2
E1	Antenna						
1-A	Antenna gain profile	X					3.2
1-B	Polarization and axial ratio	X					3.2
E2	Receiving system						
2-A	Noise temperature	X					3.3
2-B	G/T calculations						3.3
E2-C	Receiver tuning	X	X				3.3
2-D	Receiver selectivity	X	X	X			4.3
E3	Receiver performance						
3-A*	Packet error rate	X	X	X	X	X	4.5 Chapter 8
E4	Message processing						
E4-A	Character codes	X					7.2 Chapter 8
E4-B	Output devices	X	X	X	X	X	7.3 Chapter 8
4-C*	Keyboard	X	X	X	X	X	7.4
E4-D	Memory capacity	X					7.5 Chapter 8
E4-E	Receiver addressing	X					7.7 Chapter 8
E4-F	Error detection	X					7.7.5 Chapter 8
E4-G	Sequence numbering handling	X					7.7.4 Chapter 8
E5	Distress alerting functions						
E5-A	Distress messages	X					7.7.6 Chapter 8
E6	Electromagnetic compatibility						
6-A*	Mains conducted spurious emissions	X					10
E7	Physical characteristics						
7-A*	Vibration frequency response	X					11 Chapter 8
7-B*	Rain test	X					11 Chapter 8
<p>NOTES</p> <p>1) A: normal ambient temperature (15 °C to 35 °C) T: extreme temperature defined in table 3 H: relative humidity defined in table 3 P: primary power defined in table 3 V: vibration defined in table 3</p> <p>2) Equivalence between test items in table 4 and table 5: 3A* = 4A, 4C* = 7C, 6A* = 10A, 7A* = 11A, 7B* = 11B</p>							

Annex A (normative)

Requirements relating to installation

A.1 General

This annex reproduces those requirements relating to installation as extracted from IMO Resolutions A.807(19) and A.664(16).

A.2 Requirements

A.2.1 (A.807(19) A5.1 and A.664(16) A4.1) *The ship earth station and the enhanced group call equipment shall normally be powered from the ship's main source of electrical energy. In addition, it shall be possible to operate the ship earth station, the enhanced group call equipment and all other equipment necessary for its normal functioning, including the antenna tracking system, where provided, from an alternative source of energy.*

A.2.2 (A.807(19) A5.2 and A.664(16) A4.2) *Changing from one source of supply to another shall not require the equipment to be manually re-initialized and shall not result in loss of received messages stored in the memory (see test in 5.2.2).*

A.2.3 (A.807(19) A6.1 and A.664(16) A5.1 and 5.3) *Where an omnidirectional antenna is used it shall, if practicable, be sited in such a position that no obstacle likely to degrade significantly the performance of the equipment appears in the fore and aft directions down to -5° and in the port and starboard directions down to -15° . For omnidirectional antennas, objects, especially those within 1 m of the antenna, which cause a shadow sector of more than 2° , are likely to degrade significantly the performance of the equipment.*

A.2.4 (A.807(19) A6.2 and A.664(16) A5.2 and 5.4) *Where a stabilized directive antenna is used it shall, if practicable, be sited in such a position that no obstacle, likely to degrade significantly the performance of the equipment, appears in any azimuth down to -5° . For directive antennas with a gain of approximately 20 dB, objects, especially those within 10 m of the antenna, which cause a shadow sector of greater than 6° , are likely to degrade significantly the performance of the equipment.*

A.3 It shall be confirmed that the equipment installation handbook contains appropriate information.