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**Global maritime distress and safety
system (GMDSS) –**

**Part 2:
COSPAS-SARSAT EPIRB –
Satellite emergency position indicating radio
beacon operating on 406 MHz –
Operational and performance requirements,
methods of testing and required test results**

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

GLOBAL MARITIME DISTRESS AND SAFETY SYSTEM (GMDSS) –

**Part 2: COSPAS-SARSAT EPIRB – Satellite emergency position
indicating radio beacon operating on 406 MHz –
Operational and performance requirements,
methods of testing and required test results**

FOREWORD

- 1) The IEC (International Electrotechnical Commission) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of the IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, the IEC publishes International Standards. Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. The IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
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International Standard IEC 61097-2 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, of which it constitutes a technical revision.

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

FDIS	Report on voting
80/348/FDIS	80/351/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.

The committee has decided that the contents of this publication will remain unchanged until 2007. At this date, the publication will be

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- withdrawn;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

INTRODUCTION

This revision of IEC 61097-2 is due to changes to the Radio Regulations, COSPAS-SARSAT requirements and amendments to the IMO performance standards for 406 MHz Satellite emergency position indicating radio beacons (EPIRBs).

The document has been renumbered and rearranged to comply in certain aspects with ISO/IEC Directives, and the requirements have been regrouped in a more logical order.

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GLOBAL MARITIME DISTRESS AND SAFETY SYSTEM (GMDSS) –

Part 2: COSPAS-SARSAT EPIRB – Satellite emergency position indicating radio beacon operating on 406 MHz – Operational and performance requirements, methods of testing and required test results

1 Scope

This part of IEC 61097 specifies the minimum performance requirements, technical characteristics and type-testing requirements of the satellite emergency position-indicating radio beacon used in the COSPAS-SARSAT satellite system (satellite EPIRB), as required by Regulation IV/7.1.6 of the 1988 amendments to the 1974 International Convention for Safety of Life at Sea (SOLAS), and which is associated with IEC 60945 (General requirements). When a requirement in this standard is different from IEC 60945, the requirement in this standard shall take precedence.

This standard also includes minimum performance standards for a manually activated satellite EPIRB without float-free release mechanism (see annex C).

This standard incorporates the performance standards of IMO Resolutions A.810(19) *Performance Standards for float-free satellite emergency position-indicating radio beacons (EPIRBs) operating on 406 MHz* and A.662(16) *Performance Standards for float-free release and activation arrangements for emergency radio equipment*, the International Telecommunication Union (ITU) Radio Regulations as well as the technical characteristics for such transmitters contained in Recommendation ITU-R M.633 (as amended), and takes account of the general requirements contained in IMO Resolution A.694(17).

All texts of this standard, whose wording is identical to that in the IMO SOLAS Convention 1974 as amended in 1988 and Resolutions A.658(16), A.662(16), A.689(17), A.694(17), A.696(17), A.702(17) and A.810(19) and Recommendation ITU-R M.633 will be printed in italics and the Resolution/Recommendation and paragraph number indicated between brackets.

NOTE 1 Classes of satellite EPIRB's considered in this document are:

– Class 1: Float-free (–40 °C to +55 °C). The float-free release mechanism (A.662(16)) should be capable of operating throughout the temperature range of –40 °C to +65 °C.

This class is not required by IMO Resolutions but may be applied at the discretion of each Administration.

– Class 2: Float-free (–20 °C to +55 °C). The float-free release mechanism (A.662(16)) should be *capable of operating throughout the temperature range of –30 °C to +65 °C*.

NOTE 2 Non-float-free, manually activated satellite EPIRB's in both classes are considered in annex C.

NOTE 3 All classes shall include a 121,5 MHz homing device, described in annex D.

User experience of COSPAS-SARSAT EPIRB operation leading to some clarification of IMO performance standards, and providing some useful information for satellite EPIRB users is included in annex E.

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, *Marine navigation and radiocommunication equipment and systems – General Requirements – Methods of testing and required test results*

IMO Resolution A.658(16):1989, *Use and fitting of retro-reflective materials on life-saving appliances*

IMO Resolution A.662(16):1989, *Performance standards for float-free release and activation arrangements for emergency radio equipments*

IMO Resolution A.689(17):1991, *Testing of life-saving appliances*

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 Resolution A.696(17):1991, *Type approval of satellite emergency position-indicating radio beacons (EPIRBs) operating in the COSPAS-SARSAT system*

IMO Resolution A.702(17):1991, *Radio maintenance guidelines for the global maritime distress and safety system (GMDSS) related to sea areas A3 and A4*

IMO Resolution A.810(19):1995, *Performance standards for float-free satellite emergency position-indicating radio beacons (EPIRBs) operating on 406 MHz*

ITU-R Recommendation M.585 as amended, *Assignment and use of maritime mobile service identities*

ITU-R Recommendation M.633, *Transmission characteristics of a satellite emergency position-indicating radio beacon (satellite EPIRB) system operating through a low polar-orbiting satellite system in the 406 MHz band*

ITU-R Recommendation M.690-1, *Technical characteristics of emergency position indicating radio beacons (EPIRBs) operating on the carrier frequencies of 121,5 MHz and 243 MHz*

COSPAS-SARSAT
C/S T.001, as amended, *Specification for COSPAS-SARSAT 406 MHz distress beacons and C/S T.007, as amended, COSPAS-SARSAT 406 MHz distress beacon type approval standard (as applicable to EPIRBs).*

IMO Safety of Life at Sea (SOLAS) Convention 1974, as amended. (GMDSS)

3 Performance requirements

3.1 Compliance

(A.810(19)/A.1) *The satellite emergency position-indicating radio beacon (EPIRB) shall, in addition to meeting the requirements of the Radio Regulations, the relevant ITU-R Recommendations and the general requirements set out in resolution A.694(17) comply with the following performance Standard.*

In addition to this performance Standard, the satellite EPIRB shall comply with the requirements of COSPAS-SARSAT documents C/S T.001 and C/S T.007, as amended.

The radio frequency of operation of the equipment shall at all times be within the limits defined by the Radio Regulations.

3.2 General

- a) The satellite EPIRB shall be (IV/7.1.6.3) *ready to be manually released and capable to be carried by one person into a survival craft.*
- b) (A.810(19)/A.2.1) *The satellite EPIRB shall be capable of transmitting a distress alert to a polar orbiting satellite service operating in the 406 MHz band.*
- c) It shall be designed to operate according to this standard when floating in the sea and shall also be capable of operating on board a ship and on a survival craft.
- d) (A.810(19)/A.2.2) *The satellite EPIRB shall be of an automatic float-free type. The equipment, mounting and releasing arrangements shall be reliable and operate satisfactorily under the most extreme conditions likely to be met with at sea.*
- e) (A.662(16)/1) *Float-free release and activation arrangements shall enable the automatic release of the satellite EPIRB from a sinking ship and its automatic activation.* Table 1 shows the correct combination of control functions to prevent or enable activation.

Table 1 – EPIRB control functions

Control position		EPIRB condition		EPIRB-mount or release mechanism status		Transmitter status	
ON	READY	WET*	DRY	OUT	IN	ON	OFF
X		X		X		X	
X		X			X	X	
X			X	X		X	
X			X		X	X	
	X	X		X		X	
	X	X			X		X
	X		X	X			X
	X		X		X		X

* Floating or immersed in water

- f) (A.694(17)/1.2) *Where a unit of equipment provides a facility which is additional to the minimum requirements of this standard, such as an EPFE (Electronic Position-Fixing Equipment) or the possibility of connecting external data, the operation, and as far as is reasonably practicable, the malfunction of such additional facility shall not degrade the performance of the equipment below those minimum standards. The additional facility shall, as a minimum, meet the appropriate requirements of IEC 60945, as applicable. Where such an additional facility exists, it shall not prevent the satellite EPIRB fully conforming to the requirements of this standard during normal combined operation.*
- g) The satellite EPIRB shall be a single integral unit. No part of it shall be detachable without the use of tools.

3.3 Operational

3.3.1 Prevention of inadvertent activation

The satellite EPIRB shall:

- a) (A.810(19)/A.2.3.1) be fitted with adequate means to prevent inadvertent activation and deactivation;
- b) not automatically activate when water washes over it while in its release mechanism. See table 1;
- c) be designed to limit any inadvertent continuous 406 MHz transmission to a maximum of 45 s.

3.3.2 Immersion, buoyancy and drop into water

The satellite EPIRB shall:

- a) (A.810(19)/A.2.3.2) *be so designed that the electrical portions are watertight at a depth of 10 m for at least 5 min. Consideration shall be given to a temperature variation of 45 °C during transitions from the mounted position to immersion. The harmful effects of a marine environment, condensation and water leakage shall not affect the performance of the beacon;*
- b) (A.810(19)/A.2.3.6) *be capable of floating upright in calm water and have positive stability and sufficient buoyancy in all sea conditions;*
- c) (A.810(19)/A.2.3.7) *be capable of being dropped into the water without damage from a height of 20 m.*

3.3.3 Activation

- a) The satellite EPIRB shall (A.810(19)/A.2.3.3) *be automatically activated after floating free or when floating in the water, irrespective of the settings of any control. See table 1.*
- b) The satellite EPIRB shall (A.810(19)/A.2.3.4) *be capable of repetitive manual activation and manual deactivation.*

Manual deactivation shall not prevent automatic activation of the satellite EPIRB when automatically released from its release mechanism or when floating in the water.

- c) The satellite EPIRB shall (A.810(19)/A.2.3.11) *be provided with a low-duty cycle light (of at least effective 0,75 cd) active during darkness or operating continually, and flashing at a rate of 20 to 30 times per minute, with a flash duration of between 10⁻⁶ s and 10⁻² s to indicate its position for the nearby survivors and rescue units.*

The light shall be mounted so that it is visible over as great a portion of the upper hemisphere as is practical.

- d) When the satellite EPIRB is manually activated, the low-duty cycle light (see 3.3.3 c)) shall begin flashing within 2 s, in any lighting condition, and no distress signal shall be emitted until at least 47 s and at most 5 min after the satellite EPIRB has been manually activated.
- e) After start of transmission of the distress signal, the operation of low-duty cycle light should be in accordance with 3.3.3 c).
- f) The satellite EPIRB shall (A.810(19)/A.2.3.5) *be provided with means to indicate that signals are being emitted.* If a low-duty cycle light operating in accordance with 3.3.3 c), is not active during daylight, alternative indication during this time shall be provided.
- g) The satellite EPIRB shall (A.810(19)/A.2.3.14) *be provided with a 121,5 MHz beacon primarily for homing by aircraft.*

3.3.4 Self-test

The satellite EPIRB shall (A.810(19)/A.2.3.8) *be capable of being tested, without using the satellite system, to determine that the satellite EPIRB is capable of operating properly.*

When the self-test mode (C/S T.001) is activated, the satellite EPIRB shall emit a single burst which shall always provide the beacon 15 Hex ID. The frame synchronization pattern shall be "011010000" (i.e. the last eight bits are complemented so that this test burst will not be processed by the satellite equipment and the burst duration shall be 440 ms or 520 ms).

For location protocol beacons, the content of the encoded position data field of the self-test message should be the default values specified in (C/S T.001). Successful completion of the test shall be indicated. Activation of the test facility shall reset automatically. Any transmission in the self-test mode shall be limited to one burst. If the 121,5 MHz auxiliary radio-locating device signal is transmitted during the self-test, it should not exceed 3 audio sweeps or 1 second, whichever is greater.

3.3.5 Colour and retro-reflecting material

The satellite EPIRB shall (A.810(19)/A.2.3.9) *be of highly visible yellow/orange colour and be fitted with retro-reflecting material.*

A band of retro-reflective material, at least 25 mm wide, encircling that part of the satellite EPIRB's body which is normally protruding above the water-line, shall be acceptable.

The retro-reflective material shall also meet the performance requirements of IMO Resolution A.658(16) annex 2.

3.3.6 Lanyard

The satellite EPIRB shall (A.810(19)/A.2.3.10) *be equipped with a buoyant lanyard, firmly attached to it, suitable for use as a tether for survivors or from a survival craft in the water. It shall be so arranged as to prevent its being trapped in the ship's structure when floating free.*

The buoyant lanyard shall have a length of 5 m to 8 m. The breaking strength of the lanyard and its attachment to the satellite EPIRB shall be at least five times the weight of the satellite EPIRB.

3.3.7 Exposure to the marine environment

The satellite EPIRB shall *not* (A.810(19)/A.2.3.12), including the labelling, *be unduly affected by sea water or oil or both; and (A.810(19)/A.2.3.13) be resistant to deterioration in prolonged exposure to sunlight.*

3.3.8 Ergonomics

The satellite EPIRB shall have all controls of sufficient size for simple and satisfactory operation and also be capable of being operated by a person wearing an immersion suit as defined in the IMO Lifesaving Appliance Code (Resolution MSC.48(66)), section 2.3.

3.3.9 Indication of previous activation

The satellite EPIRB shall be provided with means to indicate that the satellite EPIRB has been previously activated, to advise the users of a possible reduction of the required battery capacity. These means shall not be capable of reset by the user.

For example, manual activation of the satellite EPIRB shall require the breaking of a seal, which shall not be replaceable by the user. This seal shall not be broken when using the self-test facility.

3.4 Distress function

(A.810(19)/A.3.1) *When the satellite EPIRB is manually operated a distress alert shall be initiated only by means of a dedicated distress alert activator. See table 1.*

The dedicated activator shall:

- a) (A.810(19)/A.3.2.1) *be clearly identified; and*
- b) (A.810(19)/A.3.2.2) *be protected against inadvertent operation.*

(A.810(19)/A.3.3) *Manual distress alert initiation shall require at least two independent actions neither of which on its own shall activate the satellite EPIRB.*