

INTERNATIONAL STANDARD

**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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IEC Central Office
3, rue de Varembe
CH-1211 Geneva 20
Switzerland
Email: inmail@iec.ch
Web: www.iec.ch

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PRICE CODE



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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**

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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 third edition cancels and replaces the second edition, published in 2002, of which it constitutes a technical revision.

The significant changes in this edition include revised characteristics for the low duty cycle light in 3.3.3 c), together with a revised test in 5.3.3.3, to allow the use of white LEDs. Requirements for retro-reflecting material and the lanyard have been clarified in 3.3 noting the ever decreasing size of EPIRBs, and requirements for equipment manuals and labelling clarified in 3.11 and 3.12. Battery life requirements have been clarified in 4.6.2.

The test methods have been generally revised to align with the latest editions of COSPAS-SARSAT T.001 and T.007 and IEC 60945. An extra test requirement for a drop onto a hard

surface has been added, together with further frequency bands for the measurement of spurious emissions to protect aeronautical communications.

Annex B, which reproduced some COSPAS-SARSAT material has been deleted and replaced with a new annex giving requirements for EPIRBs associated with navigation devices.

Annex C, concerning EPIRBs without a float free mechanism, has been expanded and Annex D, concerning the homing device, includes a new radiated power test “off ground plane” and clarification to the measurement of spurious emissions.

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

| | |
|------------|------------------|
| CDV | Report on voting |
| 80/480/CDV | 80/514/RVC |

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

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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

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- 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 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. When a requirement in this standard is different from IEC 60945, the requirement in this standard takes precedence.

This standard incorporates the performance standards of IMO Resolution A.810(19), the International Telecommunication Union (ITU) Radio Regulations as well as the technical characteristics for such transmitters contained in Recommendation ITU-R M.633, and takes account of the general requirements contained in IMO Resolution A.694(17). This standard further takes account of IMO Resolution A.696(17) concerning the type approval of satellite EPIRBs.

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

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NOTE 1 Although a number of the requirements and tests may be similar this standard is not intended to be used with 406 MHz Ship Security Alert System (SSAS) Beacons.

All texts of this standard, whose wording is identical to that in the IMO SOLAS Convention 1974 as amended and Resolutions A.662(16), A.694(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 2 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 –30 °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 3 Non float-free, satellite EPIRB's in both classes are considered in Annex C.

NOTE 4 All classes include a 121,5 MHz homing device, described in Annex D.

NOTE 5 All classes may include beacon position data, obtained from a navigation device internal or external to the satellite EPIRB as described in Annex B.

NOTE 6 User experience of COSPAS-SARSAT satellite 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*

IEC 61108-1, *Maritime navigation and radiocommunication equipment and systems – Global Navigation Satellite Systems (GNSS) – Part 1: Global Positioning System (GPS) – Receiver equipment – Performance standards, methods of testing and required test results*

ISO 15734:2001, *Ships and marine technology – Hydrostatic release units*

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 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 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, as amended by IMO Resolution MSC.56(66) and IMO Resolution MSC.120(74)*

IMO Resolution MSC.48(66):1996, *International life-saving appliance code*

IMO Resolution MSC.81(70):1998, *Revised recommendation on testing of life-saving appliances, as amended by IMO Resolution MSC.200(80)*

ITU-R Recommendation M.585, *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 satellite system in the 406 MHz band*

ITU-R Recommendation M.690, *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, *Specification for COSPAS-SARSAT 406 MHz Distress Beacons*

C/S T.007, *COSPAS-SARSAT 406 MHz Distress Beacon Type Approval Standard (as applicable to satellite EPIRBs)*

C/S T.012, as amended, *COSPAS-SARSAT 406 MHz Frequency Management Plan*

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

United Nations *Recommendations on the Transport of Dangerous Goods, Manual of Tests and Criteria, Fourth Revised Edition, PART III, Section 38.3 (ST/SG/AC.10/11/Rev.4).*

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, C/S T.007 and C/S T.012.

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

3.2 General

The following are general requirements for the satellite EPIRB.

- 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 the satellites comprising the COSPAS-SARSAT system operating in the 406 MHz band.*
- c) The satellite EPIRB 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 internal navigation device (Global Navigation Satellite System (GNSS) receiver) or the possibility of connecting external*

navigation 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. Any internal or external navigation device connected to, or forming part of, the satellite EPIRB shall comply with the requirements of Annex B.

- 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

The following describes the activation of the satellite EPIRB.

- 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 white light (of at least effective 0,75 cd) active during darkness and all other lighting conditions, and flashing at a rate of 20 to 30 times per minute, with a flash duration of between 10⁻⁶ s and 10⁻¹ s to indicate its position for the nearby survivors and rescue units.*

The light shall be mounted so that it produces effective 0,75 cd or greater over as great a portion of the upper hemisphere as is practical. The arithmetic mean of the light output over the entire upper hemisphere shall not be less than effective 0,50 cd.

NOTE Note that there can be areas of lower intensity at spots around the satellite EPIRB and as the elevation increases to allow for mounting bushes, controls and the antenna etc and for the fact that at higher elevation angles the range to rescue units is reduced.

- 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 the 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*. The low-duty cycle light operating in accordance with 3.3.3 c), is an acceptable indication.
- 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 (see C/S T.001) is activated, the satellite EPIRB shall emit a single modulated 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. The 121,5 MHz auxiliary radio-locating device signal shall also be transmitted during the self-test, but it shall not exceed 3 audio sweeps or 1 s whichever is greater. The self-test function shall perform an internal check and indicate that RF power is being emitted at 406 MHz and at 121,5 MHz.

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*.

The minimum area of retro-reflective material visible above the water-line of the satellite EPIRB shall be at least 25 cm². This shall be achieved by retro-reflective material, at least 25 mm wide, with at least 5 cm² viewable from every angle on the horizon.

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 25 kg.

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*.