

# INTERNATIONAL STANDARD

**Global maritime distress and safety system (GMDSS) –  
Part 2: Cospas-Sarsat EPIRB – Emergency position indicating radio beacon  
operating on 406 MHz – Operational and performance requirements, methods of  
testing and required test results**

[IEC 61097-2:2021](#)

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**GLOBAL MARITIME DISTRESS AND SAFETY SYSTEM (GMDSS) –****Part 2: Cospas-Sarsat EPIRB – Emergency position  
indicating radio beacon operating on 406 MHz –  
Operational and performance requirements,  
methods of testing and required test results**

## FOREWORD

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IEC 61097-2 has been prepared by IEC technical committee 80: Maritime navigation and radiocommunication equipment and systems. It is an International Standard.

This fourth edition cancels and replaces the third edition published in 2008. This edition constitutes a technical revision.

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

- a) revision of the Scope to incorporate new IMO performance standards published in 2019;
- b) addition of requirements and tests for second generation beacons designed for operation with the Cospas-Sarsat medium earth orbit (MEO) satellite constellation;
- c) addition of an AIS locating device, a night vision light and an optional return link service (RLS);

- d) reduction of the minimum duty cycle of the 121,5 MHz homing signal;
- e) addition of requirements for an internal GNSS receiver including a related range of additional GNSS tests in Annex B;
- f) inclusion of a new Clause 3 for terms, definitions and abbreviated terms;
- g) addition of a new Annex E for the AIS locating signal specification, a new Annex F for symbols and a new Annex G for IEC 61162-1 RLM sentence notes;
- h) deletion of the original Annex E which is now of historic interest.

The text of this International Standard is based on the following documents:

FDIS	Report on voting
80/999/FDIS	80/1002/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](http://www.iec.ch/members_experts/refdocs). The main document types developed by IEC are described in greater detail at [www.iec.ch/standardsdev/publications](http://www.iec.ch/standardsdev/publications).

A list of all parts in the 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 document will remain unchanged until the stability date indicated on the IEC website under [webstore.iec.ch](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 2: Cospas-Sarsat EPIRB – 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 emergency position-indicating radio beacon used in the Cospas-Sarsat satellite system (EPIRB), as required by the International Convention for Safety of Life at Sea (SOLAS) as amended, and which is associated with IEC 60945. When a requirement in this document is different from the requirements in IEC 60945 or other standards, the requirement in this document takes precedence.

This document incorporates the performance standards of IMO Resolution MSC.471(101), 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 document also includes minimum performance standards for a non-float-free EPIRB without float-free release mechanism (see Annex C).

NOTE 1 Although a number of the requirements and tests can be similar, this document is not intended to be used with 406 MHz ship security alert system (SSAS) beacons.

All texts of this document, whose wording is identical to that in the IMO Resolutions A.662(16), A.694(17), and MSC.471(101) will be printed in *italics* and the Resolution/Recommendation and paragraph number indicated between brackets.

NOTE 2 Classes of EPIRBs considered in this document are:

- Class 0: Category 1 Float-free (–55 °C to +70 °C). The float-free release mechanism (A.662(16)) is capable of operating throughout the temperature range of –30 °C to +65 °C and of surviving a stowage temperature range of –55 °C to +70 °C.
- Class 1: Category 1 Float-free (–40 °C to +55 °C). The float-free release mechanism (A.662(16)) is capable of operating throughout the temperature range of –30 °C to +65 °C and of surviving a stowage temperature range of –40 °C to +65 °C.

These classes are not required by IMO Resolutions but can be applied at the discretion of each Administration.

- Class 2: Category 1 Float-free (–20 °C to +55 °C). The float-free release mechanism (A.662(16)) is capable of being stowed and of operating throughout the temperature range of –30 °C to +65 °C.

NOTE 3 Category 2 Non float-free, EPIRBs in all 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 include an AIS locating signal, described in Annex E.

NOTE 6 All classes include beacon position data, obtained from a navigation device internal to the EPIRB and can also provide an external navigation input as described in Annex B.

#### 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 60945:2002, *Maritime navigation and radiocommunication equipment and systems – General Requirements – Methods of testing and required test results*

IEC 61097-14:2010, *Global maritime distress and safety system (GMDSS) – Part 14: AIS search and rescue transmitter (AIS-SART) – Operational and performance 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*

IEC 61108-2, *Maritime navigation and radiocommunication equipment and systems – Global navigation satellite systems (GNSS) – Part 2: Global navigation satellite system (GLONASS) – Receiver equipment – Performance standards, methods of testing and required test results*

IEC 61108-3, *Maritime navigation and radiocommunication equipment and systems – Global navigation satellite systems (GNSS) – Part 3: Galileo receiver equipment – Performance requirements, methods of testing and required test results*

IEC 61108-5:2020, *Maritime navigation and radiocommunication equipment and systems – Global navigation satellite systems (GNSS) – Part 5: BeiDou navigation satellite system (BDS) – Receiver equipment – Performance requirements, methods of testing and required test results*

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

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

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

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

IMO Resolution MSC.48(66):1996, *Adoption of the International life-saving appliance (LSA) code, as amended by IMO Resolutions MSC.207(81), MSC.218(82) and MSC.272(85)*

IMO Resolution MSC.471(101):2019, *Performance standards for float-free emergency position-indicating radio beacons (EPIRBs) operating on 406 MHz*

ITU Radio Regulations

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

ITU-R Recommendation M.1371-5:2014, *Technical characteristics for an automatic identification system using time-division multiple access in the VHF maritime mobile band*

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*

C/S T.012, *Cospas-Sarsat 406 MHz Frequency Management Plan*

C/S T.018, *Specification for Second-Generation Cospas-Sarsat 406 MHz Distress Beacons*

C/S T.021, *Cospas-Sarsat Second Generation 406 MHz Distress Beacon Type Approval Standard*

United Nations, *Recommendations on the Transport of Dangerous Goods: Manual of Tests and Criteria, 7<sup>th</sup> Revised Edition, PART III, Section 38.3 (ST/SG/AC.10/11/Rev.7), as amended*

### 3 Terms, 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

##### Hex ID

hexadecimal characters that uniquely identify each 406 MHz beacon

Note 1 to entry: First generation beacons use 15 hexadecimal characters. Second generation beacons use 23 hexadecimal characters.

#### 3.2 Abbreviated terms

AIS	automatic identification system
AIS 1	channel 2087 (161,975 MHz)
AIS 2	channel 2088 (162,025 MHz)
COG	course over ground
EIRP	effective isotropic radiated power
EPIRB	emergency position-indicating radio beacon
FGB	first generation beacon <a href="https://standards.iteh.ai/catalog/standards/sist/e6cd9fa0-af4f-4b30-a7e9-36e7864b7dea/iec-61097-2-2021">IEC 61097-2:2021</a>
GNSS	global navigation satellite system
PERP	peak effective radiated power
RLM	return link message
RLS	return link service
RF	radio frequency
SGB	second generation beacon
SOG	speed over ground
SOTDMA	self-organizing time division multiple access
TTF	time to first fix
TTFIT	time to first fix transmission (that is the time until the first GNSS fix is encoded into and transmitted in a 406 MHz signal)
UTC	coordinated universal time

### 4 Performance requirements

#### 4.1 Compliance

(MSC.471(101)/A.1) *The 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 performance standards given in MSC.471(101).*

In addition to MSC.471(101) the EPIRB shall also comply with the applicable requirements in either Cospas-Sarsat documents C/S T.001, and C/S T.012 or Cospas-Sarsat document C/S T.018.

NOTE Compliance with documents C/S T.001 or C/S T.018 is demonstrated by testing to documents C/S T.007 or C/S T.021 respectively (see 6.1.2).

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

**4.2 General**

(See 6.1.6, 6.2.1, 6.2.2, 6.3.2, 6.3.4 and 6.3.7)

The following are general requirements for the EPIRB.

- a) The EPIRB shall be (SOLAS IV/7.1.6.3) *ready to be manually released and capable to be carried by one person into a survival craft.*
- b) (MSC.471(101)/A.2.1) *The EPIRB shall be capable of transmitting a distress alert, including encoded position information from a receiver using a recognised global navigation satellite system (GNSS) with global coverage, to satellites equipped with a search and rescue 406 MHz processor or repeater.*
- c) The EPIRB shall be designed to operate according to this document when floating in the sea and shall also be capable of operating on board a ship and on a survival craft.
- d) (MSC.471(101)/A.2.2) *The 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 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 <sup>a</sup>	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

<sup>a</sup> 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 document, such as return link service (RLS) functionality 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 EPIRB fully conforming to the requirements of this document during normal combined operation. Any internal or external navigation device connected to, or forming part of, the EPIRB shall comply with the requirements of Annex B. Any EPIRB with optional RLS functionality shall comply with the appropriate requirements of C/S T.001 or C/S T.018 as applicable and 5.8.
- g) The EPIRB shall be a single integral unit. No part of it shall be detachable without the use of tools.
- h) The EPIRB shall (MSC.471(101)/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, visible to the human eye 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 for the operating lifetime of the EPIRB to indicate its position for the nearby survivors and rescue units.*

This 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. No measured points (see Table 2) shall have an effective luminous intensity of less than 0,2 cd.

NOTE 1 There can be areas of lower intensity at non measured points around the 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.

- i) The EPIRB shall (MSC.471(101)/A.2.3.11) *be provided with a low-duty cycle light active during all lighting conditions detectable by all types of night vision devices for the operating lifetime of the EPIRB.*

The night vision low-duty cycle light shall have a dominant wavelength between 770 nm and 890 nm and shall have an average radiant intensity of at least 2,5 mW/sr, flashing at a rate of 20 to 30 times per minute, with a flash duration between 66 ms and 500 ms for the operating lifetime of the EPIRB.

This night vision low-duty cycle light shall be mounted so that it produces light output over as great a portion of the upper hemisphere as is practical. The arithmetic mean of the light output over the upper hemisphere above 20° elevation shall not be less than 2,5 mW/sr. No measured points (see Table 3) shall have a radiant intensity of less than 0,25 mW/sr.

NOTE 2 There can be areas of lower intensity at non measured points around the 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.

- j) The flashes of the low-duty cycle white light and the low-duty cycle night vision light may be synchronous or asynchronous with respect to each other. The low-duty cycle white light and the low-duty cycle night vision light may be a combined light, provided all the conditions in h) and i) are complied with.
- k) The EPIRB shall (MSC.471(101)/A.2.3.14) *be provided with a 121,5 MHz beacon primarily for homing by aircraft.*
- l) The EPIRB shall (MSC.471(101)/A.2.3.15) *be provided with an internal GNSS receiver for position fixes and an associated indication that GNSS signal reception is satisfactory or unsatisfactory.*
- m) The EPIRB shall (MSC.471(101)/A.2.3.16) *be provided with an automatic identification system (AIS) locating signal in accordance with the Recommendation ITU-R M.1371, Technical characteristics for an automatic identification system using time division multiple access in the VHF maritime mobile frequency band.*
- n) The EPIRB should have an exterior design that precludes sharp edges to prevent damage to inflatable survival craft.