

INTERNATIONAL STANDARD

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**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 61097-14:2010
**Systeme mondial de detresse et de securite en mer (GMDSS) –
Partie 14: Emetteur de recherche et sauvetage AIS – Exigences operationnelles
et de fonctionnement, methodes d'essai et resultats exigibles**



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IEC Central Office
3, rue de Varembe
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
Fax: +41 22 919 03 00
info@iec.ch
www.iec.ch

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Part 14: AIS search and rescue transmitter (AIS-SART) – Operational and
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IEC 61097-14:2010
**Système mondial de détresse et de sécurité en mer (GMDSS) –
Partie 14: Émetteur de recherche et sauvetage AIS – Exigences opérationnelles
et de fonctionnement, méthodes d'essai et résultats exigibles**

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

**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**

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International Standard IEC 61097-14 has been prepared by IEC technical committee 80: Maritime navigation and radiocommunication equipment and systems.

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

FDIS	Report on voting
80/582/FDIS	80/589/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.

The French version of this standard has not been voted upon.

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

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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

1 Scope

This part of IEC 61097 specifies the minimum performance requirements, technical characteristics and methods of testing, and required test results, for Automatic Identification Systems (AIS) search and rescue transmitters (AIS-SART) which may be carried by ships as a search and rescue locating device as required by Chapters III and IV of the International Convention for Safety of Life at Sea (SOLAS), as amended. It takes account of IMO resolution A.694(17) and is associated with IEC 60945. When a requirement in this standard is different from IEC 60945, the requirement in this part of IEC 61097 takes precedence.

This standard incorporates the applicable parts of the performance standards included in IMO Resolution MSC.246(83) and the applicable technical characteristics included in Recommendation ITU-R M.1371 and is associated with IEC 61993-2 (Class A shipborne AIS).

All the text of this standard, whose wording is identical to that of IMO Resolution MSC.246(83), is printed in *italics*, and the Resolution and associated performance standard paragraph numbers are indicated in brackets.

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NOTE IEC 61097-1 specifies the requirements for radar transponders for use in search and rescue operations (SART) which may alternatively be carried by ships as a search and rescue locating device.

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, *Maritime navigation and radiocommunication equipment and systems – General requirements – Methods of testing and required test results*

IEC 61108 (all parts), *Maritime navigation and radiocommunication equipment and systems – Global navigation satellite systems (GNSS)*

IMO Resolution MSC.246(83), *Performance standards for survival craft AIS search and rescue transmitter (AIS-SART)*

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

ITU-T Recommendation O.153, *Basic parameters for the measurement of error performance at bit rates below the primary rate*

3 Performance requirements

3.1 General

(246/A2) *The AIS-SART shall be capable of transmitting messages that indicate the position, static and safety information of a unit in distress. The transmitted messages shall be compatible with existing AIS installations. The transmitted messages shall be recognized and displayed by assisting units in the reception range of AIS-SART, and clearly distinguish the AIS-SART from an AIS installation.*

3.2 Operational

(See 6.1)

(246/A2.1) *The AIS-SART shall*

- a) be capable of being easily activated by unskilled personnel,*
- b) be fitted with means to prevent inadvertent activation,*
- c) be equipped with a means which is either visual or audible, or both visual and audible, to indicate correct operation,*
- d) be capable of manual activation and deactivation, provision for automatic activation may be included,*
- e) be capable of withstanding without damage drops from a height of 20 m into water,*
- f) be watertight at a depth of 10 m for at least 5 min,*
- g) maintain water tightness when subjected to a thermal shock of 45 °C under specified conditions of immersion,*
- h) be capable of floating (not necessarily in an operating position) if it is not an integral part of the survival craft,*
- i) be equipped with a buoyant lanyard, suitable for use as a tether, if it is capable of floating,*
The buoyant lanyard shall have a length not less than 10 m.
- j) be not unduly affected by seawater or oil,*
- k) be resistant to deterioration in prolonged exposure to sunlight,*
- l) be of a highly visible yellow/orange colour on all surfaces where this will assist detection,*
- m) have a smooth external construction to avoid damaging the survival craft,*
- n) be provided with an arrangement to bring the AIS-SART antenna to a level of at least 1 metre above sea level, together with illustrated instruction,*

The manufacturer shall provide a visible means of indicating the base of the antenna. The height of 1 metre shall be measured to the declared 1 metre mark from sea level. The instructions shall illustrate the minimum requirement of 1 metre above sea level during use along with the installation method.

- o) be capable of transmitting with a reporting interval of 1 minute or less,*
- p) be equipped with an internal position source and be capable of transmitting its current position in each message, and*
- q) be capable of being tested for all functionalities using specific test information.*

3.3 Battery

(See 6.2)

3.3.1 General

(246/A2.2) *The AIS-SART shall have sufficient battery capacity to operate for 96 h within a temperature range of $-20\text{ }^{\circ}\text{C}$ to $+55\text{ }^{\circ}\text{C}$, and to provide for testing of the functions on the equipment.*

3.3.2 Battery life and expiry date

The life of the battery as defined by its expiry date shall be at least three years. The expiry date of the battery shall be the battery manufacturing date plus no more than half the useful life of the battery. The useful life of the battery is defined as the period of time after the date of battery manufacture that the battery will continue to meet the input power requirements of the AIS-SART for at least 96 h, after allowing for all losses over the useful life of the battery. To define the useful life of the battery, the following losses at the temperature of $+20\text{ }^{\circ}\text{C} \pm 5\text{ }^{\circ}\text{C}$ shall be included, in addition to the power required to operate the AIS-SART:

- a) self-testing annually with Electronic Position Fixing System (EPFS) data available;
- b) self-discharge of the battery;
- c) stand-by loads.

The manufacturer shall provide evidence to support the above battery life calculations including the time for self testing and assuming typical EPFS acquisition time.

The AIS-SART shall be clearly and durably marked with the battery expiry date (see 3.8).

NOTE For example a battery that has a useful life of 10 years from the date of manufacture, cannot have an expiry date that exceeds 5 years from the date of manufacture and would have to be capable of providing enough power for 10 years of self-testing, self-discharge and stand-by loads in addition to the operational power requirement of the AIS-SART.

3.3.3 Reverse polarity protection

It shall not be possible to connect the battery with the polarity reversed.

3.4 Unique identifier (user ID)

(See 6.3)

(246/A2.2) *The AIS-SART shall have an unique identifier to ensure the integrity of the VHF data link.*

The user ID for an AIS-SART is 970xyyyy, where xx = manufacturer ID¹ 01 to 99; yyyy = the sequence number 0000 to 9999.

The manufacturer ID xx = 00 is reserved for test purposes The unique identifier used for the purposes of type approval to this standard shall be in the format 97000yyyy.

After being programmed by the manufacturer, it shall not be possible for the user to change the unique identifier of the AIS SART.

The configuration method for the unique identifier shall be as defined by the manufacturer and held in non-volatile memory.

¹ The manufacturer ID can be obtained from CIRM, South Bank House, Black Prince Road, London SE1 7SJ, UK. Telephone: +44 20 7587 1245. E-mail: secgen@cirm.org. Web-site: www.cirm.org. Each manufacturer's ID will support 10 000 units. Further IDs can be issued when production exceeds 10 000 units.

3.5 Environment

(See 6.4)

(246/A2.3) *The AIS-SART shall be so designed as to be able to operate under ambient temperatures of –20 °C to +55 °C. It shall not be damaged in stowage throughout the temperature range of –30 °C to +70 °C.*

The AIS-SART shall meet the environmental condition requirements of IEC 60945 for equipment category Portable.

3.6 Range performance

(See 6.5)

(246/A2.4) *The AIS-SART shall be detectable at a range of 5 nautical miles over water.*

The nominal radiated power (EIRP²) of the AIS-SART shall be 1 W.

This radiated power provides the range performance of the AIS-SART as described in Annex A.

NOTE To a surface vessel the 5 nautical mile range is based on an antenna height for the AIS-SART of 1 m above sea level, and the antenna height for a receiving AIS Station of at least 15 m above sea level. The receiving AIS Station has the minimum sensitivity of a Class A mobile AIS station as defined in IEC 61993-2.

3.7 Transmission performance

(See 6.6)

3.7.1 Active mode

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In active mode the AIS-SART transmits messages in a burst of 8 messages once per minute. The SOTDMA (Self-Organising Time Division Multiple Access) communication state of Message 1 is used to pre-announce its future transmissions.

The AIS-SART shall transmit Message 1 “Position report” with the Navigational Status set to 14 and Message 14 “Safety related broadcast message” with the text “SART ACTIVE”.

NOTE A future revision of Recommendation ITU-R M.1371 may define navigational status 14 as “AIS-SART”.

Message 14 shall be transmitted nominally every 4 min and replace one of the position reports on both channels.

The AIS-SART transmissions shall alternate between AIS 1 and AIS 2.

The 1st and 5th burst shall be as follows.

- AIS 1, Message 1, Nav Status = 14, comm-state (time-out={7,3}, sub-message=0)
- AIS 2, Message 1, Nav Status = 14, comm-state (time-out={7,3}, sub-message=0)
- AIS 1, Message 1, Nav Status = 14, comm-state (time-out={7,3}, sub-message=0)
- AIS 2, Message 1, Nav Status = 14, comm-state (time-out={7,3}, sub-message=0)
- AIS 1, Message 14 “SART ACTIVE”
- AIS 2, Message 14 “SART ACTIVE”
- AIS 1, Message 1, Nav Status = 14, comm-state (time-out={7,3}, sub-message=0)
- AIS 2, Message 1, Nav Status = 14, comm-state (time-out={7,3}, sub-message=0)

² Equivalent Isotropically Radiated Power

The 2nd, 4th, 6th burst shall be as follows.

- AIS 1, Message 1, Nav Status =14, comm-state (time-out={6,4,2}, sub-message=slot)
- AIS 2, Message 1, Nav Status =14, comm-state (time-out={6,4,2}, sub-message=slot)
- AIS 1, Message 1, Nav Status =14, comm-state (time-out={6,4,2}, sub-message=slot)
- AIS 2, Message 1, Nav Status =14, comm-state (time-out={6,4,2}, sub-message=slot)
- AIS 1, Message 1, Nav Status =14, comm-state (time-out={6,4,2}, sub-message=slot)
- AIS 2, Message 1, Nav Status =14, comm-state (time-out={6,4,2}, sub-message=slot)
- AIS 1, Message 1, Nav Status =14, comm-state (time-out={6,4,2}, sub-message=slot)
- AIS 2, Message 1, Nav Status =14, comm-state (time-out={6,4,2}, sub-message=slot)

The 3rd burst shall be as follows.

- AIS 1, Message 1, Nav Status = 14, comm-state (time-out=5, sub-message=0)
- AIS 2, Message 1, Nav Status = 14, comm-state (time-out=5, sub-message=0)
- AIS 1, Message 1, Nav Status = 14, comm-state (time-out=5, sub-message=0)
- AIS 2, Message 1, Nav Status = 14, comm-state (time-out=5, sub-message=0)
- AIS 1, Message 1, Nav Status = 14, comm-state (time-out=5, sub-message=0)
- AIS 2, Message 1, Nav Status = 14, comm-state (time-out=5, sub-message=0)
- AIS 1, Message 1, Nav Status = 14, comm-state (time-out=5, sub-message=0)
- AIS 2, Message 1, Nav Status = 14, comm-state (time-out=5, sub-message=0)

The 7th burst shall be as follows.

- AIS 1, Message 1, Nav Status = 14, comm-state (time-out=1, sub-message=utc)
- AIS 2, Message 1, Nav Status = 14, comm-state (time-out=1, sub-message=utc)
- AIS 1, Message 1, Nav Status = 14, comm-state (time-out=1, sub-message=utc)
- AIS 2, Message 1, Nav Status = 14, comm-state (time-out=1, sub-message=utc)
- AIS 1, Message 1, Nav Status = 14, comm-state (time-out=1, sub-message=utc)
- AIS 2, Message 1, Nav Status = 14, comm-state (time-out=1, sub-message=utc)
- AIS 1, Message 1, Nav Status = 14, comm-state (time-out=1, sub-message=utc)
- AIS 2, Message 1, Nav Status = 14, comm-state (time-out=1, sub-message=utc)

The 8th burst shall be as follows.

- AIS 1, Message 1, Nav Status = 14, comm-state (time-out=0, sub-message=incr)
- AIS 2, Message 1, Nav Status = 14, comm-state (time-out=0, sub-message=incr)
- AIS 1, Message 1, Nav Status = 14, comm-state (time-out=0, sub-message=incr)
- AIS 2, Message 1, Nav Status = 14, comm-state (time-out=0, sub-message=incr)
- AIS 1, Message 1, Nav Status = 14, comm-state (time-out=0, sub-message=incr)
- AIS 2, Message 1, Nav Status = 14, comm-state (time-out=0, sub-message=incr)
- AIS 1, Message 1, Nav Status = 14, comm-state (time-out=0, sub-message=incr)
- AIS 2, Message 1, Nav Status = 14, comm-state (time-out=0, sub-message=incr)

In the 8th burst the increment to the next burst (sub-message=incr) shall be randomly selected between 2 025 and 2 475 slots.

This pattern of transmissions is repeated. It is permissible to start the sequence on AIS 2.

Message 14 is transmitted at the 1st and 5th bursts (slot-time-out = 7 and 3) thereby ensuring that all future Message 14 messages are pre-announced.

(246/A.2.5) *The AIS-SART shall continue transmission even if the position and time synchronization from the positioning system is lost or fails.*

If position and time synchronization are lost the AIS-SART shall continue to transmit with last known position, COG (Course Over Ground), SOG (Speed Over Ground) and indicate that the positioning system is inoperative (Time stamp = 63) and synch state 3 (see 4.3.3).

(246/A.2.6) *The AIS-SART shall transmit within 1 minute of activation.*

The AIS-SART shall start transmitting within 1 min. If the position is unknown then it shall use default position (+91; +181). If time is not established the unit shall begin transmission unsynchronised. The unit shall begin synchronised transmission with the correct position within 15 min under normal operating conditions.

The position of the AIS-SART shall be determined every minute.

In conditions when the AIS-SART cannot get time and position within 15 min, the AIS-SART shall attempt to obtain a position for at least 30 min in the first hour after activation and at least 5 min in subsequent hours.

3.7.2 Test Mode

It shall be possible to put the AIS-SART in a test mode. When operating in the test mode there shall be one burst of 8 messages, 4 on each channel alternating.

- AIS 1, Message 14 "SART TEST"
- AIS 2, Message 1, Nav Status = 15 not defined, comm-state (time-out=0, sub-message=0)
- AIS 1, Message 1, Nav Status = 15 not defined, comm-state (time-out=0, sub-message=0)
- AIS 2, Message 1, Nav Status = 15 not defined, comm-state (time-out=0, sub-message=0)
- AIS 1, Message 1, Nav Status = 15 not defined, comm-state (time-out=0, sub-message=0)
- AIS 2, Message 1, Nav Status = 15 not defined, comm-state (time-out=0, sub-message=0)
- AIS 1, Message 1, Nav Status = 15 not defined, comm-state (time-out=0, sub-message=0)
- AIS 2, Message 14 "SART TEST"

It is permissible to start the sequence on AIS 2.

The test messages shall be transmitted in one burst after position, SOG, COG and time are available. If the AIS-SART does not acquire position, SOG, COG and time within 15 min it shall transmit the test messages but with appropriate field values (including default values) in Message 1 for position, SOG, COG and time stamp.

Activation of the test facility shall reset automatically after transmission of the burst.

3.8 Labelling

(See 6.7)

In addition to the items specified in IEC 60945, the following shall be clearly indicated on the exterior of the equipment:

- a) brief operating and test instructions (in English);
- b) expiry date (in English) for the primary battery used and
- c) the unique identifier (user ID field of the AIS messages).

NOTE Expiry date is battery replacement date (see 3.3.2).

3.9 Manuals

(See 6.8)

In addition to the requirements of IEC 60945, the manuals shall include instructions for periodic testing and maintenance for the AIS-SART.

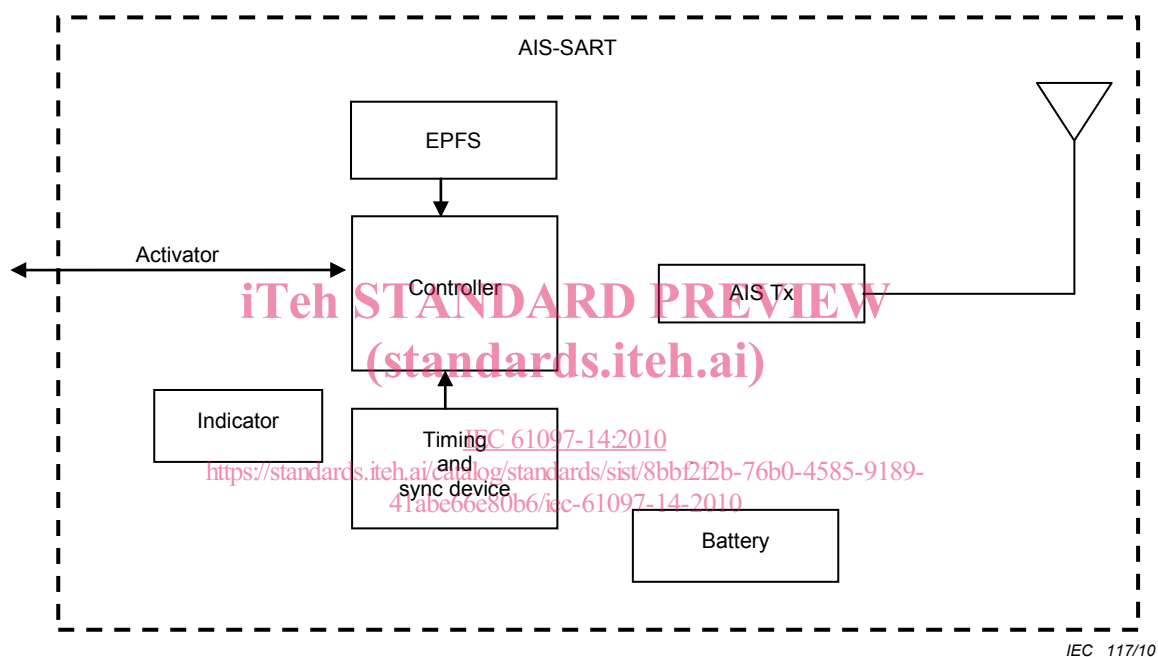
NOTE Instructions on how to operate the AIS-SART in a SART active mode should be part of the labelling on the device (see 3.8).

4 Technical requirements

4.1 Functional block diagram of an AIS-SART

4.1.1 General

Figure 1 shows the functional block diagram of an AIS-SART.



IEC 117/10

Figure 1 – Functional block diagram of an AIS-SART

The components of the AIS-SART are as listed below.

4.1.2 TDMA transmitter (AIS Tx)

The transmitter has the following characteristics:

- transmits using modified SOTDMA;
- has nominal 1 W (EIRP) transmitter power;
- has dual channel transmission (see 4.2).

4.1.3 Controller

The controller composes Message 1 and Message 14 and ensures the correct operation of the AIS-SART on the VHF Data Link (VDL) (see 4.3).

4.1.4 Timing and synchronisation device

This device provides the time and synchronisation for the controller (see 4.3.3).