

# INTERNATIONAL STANDARD



**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**



## THIS PUBLICATION IS COPYRIGHT PROTECTED

Copyright © 2010 IEC, Geneva, Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either IEC or IEC's member National Committee in the country of the requester.

If you have any questions about IEC copyright or have an enquiry about obtaining additional rights to this publication, please contact the address below or your local IEC member National Committee for further information.

IEC Central Office  
3, rue de Varembe  
CH-1211 Geneva 20  
Switzerland  
Email: [inmail@iec.ch](mailto:inmail@iec.ch)  
Web: [www.iec.ch](http://www.iec.ch)

### About the IEC

The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

### About IEC publications

The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigenda or an amendment might have been published.

- Catalogue of IEC publications: [www.iec.ch/searchpub](http://www.iec.ch/searchpub)

The IEC on-line Catalogue enables you to search by a variety of criteria (reference number, text, technical committee,...). It also gives information on projects, withdrawn and replaced publications.

- IEC Just Published: [www.iec.ch/online\\_news/justpub](http://www.iec.ch/online_news/justpub)

Stay up to date on all new IEC publications. Just Published details twice a month all new publications released. Available on-line and also by email.

- Electropedia: [www.electropedia.org](http://www.electropedia.org)

The world's leading online dictionary of electronic and electrical terms containing more than 20 000 terms and definitions in English and French, with equivalent terms in additional languages. Also known as the International Electrotechnical Vocabulary online.

- Customer Service Centre: [www.iec.ch/webstore/custserv](http://www.iec.ch/webstore/custserv)

If you wish to give us your feedback on this publication or need further assistance, please visit the Customer Service Centre FAQ or contact us:

Email: [csc@iec.ch](mailto:csc@iec.ch)  
Tel.: +41 22 919 02 11  
Fax: +41 22 919 03 00

Document generated by EVS



IEC 61097-14

Edition 1.0 2010-02

# INTERNATIONAL STANDARD



---

**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**

INTERNATIONAL  
ELECTROTECHNICAL  
COMMISSION

PRICE CODE

**W**

---

ICS 47.020.70

ISBN 2-8318-1078-1

## CONTENTS

FOREWORD.....	5
1 Scope.....	7
2 Normative references .....	7
3 Performance requirements .....	8
3.1 General.....	8
3.2 Operational .....	8
3.3 Battery .....	8
3.3.1 General .....	9
3.3.2 Battery life and expiry date.....	9
3.3.3 Reverse polarity protection.....	9
3.4 Unique identifier (user ID) .....	9
3.5 Environment.....	10
3.6 Range performance.....	10
3.7 Transmission performance .....	10
3.7.1 Active mode .....	10
3.7.2 Test Mode .....	12
3.8 Labelling .....	12
3.9 Manuals .....	12
4 Technical requirements .....	13
4.1 Functional block diagram of an AIS-SART .....	13
4.1.1 General .....	13
4.1.2 TDMA transmitter (AIS Tx).....	13
4.1.3 Controller .....	13
4.1.4 Timing and synchronisation device.....	13
4.1.5 Battery .....	14
4.1.6 Electronic position fixing system.....	14
4.1.7 Activator .....	14
4.1.8 Indicator .....	14
4.2 Physical layer requirement .....	15
4.2.1 Transmitter requirements.....	15
4.3 Link layer requirements .....	16
4.3.1 General .....	16
4.3.2 AIS Messages .....	16
4.3.3 Synchronisation.....	17
4.3.4 VDL access scheme .....	17
4.3.5 Link sub-layer 1: Medium Access Control (MAC) .....	18
4.3.6 Link sub-layer 2: Data Link Service (DLS) .....	18
4.3.7 Link sub-layer 3: Link Management Entity (LME) .....	18
5 General methods of testing.....	18
5.1 Introduction .....	18
5.2 General requirements.....	18
5.2.1 General .....	18
5.2.2 Performance check.....	19
5.2.3 Performance test .....	19
5.3 Normal test conditions.....	19
5.4 Extreme test conditions .....	19

5.5	Preparation of AIS-SART for type-approval testing .....	19
5.6	Test signals .....	19
5.6.1	Standard test signal number 1 .....	19
5.6.2	Standard test signal number 2 .....	19
5.6.3	Standard test signal number 3 .....	20
5.7	Artificial antenna (dummy load) .....	20
5.8	Facilities for access .....	20
5.9	Modes of operation of the transmitter .....	20
5.10	Measurement uncertainties .....	20
6	Performance tests .....	21
6.1	Operational tests .....	21
6.2	Battery .....	21
6.2.1	Battery capacity test .....	21
6.2.2	Expiry date indication .....	22
6.2.3	Reverse polarity protection .....	22
6.3	Unique identifier .....	22
6.4	Environment .....	22
6.5	Range performance .....	22
6.6	Transmission performance .....	22
6.7	Labelling .....	22
6.8	Manuals .....	23
6.9	Electronic position fixing system .....	23
6.10	Activator .....	23
6.11	Indicator .....	23
7	Physical radio tests .....	23
7.1	General description .....	23
7.2	Frequency error .....	24
7.2.1	Purpose .....	24
7.2.2	Method of measurement .....	24
7.2.3	Required results .....	24
7.3	Conducted power .....	24
7.3.1	Purpose .....	24
7.3.2	Method of measurement .....	24
7.3.3	Required result .....	25
7.4	Radiated power .....	25
7.4.1	Purpose .....	25
7.4.2	Method of measurement .....	25
7.4.3	Required results .....	26
7.5	Modulation spectrum slotted transmission .....	26
7.5.1	Purpose .....	26
7.5.2	Method of measurement .....	26
7.5.3	Required results .....	26
7.6	Transmitter test sequence and modulation accuracy .....	27
7.6.1	Purpose .....	27
7.6.2	Method of measurement .....	27
7.6.3	Required results .....	28
7.7	Transmitter output power versus time function .....	28
7.7.1	Definition .....	28
7.7.2	Method of measurement .....	29

7.7.3	Required results .....	30
7.8	Spurious emissions from the transmitter .....	30
7.8.1	Purpose .....	30
7.8.2	Method of measurement .....	30
7.8.3	Required results .....	30
8	Link layer tests .....	30
8.1	Tests for synchronisation accuracy .....	30
8.1.1	Method of measurement .....	30
8.1.2	Required results .....	30
8.2	Active mode tests .....	30
8.2.1	Method of measurement .....	31
8.2.2	Initialisation period – Required results .....	31
8.2.3	Message content of Message 1 – Required results .....	31
8.2.4	Message content of Message 14 – Required results .....	31
8.2.5	Transmission schedule for Message 1 – Required results .....	32
8.2.6	Communication state of Message 1 – Required results .....	32
8.2.7	Transmission schedule of Message 14 – Required results .....	32
8.2.8	Transmission with lost EPFS – Required results .....	32
8.3	Test mode tests .....	33
8.3.1	General .....	33
8.3.2	Transmission with EPFS data available .....	33
8.3.3	Transmission without EPFS data available .....	33
Annex A (informative)	Results of trials to verify the range performance of the AIS-SART .....	35
Bibliography	.....	39
Figure 1	– Functional block diagram of an AIS-SART .....	13
Figure 2	– Burst transmissions in active mode .....	18
Figure 3	– Measurement arrangement .....	24
Figure 4	– Emission mask .....	27
Figure 5	– Measurement arrangement for modulation accuracy .....	27
Figure 6	– Power versus time mask .....	29
Table 1	– Required parameter settings for an AIS-SART .....	15
Table 2	– Required settings of physical layer constants .....	15
Table 3	– Modulation parameters of the physical layer of the AIS-SART .....	16
Table 4	– Minimum required transmitter characteristics .....	16
Table 5	– Maximum values of absolute measurement uncertainties .....	20
Table 6	– Conducted power – Required results .....	25
Table 7	– Peak frequency deviation versus time .....	28
Table 8	– Definition of timings .....	29
Table A.1	– Test results, AIS-SART to vessel (Oban Bay, Scotland) Distances detected in nautical miles (NM) .....	37
Table A.2	– Test results, AIS-SART to helicopter (Oban Bay, Scotland) Distances detected in nautical miles (NM) .....	37
Table A.3	– Test results, AIS-SART to aircraft (Key West, Florida) Distances detected in nautical miles (NM) .....	38

## 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**

## FOREWORD

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of 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, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). 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. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

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

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.

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

A list of all parts of 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 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.

**IMPORTANT – The “colour inside” logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this publication using a colour printer.**

## 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.

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*