IEC 61097-1

Edition 2.0 2007-06

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Global maritime distress and safety system (GMDSS) – Part 1: Radar transponder – Marine search and rescue (SART) – Operational and performance requirements, methods of testing and required test results

Systeme mondial de detresse et de securite en mer (GMDSS) – Partie 1: Répondeur radar – Recherche et sauvetage maritime (SAR) – Exigences opérationnelles et de fonctionnement, méthodes d'essai et résultats exigibles

IEC 61097-1:2007-06(en-fr)

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

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

IEC Catalogue - webstore.iec.ch/catalogue
The stand-alone application for consulting the entire bibliographical information on IEC International Standards, Technical Specifications, Technical Reports and other documents. Available for PC, Mac OS, Android Tablets and iPad.

IEC publications search - www.iec.ch/searchpub
The advanced search enables to find IEC publications by a variety of criteria (reference number, text, technical committee,…). It also gives information on projects, replaced and withdrawn publications.

IEC Just Published - webstore.iec.ch/justpublished
Stay up to date on all new IEC publications. Just Published details all new publications released. Available online and also once a month by email.

Electropedia - www.electropedia.org
The world's leading online dictionary of electronic and electrical terms containing 20 000 terms and definitions in English and French, with equivalent terms in 16 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

IEC Glossary - std.iec.ch/glossary
65 000 electrotechnical terminology entries in English and French extracted from the Terms and Definitions clause of IEC publications issued since 2002. Some entries have been collected from earlier publications of IEC TC 37, 77, 86 and CISPR.

IEC Customer Service Centre - webstore.iec.ch/csc
If you wish to give us your feedback on this publication or need further assistance, please contact the Customer Service Centre: csc@iec.ch.

A propos de l'IEC
La Commission Electrotechnique Internationale (IEC) est la première organisation mondiale qui élabore et publie des Normes internationales pour tout ce qui a trait à l'électricité, à l'électronique et aux technologies apparentées.

A propos des publications IEC
Le contenu technique des publications IEC est constamment revu. Veuillez vous assurer que vous possédez l'édition la plus récente, un corrigendum ou amendement peut avoir été publié.

Catalogue IEC - webstore.iec.ch/catalogue
Application autonome pour consulter tous les renseignements bibliographiques sur les Normes internationales, Spécifications techniques, Rapports techniques et autres documents de l'IEC. Disponible pour PC, Mac OS, tablettes Android et iPad.

Recherche de publications IEC - www.iec.ch/searchpub
La recherche avancée permet de trouver des publications IEC en utilisant différents critères (numéro de référence, texte, comité d'études,…). Elle donne aussi des informations sur les projets et les publications remplacées ou retirées.

IEC Just Published - webstore.iec.ch/justpublished
Restez informé sur les nouvelles publications IEC. Just Published détaille les nouvelles publications parues. Disponible en ligne et aussi une fois par mois par email.

Electropedia - www.electropedia.org
Le premier dictionnaire en ligne de termes électroniques et électriques. Il contient 20 000 termes et définitions en anglais et en français, ainsi que les termes équivalents dans 16 langues additionnelles. Egalement appelé Vocabulaire Electrotechnique International (IEV) en ligne.

Glossaire IEC - std.iec.ch/glossary
65 000 entrées terminologiques électrotechniques, en anglais et en français, extraites des articles Termes et Définitions des publications IEC parues depuis 2002. Plus certaines entrées antérieures extraites des publications des CE 37, 77, 86 et CISPR de l'IEC.

Service Clients - webstore.iec.ch/csc
Si vous désirez nous donner des commentaires sur cette publication ou si vous avez des questions contactez-nous: csc@iec.ch.

IEC 61097-1

Edition 2.0 2007-06

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Global maritime distress and safety system (GMDSS) –
Part 1: Radar transponder – Marine search and rescue (SART) – Operational and performance requirements, methods of testing and required test results

Systeme mondial de detresse et de securite en mer (GMDSS) –
Partie 1: Répondeur radar – Recherche et sauvetage maritime (SAR) – Exigences opérationnelles et de fonctionnement, méthodes d'essai et résultats exigibles

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

COMMISSION
ELECTROTECHNIQUE
INTERNATIONALE

ICS 47.020.70

ISBN 978-2-8322-5006-8

Warning! Make sure that you obtained this publication from an authorized distributor.
Attention! Veuillez vous assurer que vous avez obtenu cette publication via un distributeur agréé.

CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

_____

GLOBAL MARITIME DISTRESS AND SAFETY SYSTEM (GMDSS) –

Part 1: Radar transponder – Marine search and rescue (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 provides no marking procedure to indicate its approval and cannot be rendered responsible for any equipment declared to be in conformity with an IEC Publication.
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 61097-1 has been prepared by IEC technical committee 80: Maritime navigation and radiocommunication equipment and systems.

This bilingual version (2017-11) corresponds to the monolingual English version, published in 2007-06.

This second edition cancels and replaces the first edition published in 1992. This edition constitutes a technical revision.

The main changes with respect to the previous edition are listed below:

– some amendments to bring the standard up to date with newer IMO resolutions and ITU recommendations. In particular, in 1995, the IMO adopted new performance standards for

the SART in resolution A.802(19) which replaced those of resolution A.697(17). This new resolution introduced a new requirement for the SART to be provided with a pole arrangement. In 2006, the ITU-R revised recommendation M.628 to permit the optional use of circular polarisation with the SART;

– the Introduction has been deleted as it was of historical interest only;

– Annex A, which contained details of the parts of the IEC 61097 series of standards, has been deleted as this information is now available from this Foreword;

– Annex B which contained a Bibliography has been deleted and the information moved into the normative references.

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

FDIS	Report on voting
80/479/FDIS	80/485/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.

A list of all parts of 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.

GLOBAL MARITIME DISTRESS AND SAFETY SYSTEM (GMDSS) –

Part 1: Radar transponder – Marine search and rescue (SART) – Operational and performance requirements, methods of testing and required test results

1 Scope

This part of IEC 61097 specifies the performance standards and type testing of marine radar transponders used in search and rescue operations at sea (SART), as required by Regulation 6.2.2 of Chapter III, and 7.1.3 and 8.3.1 of Chapter IV of the 1988 amendments to the 1974 International Convention for Safety of Life at Sea (SOLAS), and which is associated with IEC 60936 (Shipborne radar) and IEC 60945 (General requirements).

This standard incorporates the performance standards of IMO Resolutions A.530 (13) and A.802 (19) (Survival craft radar transponders for use in search and rescue operations) and the technical characteristics for such transponders contained in ITU-R Recommendation M.628-4, and takes account of the general requirements contained in IMO Resolution A.694 (17).

NOTE 1 The categories of SART operation which are applicable to the stated SOLAS Regulations, IMO Resolutions and ITU-R Recommendation are:

a) integral with a survival craft;
b) portable and capable of floating;
c) as part of an EPIRB.

NOTE 2 This standard does not include non-SOLAS options for instance those envisaged in ITU-R Recommendation 628-4 - Considering (b).

All text whose meaning is identical to that in IMO Resolutions A.530 (13), A.694 (17), A.802 (19) and ITU-R Recommendation M.628-4 is printed in italics.

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 60936-1, *Shipborne radar – Operational and performance requirements – Methods of tests and required test results*

IEC 60945, *Marine navigational equipment – General requirements – Methods of testing and required test results.*

IMO Resolution A.222 (VII): *Performance standards for navigational radar equipment.*

IMO Resolution A.477 (XII): *Performance standards for radar equipment.*

IMO Resolution A.530 (13): *Use of radar transponders for search and rescue purposes.*

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

IMO Resolution A.802 (19): *Peformance standards for survival craft radar transponders for use in search and rescue operations.*

Safety of Life at Sea (SOLAS) Convention (1974) – *Amendments concerning Radiocommunications for the Global maritime distress and safety system (GMDSS) (1988)*

ITU-R Recommendation M.628-4: *Technical characteristics for search and rescue radar transponders.*

ITU-R Report 1036-1: *Frequencies for homing and locating in the global maritime distress and safety system (GMDSS).*

3 Performance requirements

3.1 General

The SART shall be capable of indicating the location of a unit in distress on the assisting units' radar(s) by means of a series of equally spaced dots.

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

3.2 Operational

The 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 and to alert survivors to the fact that a radar has triggered the SART;*

d) *be capable of manual activation and deactivation, provision for automatic activation may be included;*

e) *be provided with an indication of the stand-by condition, i.e. activated, but not triggered;*

f) *be capable of withstanding without damage drops from a height of 20 m into the water;*

g) *be watertight at a depth of 10 m for at least 5 min;*

h) *maintain watertightness when subjected to a thermal shock of 45 °C under specified conditions of immersion;*

i) *be capable of floating if it is not an integral part of the survival craft;*

j) *be equipped with a buoyant lanyard, suitable for use as a tether, if it is capable of floating (not less than 10 m length);*

k) *be not unduly affected by seawater or oil;*

l) *be resistant to deterioration in prolonged exposure to sunlight;*

m) *be of a highly visible yellow/orange colour on all surfaces where this will assist detection;*

n) *be of a smooth external construction to avoid damaging the survival craft, and*

o) *be provided with a pole or other arrangement compatible with the antenna pocket in a survival craft in order to comply with the requirements referred to in 3.5 together with illustrated instructions.*

3.3 Battery

The SART shall have sufficient battery capacity to operate in the stand-by condition for 96 h and, in addition, following the stand-by period, to provide transponder transmissions for 8 h when being continuously interrogated with a pulse repetition frequency of 1 kHz.

3.4 Environment (temperature)

The 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 +65 °C.

3.5 Antenna height

The height of the installed SART antenna shall be at least 1 m above sea level.

3.6 Antenna characteristics

The vertical antenna polar diagram and hydrodynamic characteristics of the device shall permit the SART to respond to search radars under heavy swell conditions. The antenna shall be substantially omnidirectional in the horizontal plane. Horizontal polarisation or circular polarisation shall *be used for transmission and reception.*

3.7 Range performance

The SART shall operate correctly when interrogated at a distance of up to at least 5 n.miles by a navigational radar complying with IMO Resolution A.477 (XII) and A.222 (VII) and IEC 60936-1, with an antenna height of 15 m.

It shall also operate correctly when interrogated at a distance of up to at least 30 nautical miles by an airborne radar with at least 10 kW peak output power at a height of 3 000 ft.

4 Labelling

In addition to the items specified in IMO Resolution A.694 (17), the following shall be clearly indicated on the exterior of the equipment:

a) brief operating instructions (in English),

b) expiry date (in English) for the primary battery used (expiry date is battery replacement date).

5 Technical characteristics

The technical characteristics are derived from ITU-R Recommendation M.628-4.

5.1 Frequency

9 200 to 9 500 MHz.

5.2 Polarisation

Horizontal or circular.

5.3 Sweep rate

5 μs per 200 MHz nominal.

5.4 Response signal

12 sweeps.

5.5 Form of sweep (sawtooth)

Forward sweep time: 7,5 μs ± 1 μs; return sweep time: 0,4 μs ± 0,1 μs. The response shall commence with a return sweep.

5.6 Pulse emission

100 μs nominal.

5.7 E.i.r.p.

Not less than 400 mW (equivalent to +26 dBm).

5.8 Effective receiver sensitivity

Better than –50 dBm (equivalent to 0,1 mW/m^2) (see Note 1).

The receiver shall be capable of correct operation when subjected to the radiated field (28 dBW/m²) emitted from a shipborne radar complying with IMO Resolution A.477 (XII) at any distance > 20 m.

5.9 Duration of operation

96 h in stand-by condition followed by 8 h of transponder transmissions while being continuously interrogated with a pulse repetition frequency of 1 kHz.

5.10 Temperature range:

ambient: *–20 °C to + 55 °C*

stowage: *–30 °C to + 65 °C.*

5.11 Recovery time following excitation

10 μs or less.

5.12 Effective antenna height

Greater or equal to 1 m (see Note 2).

5.13 Delay between receipt of radar signal and start of transmission

0,5 μs or less.

5.14 Antenna vertical beamwidth

At least ±12,5° relative to the horizontal plane of the radar transponder.

5.15 Antenna azimuthal beamwidth

Omnidirectional within ± 2 dB.

NOTE 1 Sensitivity:

1.1 Effective receiver sensitivity includes antenna gain.

1.2 Effective receiver sensitivity of better than –50 dBm applies to interrogating radar pulses (medium/long) of >400 ns.

1.3 Effective receiver sensitivity of better than –37 dBm applies to interrogating radar pulses (short) of ≤ 100 ns.

NOTE 2 The effective antenna height applies to equipment required by Regulation 6.2.2 of Chapter III and 7.1.3 and 8.3.1 of Chapter IV of the 1988 Amendments to the 1974 SOLAS Convention.

NOTE 3 The weight of the SART should be limited within manhandling capabilities.

6 Methods of testing and required test results

6.1 General

Tests shall be normally carried out at test sites nominated by the Type Test Authority. The manufacturer shall, unless otherwise agreed, set up the equipment and ensure it is operating normally before testing commences.

Electrical power shall be supplied during performance tests normally by the batteries which form a part of the equipment. However, the normal batteries may be replaced by a test power source for some of the performance tests. Such other sources of power shall be agreed mutually by the manufacturer and the test authority.

For the purpose of this standard a "functional" test comprises a test based upon 6.9.4.

Within 5 min of switching on, the requirements of this standard shall be met.

6.2 Operational requirements

The requirements of 3.2 shall be verified as follows (the subclause reference is given in brackets):

a) (See 3.2.a).) By inspection.

b) (See 3.2.b).) By inspection. Manual activation shall normally require the use of not less than two simple but independent actions.

c) (See 3.2.c).) By inspection at the time the SART commences transmission.

d) (See 3.2.d) and 3.2.b).) By inspection.

e) (See 3.2.e).) By inspection during the time the SART is in the stand-by condition.

f) (See 3.2.f).) The equipment shall be set up as ready for normal use and released to fall freely from a height of 20 m into water. On completion the equipment shall be inspected for damage and a functional test carried out.

g) (See 3.2.g).) The equipment shall be immersed in water to a pressure of 100 kPa, which shall be applied for a period of 5 min. On completion the equipment shall be inspected for leakage and a functional test carried out.

h) (See 3.2.h).) The equipment shall be thermally soaked for a period of at least 3 h at a temperature of 1) 45 °C ± 2 °C above and 2) 30 °C ± 2 °C below the temperature of the water in the pressure test vessel (between 10 °C and 20 °C) and the equipment then immersed in water to a pressure of 100 kPa for at least 1 h. On completion the equipment shall be inspected for leakage and malformation and a functional test carried out.

NOTE Test 6.2.h) may be combined with 6.2.g), especially in connection with leakage.

The pressure test vessel shall be of sufficient capacity to ensure that the water temperature within the vessel remains within the range 10 °C to 20 °C during the period of immersion of the equipment under test.

i) (See 3.2.i).) If the device is not designed specifically to be an integral part of a survival craft, it shall be placed in water for 5 min, as a check that it is capable of floating.

j) (See 3.2.j).) By inspection.

k) (See 3.2.k).) Shall comply with IEC 60945 for corrosion and oil resistance.

l) (See 3.2.l).) By inspection. The manufacturer shall be required to produce evidence that the materials used, including any coloured external coating, are unlikely to be affected adversely by prolonged exposure to sunlight.

m) (See 3.2.m).) By inspection.