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**Electromagnetic compatibility and
Radio spectrum Matters (ERM);
Maritime low power personal locating devices employing AIS;
Part 1: Technical characteristics and methods of measurement**

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Foreword

This European Standard (EN) has been produced by ETSI Technical Committee Electromagnetic compatibility and Radio spectrum Matters (ERM).

The present document is part 1 of a multi-part deliverable covering the Electromagnetic compatibility and Radio spectrum Matters (ERM); Maritime low power personal locating devices employing AIS, as identified below:

Part 1: "Technical characteristics and methods of measurement";

Part 2: "Harmonized EN covering the essential requirements of article 3.2 of the R&TTE Directive";

National transposition dates

Date of adoption of this EN:	1 September 2014
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Date of latest publication of new National Standard or endorsement of this EN (dop/e):	30 June 2015
Date of withdrawal of any conflicting National Standard (dow):	30 June 2016

Modal verbs terminology

In the present document "**shall**", "**shall not**", "**should**", "**should not**", "**may**", "**may not**", "**need**", "**need not**", "**will**", "**will not**", "**can**" and "**cannot**" are to be interpreted as described in clause 3.2 of the [ETSI Drafting Rules](#) (Verbal forms for the expression of provisions).

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1 Scope

The present document lays down the minimum requirements for low power maritime personal locating devices employing AIS and an integrated GNSS receiver to provide the locating function. The present document incorporates the relevant provisions of the International Telecommunication Union (ITU) radio regulations [i.3] included in Recommendation ITU-R M.1371-5 [1].

For this application, both the radiated power and the length of time of operation are limited to enable the equipment to be sufficiently small and light to be worn comfortably at all times and to limit the operating range to a local area.

2 References

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the reference document (including any amendments) applies.

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NOTE: While any hyperlinks included in this clause were valid at the time of publication, ETSI cannot guarantee their long term validity.

2.1 Normative references

The following referenced documents are necessary for the application of the present document.

- [1] Recommendation ITU-R M.1371-5 (02/2014): "Technical characteristics for an automatic identification system using time-division multiple access in the VHF maritime mobile band".
- [2] ETSI TR 100 028 (all parts) (V1.4.1): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics".
- [3] ETSI TR 102 273-7 (2001): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Improvement on Radiated Methods of Measurement (using test site) and evaluation of the corresponding measurement uncertainties; Part 7: Artificial human beings".
- [4] CENELEC EN 61108-1 (2003): "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".
- [5] CENELEC EN 61108-2 (1998): "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".
- [6] CENELEC EN 61108-3 (2010): "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".
- [7] Recommendation ITU-T O.153 (10/1992): "Basic parameters for the measurement of error performance at bit rates below the primary rate".
- [8] IMO ANNEX 11 - RESOLUTION MSC.149(77) - (adopted on 3 June 2003): "Adoption of the revised performance standards for survival craft portable two-way VHF radiotelephone apparatus".

2.2 Informative references

The following referenced documents are not necessary for the application of the present document but they assist the user with regard to a particular subject area.

- [i.1] ETSI TR 102 273 (Parts 2, 3 and 4) (V1.2.1): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Improvement on Radiated Methods of Measurement (using test site) and evaluation of the corresponding measurement uncertainties".
- [i.2] ANSI C63.5-2006: "American National Standard for Calibration of Antennas Used for Radiated Emission Measurements in Electro Magnetic Interference".
- [i.3] ITU-R Radio Regulations 2012.

3 Definitions, symbols and abbreviations

3.1 Definitions

For the purposes of the present document, the following terms and definitions apply:

active mode: activated mode, transmitting in an emergency situation

test mode: self testing mode, not involved in a genuine emergency

UTC lock: GNSS has precisely locked to UTC so that it can determine SOTDMA slot timing correctly.

UTC parameters: "Coordinated Universal Time (UTC) offset parameters" GNSS data that contains leap second offset information

3.2 Symbols

For the purposes of the present document, the following symbols apply:

ϵ	permittivity
σ	conductivity
λ	wavelength
cSt	centi-Stokes
dB	decibel
div	division
S	Siemens
μT	microtesla

3.3 Abbreviations

For the purposes of the present document, the following abbreviations apply:

AIS	Automatic Identification System
ASTM	American Society for Testing and Materials
CIRM	Comité International Radio-Maritime
COG	Course Over Ground
CRC	Cyclic Redundancy Check
CSP	Channel SPacing
CW	Continuous Wave
EIRP	Effective Isotropic Radiated Power
ERP	Effective Radiated Power
EUT	Equipment Under Test
GLONASS	GLObal NAVigation Satellite System (Russian system)
GMSK	Gaussian Minimum Shift Keying

GNSS	Global Navigation Satellite System
GPS	Global Positioning System
GTRF	Galileo Terrestrial Reference Frame system
IMO MSC	International Maritime Organization Maritime Safety Committee
ISO	International Organization for Standardization
ITRF	International Terrestrial Reference Frame
ITU-R	International Telecommunication Union Radiocommunication sector
ITU-T	International Telecommunication Union Telecommunication sector
MOB	Man Over-Board
NRZI	Non Return to Zero, Inverted
OATS	Open Area Test Site
PPS	Pulses Per Second
PZ-90	Parametry Zemli 1990
RAIM	Receiver Autonomous Integrity Monitoring
RF	Radio Frequency
SOG	Speed Over Ground
SOTDMA	Self-Organized Time Division Multiple Access
TDMA	Time Division Multiple Access
UTC	Coordinated Universal Time
VDL	VHF Data Link
VHF	Very High Frequency
VSWR	Voltage Standing Wave Ratio
WGS-84	World Geodetic System 1984

4 General requirements

4.1 Construction

The manufacturer shall provide evidence that all requirements in clause 4 are fulfilled.

In all respects, the mechanical and electrical design and the construction and finish of the equipment shall conform with good engineering practice.

The equipment shall be designed to minimize the risk of internal and external damage during use or stowage.

The exterior of the equipment shall have no sharp edges or projections that could easily damage inflatable rafts or injure personnel.

The general construction and method of operation shall provide a high degree of proof against inadvertent operation due to magnetic influences, handling, stowage and transit, whilst still providing a simple means of operation in an emergency.

The equipment shall be portable, lightweight, compact and be designed as one integral unit. The locating device shall derive its energy from a battery forming a part of the equipment and incorporate a permanently attached antenna which may be either fixed length or extendible.

The locating device may be fitted with a test facility by which the functioning of the transmitter and battery can be easily tested without the use of any external equipment.

The equipment shall be capable of being used by an unskilled person.

The locating device shall be watertight to a depth of 1 m (see clause 7.13).

The equipment shall not be unduly affected by sea water or oil and shall be resistant to deterioration by prolonged exposure to sunlight.

A substantial part of the equipment shall be of highly visible yellow or orange colour to assist visual location.

4.1.1 Categories of equipment

Two categories are defined:

- Category 1 locating devices shall have sufficient positive buoyancy to float in fresh water.
- Category 2 locating devices intended to be incorporated into or attached to a buoyancy aid are not required to float.

Category 1 locating devices that can float free may have a lanyard to attach them to a person or life vest. Where a lanyard is employed it shall meet the requirements of IMO MSC.149(77) [8], paragraph 2.3.11. The user manual or instructions shall include necessary information to allow the user to properly attach the locating device lanyard.

The user manual or instructions for Category 2 devices shall include necessary information to allow the user to fit or attach the locating device to a buoyancy aid.

4.2 Controls

The equipment shall be initially activated by the use of two simple, but independent mechanical actions, neither of which on its own shall activate the equipment. The second mechanical action may be replaced by an immersion sensor. Where the second action is replaced by an immersion sensor then the first action shall be an arm function thus to ensure the device is armed for automatic activation when submerged.

It shall only be possible to activate the equipment after a seal or other mechanical restraint has been removed from the first mechanical action. For devices without an arm function it shall not be possible to reattach a removed seal or restrain. After activation it shall be simple to de-activate the equipment and the means to deactivate the equipment shall be clearly marked.

The switch that operates any test facility (clause 4.1) shall be so designed that it returns automatically to the off-position when released.

4.3 Indicators

The equipment shall be provided with a visual and/or audible indication that signals are being emitted. The indicator shall be sufficiently bright to be seen in bright sunlight. Except when operating in test mode the indicator shall not be green in colour.

The indicator shall clearly distinguish the following states:

- (i) The locating device has been activated and is waiting for GNSS data.
- (ii) The locating device has GNSS data and is transmitting in active mode.
- (iii) The locating device is undergoing test and is transmitting in test mode.
- (iv) The locating device has completed a test or has been de-activated.

4.4 Identifier (user ID)

The locating device shall have an identifier to distinguish it from other AIS devices.

The User ID for a personal search and rescue locating device is 972xyyyy, where xx = manufacturer ID 01 to 99; yyyy = the sequence number 0000 to 9999. Manufacturers IDs are issued by CIRM. Manufacturers shall only use manufacturer IDs that have been issued to them by CIRM, except for testing purposes where the ID xx=00 can be used (see clause 6.3).

After being programmed by the manufacturer, it shall not be possible for the user to change the identifier of the locating device.

The user ID shall be held in non-volatile memory.

4.5 Labelling

The equipment shall be provided with a label, or labels, permanently affixed to the exterior of the equipment, containing the information described hereunder.

4.5.1 Labelling Requirements

- user ID of the equipment (see clause 4.4) and manufacturer serial number;
- type designation of the equipment with prefix AIS-MOB;
- adequate instructions to enable the equipment to be activated and de-activated;
- the type of battery as specified by the manufacturer of the locating device;
- a warning to not block the GNSS antenna;
- the compass safe distance as measured in clause 7.10;
- a warning to the effect that the locating device should not be operated except in an emergency;
- the date on which the battery will need to be replaced. Simple means shall be provided for changing this date when the battery is replaced. The battery replacement date marked on the locating device should be the date specified in clause 4.7.1.

4.6 Instructions

Necessary operating instructions shall be provided with the equipment. These should include the following warnings:

- "WARNING - An AIS-MOB Man overboard device is only intended for short range signalling to an AIS receiver installed onboard your own vessel. It will not directly alert the emergency services or other vessels."
- "WARNING - This equipment is not intended for routine tracking of persons or property. This includes tracking of divers."
- "WARNING - If self-test is performed more frequently than once a month, then battery life may be reduced."

4.7 Power source

4.7.1 Battery requirements

The type of battery and designation specified by the manufacturer for use in the equipment shall be clearly and indelibly marked on the equipment.

The manufacturer should establish a useful life and an expiry date for primary (non-rechargeable) batteries. The useful life is the period of time after the date of battery manufacture that the battery will continue to meet the input power requirements of the locating device, over the entire specified operating temperature range. The following losses shall be included (at a temperature of $+20\text{ °C} \pm 5\text{ °C}$):

- a) self-testing monthly with GNSS data available;
- b) self-discharge of the battery;
- c) stand-by loads.

The expiry date of the battery shall be the battery installation date plus no more than half the useful life of the battery. The battery shall have a minimum useful life of at least two years. The installation date shall be no more than one year from the date of manufacture of the battery. The battery shall be clearly and durably marked with its date of manufacture. The locating device shall be clearly marked with the expiry date of the battery.

4.7.2 Battery capacity

The battery, after having met the requirements of clause 4.7.1 shall have sufficient remaining capacity to power an activated locating device and keep it transmitting for at least 12 hours at a temperature of $-20\text{ }^{\circ}\text{C} \pm 3\text{ }^{\circ}\text{C}$.

4.7.3 Safety precautions

Provisions shall be made for protecting the equipment from damage due to the accidental reversal of polarity of the battery.

5 Technical requirements

5.1 General

When activated the locating device shall be capable of transmitting messages that indicate the position of a person in the water. The transmitted messages shall be compatible with existing AIS installations. The transmitted messages shall be recognized and displayed by AIS receivers in the reception range of the transmitter, and clearly distinguish the transmitter as a personal Man Over-Board (MOB) locating device. AIS TDMA Synchronization shall be UTC direct; the locating device does not require an AIS receiver.

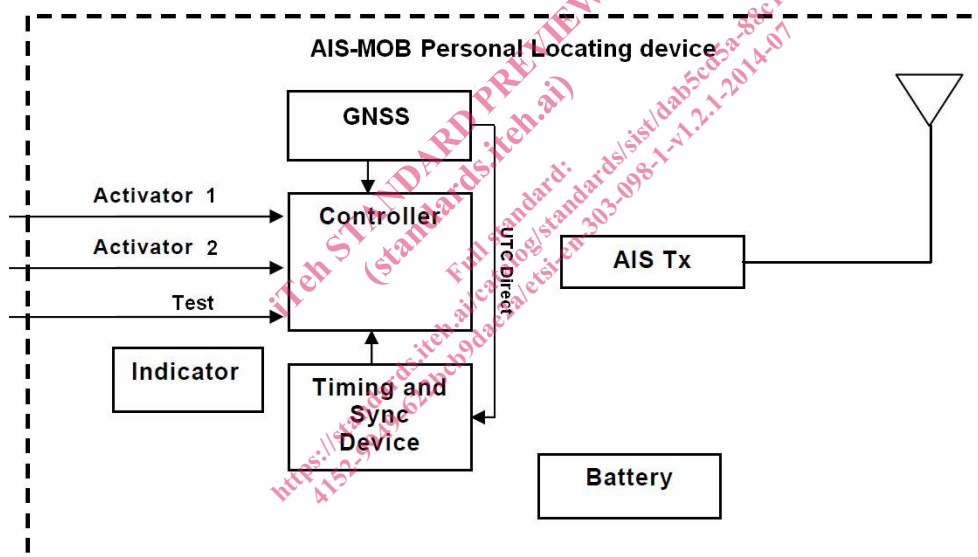


Figure 1: Functional block diagram of personal locating device

5.2 AIS transmission characteristics

The AIS Tx transmits using modified SOTDMA on two channels AIS1 and AIS2. The GNSS receiver, e.g. a GPS receiver, determines the current position of the locating device and facilitates TDMA synchronization in the UTC direct mode.

The locating device shall shutdown automatically if, under a fault condition, the transmitter remains permanently keyed for more than 2 seconds. This shutdown shall be independent of the operating software.

5.2.1 AIS messages

The locating device shall broadcast Message 1 and Message 14, as defined in Recommendation ITU-R M.1371-5 [1]. The content of the messages differs for active transmissions (active mode) and test transmissions (test mode). The combination of these messages in burst sequences is detailed in annex B.