

# INTERNATIONAL STANDARD



**Maritime navigation and radiocommunication equipment and systems – Automatic identification system (AIS) – Part 1: AIS Base Stations – Minimum operational and performance requirements, methods of testing and required test results**

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**Maritime navigation and radiocommunication equipment and systems – Automatic identification system (AIS) – Part 1: AIS Base Stations – Minimum operational and performance requirements, methods of testing and required test results**

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## INTERNATIONAL ELECTROTECHNICAL COMMISSION

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**MARITIME NAVIGATION AND RADIOCOMMUNICATION  
EQUIPMENT AND SYSTEMS –  
AUTOMATIC IDENTIFICATION SYSTEM (AIS) –****Part 1: AIS Base Stations –  
Minimum operational and performance requirements,  
methods of testing and required test results**

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This second edition cancels and replaces the first edition published in 2007 and its Amendment 1:2008. This edition constitutes a technical revision.

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

- incorporation of the technical characteristics included in Recommendation ITU-R M.1371-5;
- the BCE, BCF and CAB sentences replaced with BCG, BCL and RST;

- comment blocks replaced with TAG blocks;
- scheduled broadcast of Message 26 added;
- Message 27 control added;
- transmitter intermodulation attenuation harmonised with ITU;
- 12,5 kHz channel operation removed;
- transmission of Message 24A, Message 25 and Message 26 added;
- 90 % channel load test with VSI and TAG blocks enabled added.

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

CDV	Report on voting
80/736/CDV	80/746/RVC

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

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## INTRODUCTION

Chapter V of the International Convention for the Safety of Life at Sea 1974 (SOLAS) requires mandatory carriage of Automatic Identification System (AIS) equipment on all vessels constructed on or after 01 July 2002. Carriage for other types and sizes of SOLAS Convention vessels was required to be completed not later than 31 December 2004.

SOLAS Chapter V, Regulation 19, states that AIS shall:

- a) provide automatically to appropriate equipped shore stations, other ships and aircraft information, including ship's identity, type, position, course, speed, navigational status and other safety-related information;
- b) receive automatically such information from similarly fitted ships;
- c) monitor and track ships; and
- d) exchange data with shore-based facilities.

In addition, the IMO performance standards for AIS state that:

- The AIS should improve the safety of navigation by assisting in the efficient navigation of ships, protection of the environment, and operation of Vessel Traffic Services (VTS), by satisfying the following functional requirements:
  - 1) in a ship-to-ship mode for collision avoidance;
  - 2) as a means for littoral States to obtain information about a ship and its cargo; and
  - 3) as a VTS tool, i.e. ship-to-shore (traffic management).
- The AIS should be capable of providing to ships and to competent authorities, information from the ship, automatically and with the required accuracy and frequency, to facilitate accurate tracking. Transmission of the data should be with the minimum involvement of ship's personnel and with a high level of availability.

The provision of Shore Based AIS is necessary to attain the full benefit of the SOLAS Convention requirements.

This part of IEC 62320 provides the minimum operational and performance requirements, methods of test and the required test results for AIS Base Stations. The testing is divided into three sections, the transceiver tests, the logical tests and the Presentation Interface tests. These are captured in Clauses 8, 9 and 10 respectively. The method used for testing is that the EUT should meet all the tests requirements of Clause 8 before proceeding to Clause 9. Likewise, the unit should meet all of the test requirements before proceeding to Clause 10. Clause 10 has also been prioritised so that the tests are progressive.

Clauses 5 to 7 provide functional requirement information and Clause 8 provides the general test environment for the EUT.

**MARITIME NAVIGATION AND RADIOCOMMUNICATION  
EQUIPMENT AND SYSTEMS –  
AUTOMATIC IDENTIFICATION SYSTEM (AIS) –**

**Part 1: AIS Base Stations –  
Minimum operational and performance requirements,  
methods of testing and required test results**

**1 Scope**

This part of IEC 62320 specifies the minimum operational and performance requirements, methods of testing and required test results for AIS Base Stations, compatible with the performance standards adopted by IMO Resolution MSC.74 (69), Annex 3, Universal AIS. It incorporates the technical characteristics of non-shipborne, fixed station AIS equipment, included in recommendation ITU-R M.1371 and IALA Recommendation A-124. Where applicable, it also takes into account the ITU Radio Regulations. This standard takes into account other associated IEC international standards and existing national standards, as applicable.

This standard is applicable for AIS Base Stations. It does not include specifications for the display of AIS data on shore.

**2 Normative references**

[IEC 62320-1:2015](#)

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

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 61162-1:2010, *Maritime navigation and radiocommunication equipment and systems – Digital interfaces – Part 1: Single talker and multiple listeners*

IEC 61993-2, *Maritime navigation and radiocommunication equipment and systems – Automatic identification systems (AIS) – Part 2: Class A shipborne equipment of the automatic identification system (AIS) – Operational and performance requirements, methods of test and required test results*

IEC 62287-1:2010, *Maritime navigation and radiocommunication equipment and systems – Class B shipborne equipment of the automatic identification system (AIS) – Part 1: Carrier-sense time division multiple access (CSTDMA) techniques*  
IEC 62287-1:2010/AMD1:2013

IEC 62320-2, *Maritime navigation and radiocommunication equipment and systems – Automatic identification system (AIS) – Part 2: AIS AtoN Stations – Operational and performance requirements, methods of testing and required test results*

IMO Resolution MSC.74 (69), Annex 3, *Recommendation on performance standards for an universal shipborne automatic identification system (AIS)*

ITU-R Recommendation M.1084-4, *Interim solutions for improved efficiency in the use of the band 156-174 MHz by stations in the maritime mobile service*

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

RTCM 10402 – *RTCM Recommended Standards for Differential GNSS (Global Navigation Satellite Systems) Service*

IALA Recommendation A-124 *on Automatic Identification System (AIS). Shore Station and networking aspects relating to the AIS Service*

### 3 Abbreviations

AIS	Automatic Identification System
AtoN	Aids to Navigation
BER	Bit Error Rate
BIIT	Built-In Integrity Tests
BT	Bandwidth Time product
CommState	Communication State

NOTE Communication state is defined in Recommendation ITU-R M.1371-4. It is used to indicate whether the AIS is using the message structure for SOTDMA or ITDMA.

DGNSS	Differential Global Navigation Satellite System
EPFS	Electronic position fixing system
EUT	Equipment under test
FATDMA	Fixed Access Time Division Multiple Access
GNSS	Global Navigation Satellite System
IALA	International Association of Marine Aids to Navigation and Lighthouse Authorities
IMO	International Maritime Organization
ITU	International Telecommunication Union
LFR	Limited Frequency Range
MAC	Medium Access Control
MMSI	Maritime Mobile Service Identity
NM	Nautical Mile
NRZI	Non-Return to Zero Inverted
PER	Packet Error Rate
P <sub>c</sub>	Carrier Power
PI	Presentation Interface
PPS	Pulse Per Second
PSS	Physical Shore Station
RAIM	Receiver Autonomous Integrity Monitoring
RATDMA	Random Access Time Division Multiple Access
RSSI	Received signal strength indicator
Rx	Receive
SFI	Specific Frequency of Interest

TDMA	Time Division Multiple Access
Tx	Transmit
UI	Unique Identifier
UTC	Universal Time Co-ordinated
VDL	VHF Data Link
VSWR	Voltage Standing Wave Ratio
VTS	Vessel Traffic Services

## 4 Functional layout of an AIS Base Station

### 4.1 General

The Base Station may be designed for dependent only operation or independent operation. Both are under some control of the Physical Shore Station (PSS) as defined in the IALA Recommendation A-124.

- dependent Base Station accesses the VHF data link (VDL) using only the combination of linked TSA+VDM sentences (see Table 1), as provided by the PSS.
- An independent Base Station accesses the VDL using either the combination of linked TSA+VDM sentences as provided by the PSS or by using internal control. When operated as an independent Base Station the unit may be delegated certain autonomous functionality under the supervisory control of the PSS.

The PSS, or external controlling entity, is responsible for Base Station configuration, transmission scheduling, and processing of received information. Presentation Interface (PI) text sentences are used to configure the Base Station, schedule message transmissions, and output information.

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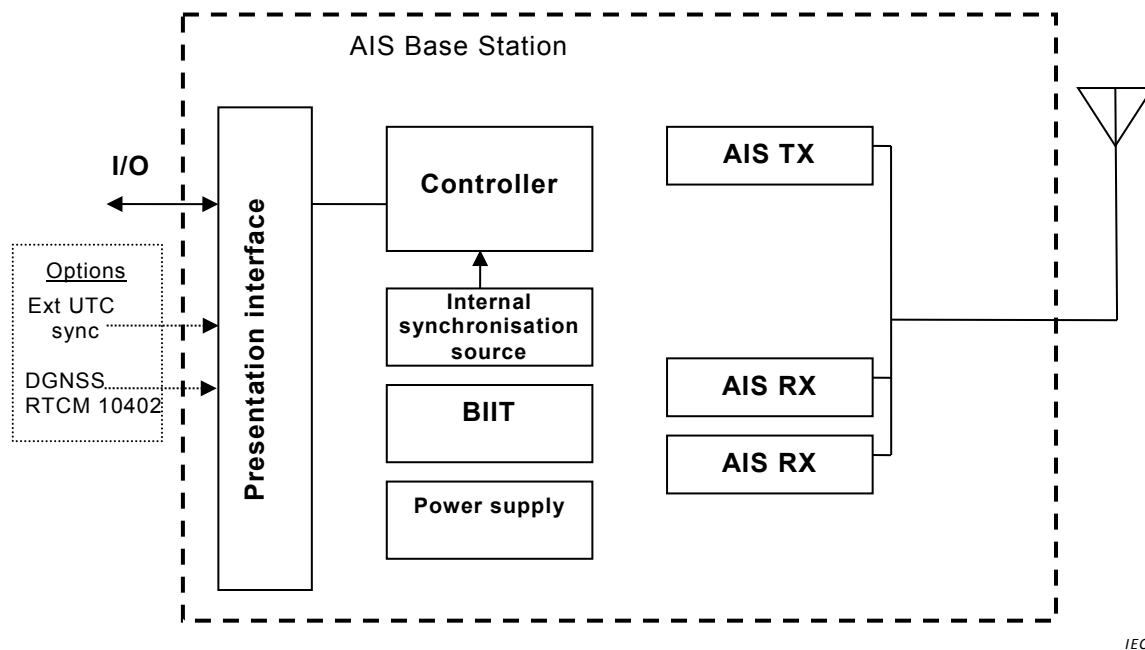
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When TSA and VDM sentences are used, the PSS is responsible for ensuring the integrity of the VDL.

The tests in this standard are for all Base Stations. Additional tests for independent Base Stations are indicated by a note located at the beginning of each appropriate test section.

### 4.2 Functional block diagram of an AIS Base Station

Figure 1 shows the principal components of the AIS Base Station.



**Figure 1 – Functional block diagram of an AIS Base Station**

As a minimum, the following functional elements are required for the AIS Base Station:

- two multi-channel receivers;
- one multi-channel TDMA transmitter;

NOTE Since the minimum configuration of the AIS Base Station has only one transmitter, the AIS Base Station cannot transmit on both AIS Channels (AIS A and AIS B) simultaneously.

- a controlling unit;
- an internal synchronisation source, which may also be used as a position sensor for independent Base Stations. If used as a position source, the internal GNSS receiver shall meet the appropriate requirements of IEC 61108-1;
- a Built-In-Integrity-Test unit (BIIT), which shall provide alarms;
- a power supply;
- a Presentation Interface (PI), which allows the AIS Base Station to exchange sentences with the PSS;
- optional features, for example: DGNSS (RTCM 10402); external synchronisation; DSC functionality.

### 4.3 General VDL requirements

#### 4.3.1 Sources of VDL messages for transmission

The AIS Base Station interacts with the VDL by receiving and transmitting VDL messages.

In order to transmit VDL messages, the Base Station may derive the messages to be transmitted from three sources:

- generate and transmit VDL messages autonomously as per the configuration received via sentences;
- generate and transmit VDL messages automatically based on data input received via the PI, using different sentences from that of the VDM;