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**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 62287-1:2006

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

**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**

FOREWORD

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International Standard IEC 62287-1 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
80/426/FDIS	80/434/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.

IEC 62287 consists of the following parts, under the general title *Maritime navigation and radiocommunication and systems – Class B shipborne equipment of the automatic identification system (AIS)*

Part 1: Carrier-sense time division multiple access (CSTDMA) techniques

Part 2: Self-organising time division multiple access (SOTDMA) techniques

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- withdrawn,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
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INTRODUCTION

In the ITU Radiocommunications Sector Recommendation ITU-R M.1371-1 "Technical characteristics for a universal shipborne Automatic Identification System (AIS) using SOTDMA (Self-Organising Time Division Multiple Access) in the VHF maritime mobile band", provision is made for a Class B AIS for use on craft not covered by a mandatory carriage requirement under SOLAS Chapter V, Regulation 19. This part of IEC 62287 sets out the requirements, methods of test and required test results for such a Class B AIS.

The International Maritime Organization (IMO), in its Resolution MSC.140(76), recognised that the radio channels used by AIS, particularly AIS 1 (161,975 MHz) and AIS 2 (162,025 MHz), are regarded as an AIS network, and any disruption to those channels by any one AIS device could affect the operation of all AIS devices on that network. IMO also recognised that Administrations should take steps necessary to ensure the integrity of the radio channels used for AIS in their waters.

IEC Technical Committee 80 (TC 80) allocated a new work item 80/287/INP to Working Group 8a (WG 8a), tasking them with producing a test standard for Class B AIS equipment. During the development of this test standard, Administrations expressed concern that large numbers of Class B AIS equipped vessels could have a detrimental effect on the safe operation of the AIS network by SOLAS Class A vessels, Base Stations and AIS on Aids to Navigation (AtoN AIS). As a result, a new network access technology was developed, which allows large numbers of Class B fitted vessels to coexist with Class A with a negligible detrimental effect on AIS network.

The new technology, hereinafter referred to as "Carrier-Sense TDMA (CSTDMA)", requires that the Class B "CS" AIS listens to the AIS network to determine if the network is free of activity and, only if the network is free, can it transmit its information. This Class B AIS is also required to listen for reservations from base stations and comply with these reservations. This polite operation ensures that this Class B AIS minimises the probability of interference with Class A, Base Station or AtoN AIS operations. Extensive computer models simulation and practical laboratory testing and sea trials were undertaken to validate CSTDMA during its development (see Annex A).

WG8a recognised that the primary function of a Class B AIS is for fitted vessels to be visible and participate in the AIS network. CSTDMA was designed to fulfil these requirements.

This Class B AIS is backward compatible with ITU-R Recommendation M.1371-1 (see Annex B).

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

1 Scope

This part of IEC 62287 specifies the minimum operational and performance requirements, methods of testing and required test results for Class B shipborne AIS equipment using CSTDMA techniques. This standard takes into account other associated IEC International Standards and existing national standards, as applicable.

It is applicable for AIS equipment used on craft that are not covered by the mandatory carriage requirement of AIS under SOLAS Chapter V.

An AIS station intended to operate in receive-only mode shall not be considered a Class B shipborne mobile AIS station.

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.

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IEC 60945, *Maritime navigation and radiocommunication equipment and systems – General requirements – Methods of testing and required test results*

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 (all parts), *Maritime navigation and radiocommunication equipment and systems – Digital interfaces*

IEC 61993-1, *Maritime navigation and radiocommunication equipment and systems – Part 1: Shipborne automatic transponder system installation using VHF digital selective calling (DSC) techniques – Operational and performance requirements, methods of testing and required test results*

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

ISO/IEC 3309:1993, *Information technology – Telecommunications and information exchange between systems – High-level data link control (HDLC) procedures – Frame structure*

IMO MSC.140(76), *Recommendation for the protection of the AIS VHF data link*

ITU-R Recommendation M.493-11, *Digital selective-calling system for use in the maritime mobile service*

ITU-R Recommendation M.825-3, *Characteristics of a transponder system using digital selective calling techniques for use with vessel traffic services and ship-to-ship identification*

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.1371-1, *Technical characteristics for a universal shipborne 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 Abbreviations

AIS	Automatic Identification System
BER	Bit Error Rate
BT	Bandwidth Time product
COG	Course over ground
CPU	Central Processing Unit
CRC	Cyclic Redundancy Check
CS	Carrier-Sense
CSTDMA	Carrier-Sense Time Division Multiple Access
DGNSS	Differential Global Navigation Satellite System
DLS	Data Link Service
DSC	Digital Selective Calling
ECDIS	Electronic Chart Display and Information System
EPFS	Electronic Position Fixing System
ETA	Estimated Time of Arrival
EUT	Equipment Under Test
FCS	Frame Check Sequence
FM	Frequency Modulation
GMSK	Gaussian Minimum Shift Keying
GNSS	Global Navigation Satellite System
HDG	Heading
HDLC	High level Data Link Control
HSC	High Speed Craft
IHO	International Hydrographic Office
IMO	International Maritime Organization
LME	Link Management Entity
LR	Long Range
MAC	Medium Access Control
MMSI	Maritime Mobile Service Identity
NM	Nautical Miles (refer to ISO 19018)

NRZI	Non Return to Zero Inverted
NUC	Not Under Command
OSI	Open System Interconnection model
P _{ss}	Steady state RF output power
PER	Packet Error Rate
PI	Presentation Interface
PRS	Pseudo Random Sequence
RAIM	Receiver Autonomous Integrity Monitoring
RF	Radio Frequency
Rx	Receive
SINAD	Signal Interference Noise and Distortion ratio
SOG	Speed Over Ground
SOLAS	International Convention for the Safety of Life at Sea
TDMA	Time Division Multiple Access
Tx	Transmit
UTC	Universal Time Co-ordinated
VDL	VHF Data Link
VDM	Serial output message containing VDL information (IEC 61162-1)
VHF	Very High Frequency
VSWR	Voltage Standing Wave Ratio
VTS	Vessel Traffic Services

NOTE Abbreviations related to IEC 61162 series are not included in the above list. For their meaning refer to that standard.

4 General requirements

4.1 General

4.1.1 Capabilities of the Class B“CS” AIS

The Class B“CS” AIS shall improve the safety of navigation by assisting in the efficient navigation of ships and small craft, protection of the environment, and operation of Vessel Traffic Services (VTS). Small craft are vessels which are not required to comply with the mandatory carriage requirements of SOLAS Chapter V, Regulation 19.

The Class B“CS” AIS shall be capable of providing information from small craft, automatically, continuously and with the required accuracy and update rate:

- in a ship-to-ship mode for collision avoidance;
- as a means for littoral States to obtain information about the craft; and
- as a VTS tool, i.e. ship-to-shore (traffic management).

The Class B“CS” AIS station shall be inter-operable and compatible with Class A or other Class B shipborne mobile AIS stations or any other AIS station operating on the AIS VHF Data Link. In particular, Class B“CS” AIS stations shall receive other stations, shall be received by other stations and shall not degrade the integrity of the AIS VHF Data Link.

The Class B“CS” AIS shall only transmit if it has verified that the time period intended for transmission does not interfere with transmissions made by equipment complying with

IEC 61993-2 and from Base Stations. Transmissions of the Class B"CS" AIS shall not exceed one nominal time period (except when responding to a Base station with Message 19).

4.1.2 Quality assurance

Manufacturers shall have a quality control system¹ audited by a competent authority to ensure continuous compliance with the requirements of this standard. Alternatively, the manufacturer may use final product verification procedures where a competent authority verifies compliance with the requirements of this standard before the product is put to the market.

4.1.3 Safety of operation

It shall not be possible for the operator to augment, amend or erase any program software in the equipment required for operation in accordance with the equipment standard. Data used during operation and stored in the system shall be protected in such a way, that necessary modifications and amendments by the user cannot affect its integrity and correctness.

4.1.4 Additional features

Where equipment provides a facility that is additional to the minimum requirements of this standard, the operation and, as far as is reasonably practicable, the malfunction of such an additional facility shall not degrade the performance of the equipment.

4.1.5 Modes of operation

The system shall be capable of operating in a number of modes as described below subject to the transmission of messages by a competent authority. It shall not retransmit received messages.

4.1.5.1 Autonomous and continuous mode

An "autonomous and continuous" mode for operation in all areas transmitting Message 18 for scheduled position reporting and Message 24 for static data.

The Class B"CS" AIS shall be able to receive and process messages at any time except during time periods of transmission.

4.1.5.2 Assigned mode

An "assigned" mode for operation in an area subject to a competent authority responsible for traffic monitoring so that the reporting interval, silent mode and/or transceiver behaviour may be set remotely by that authority using group assignment by Message 23.

4.1.5.3 Interrogation mode

A "polling" or "controlled" mode where the Class B"CS" AIS responds to interrogations by Messages 18 and 24 from a Class A AIS or a Base Station. A Base Station interrogation for Message 19 specifying transmission offset shall also be answered². An interrogation overrides a silent period defined by Message 23 (see 7.3.3.3.3).

A Class B"CS" AIS shall not interrogate other stations.

¹ ISO 9000 series, as applicable, meets this requirement.

² Note that because Message 19 is a message occupying two time periods, this requires the reservation of the respective time periods by Message 20 prior to interrogation.

4.2 Manuals

The manuals shall include:

- the type of external connectors if applicable;
- the required information for correct siting of the antennas;
- the required information for compass safe distance.

4.3 Marking and identification

Each unit of the equipment shall be marked externally with the following information which, where practicable, shall be clearly visible when the equipment is installed in its recommended position:

- identification of the manufacturer;
- equipment type number or model identification;
- serial number of the unit;
- power supply requirements; and
- compass safe distance.

Alternatively, the marking may be presented on a display at equipment start-up.

The version of software shall be either marked or displayed on command on the equipment.

When the marking and the title and version of the software are presented only on the display, such information shall also be included in the equipment manual.

5 Environmental, power supply, interference and safety requirements

In addition to the specific requirements of this standard, the Class B“CS” AIS shall fulfil the following general requirements as detailed in IEC 60945:

- inter-unit connection (interfaces other than IEC 61162 are allowed; see 6.7.3);
- power supply;
- extreme power supply;
- excessive conditions;
- power supply short-term variation and power supply failure (the Class B“CS” AIS shall not enter an undefined or unstable state in case of undervoltage);
- durability and resistance to environmental conditions;
- interference;
- electromagnetic compatibility;
- compass safe distance;
- safety precautions;
- protection against accidental access to dangerous voltages;
- electromagnetic radiofrequency radiation;
- X-radiation.