



IEC 62320-1

Edition 2.0 2015-01

# 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**

INTERNATIONAL  
ELECTROTECHNICAL  
COMMISSION

---

ICS 47.020.70

ISBN 978-2-8322-2205-8

**Warning! Make sure that you obtained this publication from an authorized distributor.**

## CONTENTS

FOREWORD.....	7
INTRODUCTION.....	9
1 Scope.....	10
2 Normative references .....	10
3 Abbreviations .....	11
4 Functional layout of an AIS Base Station .....	12
4.1 General.....	12
4.2 Functional block diagram of an AIS Base Station .....	12
4.3 General VDL requirements.....	13
4.3.1 Sources of VDL messages for transmission .....	13
4.3.2 Use of access schemes .....	14
4.4 Functional diagram for operation of a Base Station .....	14
4.5 Base Station input/output sentence formatters .....	15
5 Functional definition of the radio interface of the AIS Base Station .....	17
5.1 General requirements of the physical layer .....	17
5.2 Required parameter settings for the physical layer of the AIS Base Station.....	18
5.3 Minimum requirements for the TDMA transmitter of the AIS Base Station .....	19
5.4 Minimum requirements for the TDMA receivers of the AIS Base Station .....	21
5.5 Shutdown procedure for an AIS Base Station.....	21
6 Requirements for AIS Base Station.....	21
6.1 General.....	21
6.2 Dependent Base Station requirements .....	22
6.2.1 General rules.....	22
6.2.2 General processing diagram .....	22
6.2.3 AIS Base Station response to PI input .....	23
6.2.4 AIS Base Station response to VDL input.....	23
6.3 Independent Base Station requirements.....	23
6.3.1 General rules.....	23
6.3.2 General processing diagram .....	24
6.3.3 AIS Base Station response to PI input .....	24
6.3.4 AIS Base Station interaction on the VDL.....	25
6.3.5 Autonomous channel management .....	29
6.4 BIIT conditions.....	30
6.5 Default settings after reset.....	30
6.6 Further requirements for optional features .....	31
6.6.1 General .....	31
6.6.2 External synchronisation source option.....	31
6.6.3 DGNSS dedicated port option .....	32
7 Functional definition of the presentation interface of the AIS Base Station.....	32
7.1 Physical requirements for the presentation interface .....	32
7.2 Presentation interface data exchange .....	32
7.2.1 General .....	32
7.2.2 Base Station presentation interface output.....	32
7.2.3 Base Station presentation interface input.....	32
7.2.4 TAG blocks on presentation interface .....	32

8	Tests of AIS Base Stations – Method of measurement and required results .....	33
8.1	General.....	33
8.2	Test conditions .....	33
8.2.1	Normal test conditions .....	33
8.2.2	Extreme test conditions .....	33
8.2.3	Standard test environment.....	33
8.2.4	Test signals .....	34
8.2.5	Arrangements for test signals applied to the receiver input .....	35
8.2.6	Encoder for receiver measurements .....	35
8.2.7	Waiver for receivers.....	35
8.2.8	Impedance.....	35
8.2.9	Artificial antenna (dummy load) .....	35
8.2.10	Facilities for access .....	35
8.2.11	Operation of the transmitter .....	35
8.2.12	Measurement uncertainties.....	36
9	Physical radio tests .....	36
9.1	Remark.....	36
9.2	General transceiver tests .....	36
9.2.1	Transceiver protection test .....	36
9.2.2	Transmitter shutdown procedure.....	37
9.3	TDMA transmitter.....	37
9.3.1	General .....	37
9.3.2	Frequency error.....	37
9.3.3	Carrier power.....	38
9.3.4	Modulation spectrum slotted transmission.....	38
9.3.5	Transmitter test sequence and modulation accuracy verification .....	39
9.3.6	Transmitter output power versus time function .....	40
9.3.7	Intermodulation attenuation .....	40
9.4	TDMA receivers .....	42
9.4.1	Sensitivity.....	42
9.4.2	Error behaviour at high input levels.....	42
9.4.3	Co-channel rejection.....	43
9.4.4	Adjacent channel selectivity.....	44
9.4.5	Spurious response rejection .....	44
9.4.6	Intermodulation response rejection .....	47
9.4.7	Blocking or desensitisation .....	48
9.5	Conducted spurious emissions at the antenna .....	49
9.5.1	Spurious emissions from the receiver .....	49
9.5.2	Spurious emissions from the transmitter .....	49
10	Functional tests for Base Station .....	49
10.1	Pre-set-up.....	49
10.1.1	Basic initialisation.....	49
10.1.2	Pre-setup of dependent base station .....	50
10.1.3	Pre-setup for independent mode.....	50
10.2	Normal operation .....	51
10.2.1	Base Station configuration and services .....	51
10.2.2	Addressed and broadcast messaging .....	66
10.2.3	Interrogations and interrogation response.....	69
10.2.4	Addressed operation.....	70

10.2.5	Slot phase and frame synchronisation – Base Station operation .....	71
10.2.6	Position source .....	75
10.2.7	Alarm messages .....	76
10.3	Selection of transmission slots .....	77
10.3.1	RATDMA Transmission .....	77
10.3.2	Intentional slot reuse (link congestion) .....	77
10.4	Legacy support .....	78
10.4.1	Purpose .....	78
10.4.2	Method of measurement .....	78
10.4.3	Required results .....	79
10.5	TAG Block encapsulation .....	79
10.5.1	Application .....	79
10.5.2	TAG Block capabilities .....	80
10.5.3	Activation of Source identification for output .....	80
10.5.4	Activation of Destination identification .....	81
10.5.5	Activation of Source identification for input .....	82
10.5.6	Use of multiple Source identifications for input .....	82
10.5.7	Test of grouping by TAG blocks for output .....	83
10.5.8	Test of UNIX time output .....	85
10.5.9	Test of Line-count output .....	85
10.6	Test of optional functions .....	86
10.6.1	Test of external synchronization source .....	86
10.6.2	Test of Message 17 based on RTCM 10402 input .....	87
Annex A (normative) AIS Base Station sentences .....		88
A.1	General .....	88
A.2	ACM – AIS Base Station addressed channel management command .....	88
A.3	ADS – Automatic device status .....	89
A.4	AGA – AIS Base Station broadcast of a group assignment command .....	90
A.5	ASN – AIS Base Station broadcast of assignment command .....	92
A.6	BCG – Base Station configuration, general command .....	93
A.7	BCL – Base Station configuration, location command .....	94
A.8	DLM – Data link management slot allocations for Base Station command .....	95
A.9	ECB – Configure broadcast schedules for Base Station messages, command .....	97
A.10	FSR – Frame summary of AIS reception .....	98
A.11	RST – Equipment Reset Command .....	99
A.12	SID – Set an equipment’s identification and command .....	100
A.13	SPO – Select AIS device’s processing and output command .....	101
A.14	TFR – Transmit feed-back report .....	102
A.15	TPC – Transmit slot prohibit command .....	103
A.16	TSA – Transmit slot assignment .....	104
A.17	TSR – Transmit slot prohibit status report .....	105
A.18	VSI – VDL signal information .....	106
Annex B (normative) Legacy AIS Base Station sentences .....		107
B.1	Legacy sentences .....	107
B.1.1	BCE – Extended general Base Station configuration .....	107
B.1.2	BCF – General Base Station configuration .....	107
B.1.3	CAB – Control AIS Base Station .....	109
B.1.4	TSP – Transmit slot prohibit .....	109
B.2	Comment block .....	110

B.3	Comment block parameters for AIS	111
B.3.1	General	111
B.3.2	Comment block parameter format	111
B.3.3	Comment block “hexadecimal checksum” (*hh)	111
B.3.4	Line (either a comment block, or comment block and sentence)	111
B.3.5	Group (associated lines)	112
B.3.6	Parameter-code dictionary	112
B.3.7	Line linking (sentence linking)	112
B.3.8	Comment block used with query sentences	113
Annex C	(normative) IEC 61162-1 sentences modified for use with AIS Base Station	115
C.1	General	115
C.2	CBR – Configure broadcast rates for AIS AtoN Station message command	115
C.3	MEB – Message Input for broadcast command	116
C.4	NAK – Negative acknowledgement	118
Annex D	(normative) AIS Base Station TAG block sentences	120
D.1	General	120
D.2	CPC – Configure parameter-code for UNIX time parameter (c)	120
D.3	CPD – Configure parameter-code for Destination identification parameter (d)	121
D.4	CPG – Configure parameter-code for the sentence-grouping parameter (g)	121
D.5	CPN – Configure parameter-code for the line-count parameter (n)	123
D.6	CPS – Configure parameter-code for the Source identification parameter(s)	125
D.7	TBR – TAG block report request	125
D.8	TBS – TAG block listener Source identification configuration command	126
Bibliography		128
Figure 1	– Functional block diagram of an AIS Base Station	13
Figure 2	– Functional block diagram dependent and independent operation	15
Figure 3	– Modulation spectrum for slotted transmission	20
Figure 4	– Power versus time mask	20
Figure 5	– General processing diagram	23
Figure 6	– General processing diagram	24
Figure 7	– Flow diagram for AIS Base Station response to VDM input	28
Figure 8	– Format for repeating four-packet cluster	34
Figure 9	– Measurement arrangement for frequency error	37
Figure 10	– Measurement arrangement for carrier power	38
Figure 11	– Measurement arrangement for modulation accuracy	39
Figure 12	– Measurement arrangement for intermodulation attenuation	41
Figure 13	– Measurement arrangement for sensitivity	42
Figure 14	– Measurement arrangement for error behaviour	42
Figure 15	– Measurement arrangement for co-channel rejection	43
Figure 16	– Measurement arrangement for adjacent channel selectivity	44
Figure 17	– PER/BER or SINAD measuring equipment	45
Figure 18	– Measurement arrangement for inter-modulation	47
Figure 19	– Measurement arrangement for blocking or de-sensitisation	48
Figure A.1	– Frame summary timing	98

Table 1 – Base Station input/output sentence formatters .....	16
Table 2 – Required parameter settings for an AIS Base Station .....	18
Table 3 – Required settings of physical layer constants .....	18
Table 4 – Bandwidth related parameters of the physical layer of the AIS Base Station .....	18
Table 5 – Minimum required TDMA transmitter characteristics .....	19
Table 6 – Definition of timings for Figure 4 .....	20
Table 7 – Minimum TDMA receiver characteristics .....	21
Table 8 – Base Station response to input messages from the VDL .....	23
Table 9 – Base Station response to input messages from the VDL .....	25
Table 10 – Required content of FSR and VSI output .....	26
Table 11 – Base Station response to ABM, BBM and AIR input on the PI .....	27
Table 12 – BIIT alarm conditions monitored by an AIS Base Station .....	30
Table 13 – Settings after reset command .....	30
Table 14 – Required TAG block functions .....	32
Table 15 – Content of first two packets .....	34
Table 16 – Fixed PRS data derived from ITU-T O.153 .....	35
Table 17 – Maximum values of absolute measurement uncertainties .....	36
Table 18 – Frequencies for inter-modulation tests .....	48
Table 19 – Calculation of parameters in Message 16 .....	63

## INTERNATIONAL ELECTROTECHNICAL COMMISSION

---

**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**

## 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 62320-1 has been prepared by IEC technical Committee 80: Maritime navigation and radiocommunication equipment and systems.

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.

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

The committee has decided that the contents of this publication will remain unchanged until the stability date indicated on the IEC website 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 document using a colour printer.**



## 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

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*