

Edition 3.0 2018-07 REDLINE VERSION

INTERNATIONAL STANDARD



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 61993-2:2018

https://standards.iteh.ai/catalog/standards/iec/c750edbc-0ff6-4278-81cc-b795dfe46385/iec-61993-2-2018





THIS PUBLICATION IS COPYRIGHT PROTECTED Copyright © 2018 IEC, Geneva, Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either IEC or IEC's member National Committee in the country of the requester. If you have any questions about IEC copyright or have an enquiry about obtaining additional rights to this publication, please contact the address below or your local IEC member National Committee for further information.

IEC Central Office 3, rue de Varembé CH-1211 Geneva 20 Switzerland Tel.: +41 22 919 02 11

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 - webstore. iec.ch/advsearchform

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 It also gives information on projects, replaced and withdrawn publications.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 21 000 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

67 000 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: sales@iec.ch.

IEC 61993-2:2018

https://standards.iteh.ai/catalog/standards/iec/c750edbc-0ff6-4278-81cc-b795dfe46385/iec-61993-2-2018



Edition 3.0 2018-07 REDLINE VERSION

INTERNATIONAL STANDARD



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 61993-2:2018

https://standards.iteh.ai/catalog/standards/iec/c750edbc-0ff6-4278-81cc-b795dfe46385/iec-61993-2-2018

INTERNATIONAL ELECTROTECHNICAL COMMISSION

ICS 47.020.70 ISBN 978-2-8322-5903-0

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

CONTENTS

FOREWORD.		11
INTRODUCTI	ON	
1 Scope		14
2 Normativ	e references	14
B Terms. d	efinitions and abbreviated terms	16
	ms and definitions	
	reviated terms	
	equirements	
	neral	
4.1.1	Overview	
4.1.2	General requirements	
4.1.3	Capabilities of the AIS	
4.1.4	Additional requirements	
4.1.5	Transmitter shutdown procedure	
4.1.6	Quality assurance	
	les of operation	
	nuals	
_	king and identificationking and identification	
	uirements	
	ironmental, power supply, special purpose and safety requirements	
	play of information	
5.3 Upo	late of software	19
	nce requirements	
	nposition IEC 61993-2:2018	
6.2 Tim	e and position idards/iec/c750edbc-0ff6-4278-81cc-b795dfe46385/iec-	61993-2 ₂ 20
6.2.1	Source for UTC	
6.2.2	Source for AIS position reporting	
-	r interface	
	ntification	
-	rmation	
6.5.1	Information provided by the AIS	
6.5.2	Information reporting intervals	
6.5.3	Ship reporting capacity	
	nt log	
	missible initialization period	
	ver supply	
	hnical characteristics	
	ms Alerts and indications, fall-back arrangements	
6.10.1	Built-in test equipment	
	Alarm messages	
6.10.2	Status messages	
	play, input and output	
6.11.1	Minimum keyboard and display (MKD)	
6.11.2	Communication test	
6.11.3	Alarms Alerts and status information	

	6.11.	.4 Data protection	38
	6.11.	.5 Distance calculation	39
	6.12	Protection from invalid controls	39
7	Tech	nnical requirements	39
	7.1	General	39
	7.2	Physical layer	40
	7.2.1	1 General	40
	7.2.2	2 Transmitter parameters	40
	7.2.3	Receiver parameters	42
	7.3	Link layer	42
	7.3.1	1 General	42
	7.3.2	2 Link sublayer 1: Medium Access Control (MAC)	43
	7.3.3	3 Link sublayer 2: Data Link Service (DLS)	43
	7.3.4	Link sublayer 3 – Link Management Entity (LME)	43
	7.4	Network layer	46
	7.4.1	1 General	46
	7.4.2	2 Management of regional operating settings	46
	7.5	Transport layer	47
	7.6	Presentation interface	47
	7.6.1	1 General	47
	7.6.2	2 Automatic input of sensor data	48
	7.6.3		
	7.6.4	4 Long-range communication ports	55
	7.6.5	Optional IEC 61162-450/-460 interface	57
	7.6.6	· ·	
	7.6.7	· ·	
8	_	g-range applications <u>IEC.61993.2.2018</u>	
	8.1dar	General catalog/standards/iec/c75fledbc-0ff6-4278-81cc-h795dfc46385/iec-f	11.993262018
	8.2	Long-range application by two-way interface	62
	8.2.1	1 General	62
	8.2.2	2 Interrogations and responses	62
	8.2.3	Manual and automatic response	62
	8.2.4	Data formats and contents	62
	8.2.5	5 Addressing AIS-units	63
	8.3	Long-range application by broadcast	63
9	Test	conditions	64
	9.1	Normal and extreme test conditions	64
	9.1.1	1 Normal test conditions	64
	9.1.2	2 Extreme test conditions	64
	9.2	Standard test environment	64
	9.3	Additional test arrangements	65
	9.3.1	Arrangements for test signals applied to the receiver input	65
	9.3.2	2 Encoder for receiver measurements	65
	9.3.3	3 Waiver for receivers	65
	9.3.4	4 Impedance	65
	9.3.5	5 Artificial antenna (dummy load)	65
	9.3.6	6 Facilities for access	65
	9.3.7	7 Modes of operation of the transmitter	65

9.4	Common test conditions for protection from invalid controls	66
9.5	Measurement uncertainties	66
10 Test	signals	66
10.1	Standard test signal number 1 (DSC)	66
10.2	Standard test signal number 2 (TDMA)	
10.3	Standard test signal number 3 (TDMA)	67
10.4	Standard test signal number 4 (PRBS)	67
10.5	Standard test signal number 5 (PRBS)	67
11 Pow	er supply, special purpose and safety tests	68
12 Envi	ronmental tests	68
13 EMC	C tests	68
	rational tests	
14.1		
14.1	·	
14.1		
14.1	9	
14.1		
14.1	·	
14.1	•	
	3	
14.2	Manuals, marking and identification	73
14.2		
	Information	73
14.3		
14.3		
	Event log	
14.4	1 Method of measurement	76
s://standa 14.4		5/iec-61993-2-2018
14.5	Software update	
14.5	•	
14.5	.2 Required results	
14.6	Initialization period	
14.6	·	
14.6		
14.7	Technical characteristics	76
14.7	.1 Channel selection	76
14.7	.2 Transceiver protection	77
14.7	.3 Automatic power setting	77
14.8	Alarms Alerts Alerts and indicators, fall-back arrangements	77
14.8	.1 Loss of power supply	77
14.8	.2 Monitoring of functions and integrity	78
14.8	.3 Monitoring of sensor data	81
14.9	Display, input and output	85
14.9	.1 Data input/output facilities	85
14.9	.2 Initiate message transmission	86
14.9	.3 Communication test	86
14.9	.4 System control	87
14 0	5 Display of received targets	87

	14.9.6	Display of position quality	88
	14.9.7	Display of targets if optional filter is implemented	89
	14.9.8	Display of received safety related messages	89
	14.9.9	Presentation of navigation information	89
15	Physical	tests	
	•	MA transmitter	
	15.1.1	Frequency error	
	15.1.2	Carrier power	
	15.1.2	Slotted transmission spectrum	
	15.1.3	Modulation accuracy	
	15.1.4	•	
		Transmitter output power characteristics	
	15.2.1	Sensitivity Error behaviour at high input levels	
	15.2.2		
	15.2.3	Co-channel rejection	
	15.2.4	Adjacent channel selectivity	
	15.2.5	Spurious response rejection	
	15.2.6	Intermodulation response rejection and blocking	
	15.2.7	Transmit to receive switching time	
	15.2.8	Immunity to out-of-band energy	
		nducted spurious emissions	
	15.3.1	Spurious emissions from the transmitter	
	15.3.2	Spurious emissions from the receiver	
16		tests of link layer	
	16.1 TD	MA synchronisation	102
	16.1.1	Synchronisation test using UTC	102
	16.1.2	Synchronisation test using UTC with repeated messages	103
	16.1.3	- ,	
	16.1.4	Synchronisation test without UTC	103
	16.1.5	Reception of un-synchronised messages	104
	16.2 Tim	ne division (frame format)	104
	16.2.1	Method of measurement	104
	16.2.2	Required results	104
	16.3 Syr	nchronisation and jitter accuracy	104
	16.3.1	Definition	104
	16.3.2	Method of measurement	104
	16.3.3	Required results	104
	16.4 Dat	a encoding (bit stuffing)	
	16.4.1	Method of measurement	
	16.4.2	Required results	105
	16.5 Fra	me check sequence	
	16.5.1	Method of measurement	
	16.5.2	Required results	
		t allocation (channel access protocols)	
	16.6.1	Network entry	
	16.6.2	Autonomous scheduled transmissions (SOTDMA)	
	16.6.3	Autonomous scheduled transmissions (ITDMA)	
	16.6.4	Safety related/binary message transmission	
	16.6.5	Transmission of Message 5 (ITDMA)	

	16.6.6	5 1	
	16.6.7	- 1 9	
	16.6.8	8 Fixed allocated transmissions (FATDMA)	111
	16.6.9	9 Randomisation of message transmissions	112
1	6.7	Message formats	112
	16.7.1	1 Received messages	112
	16.7.2	2 Transmitted messages	112
17	Speci	fic tests of network layer	113
1	7.1	Dual channel operation – Alternate transmissions	113
	17.1.1		
	17.1.2	2 Required results	113
1	7.2	Regional area designation by VDL message	
	17.2.1		
	17.2.2		
1	7.3	Regional area designation by serial message	
1		Regional area designation with lost position	
	17.4.1	·	
	17.4.2		
1	7.5	Power setting	
	17.5.1	· · · · · · · · · · · · · · · · · · ·	
	17.5.2		
1	7.6	Message priority handling	
	17.6.1	Introcondards itan all	
	17.6.2		
1	_	Slot reuse and FATDMA reservations	
•	17.7.1		
	17.7.2		
httns://s1		Management of received regional operating settings	
Intpos/15.	17.8.1		2.2010
		settings	116
	17.8.2	Test of correct input via presentation interface or MKD	117
	17.8.3	3 Test of addressed telecommand	118
	17.8.4	4 Test for invalid regional operating areas	118
1	7.9	Continuation of autonomous mode reporting interval	119
	17.9.1	1 Method of test	119
	17.9.2	2 Required results	119
18	Speci	fic tests of transport layer	119
1	8.1	Addressed messages	119
	18.1.1	Transmission	119
	18.1.2		
	18.1.3		
	18.1.4		
	18.1.5	ÿ , ÿ	
1		Interrogation responses	
	18.2.1	•	
	18.2.2		
19		fic presentation interface tests	
	-	General	
		Checking manufacturer's documentation	
ļ	۷.۷	Checking manufacturer 3 documentation	141

19.3 Ele	ctrical test	122
19.3.1	Method of measurement	
19.3.2	Required results	
	et of input sensor interface performance	
19.4.1	Method of measurement	
19.4.2	Required results	
	et of sensor input	
19.5.1	Test of GNS input	
19.5.2	Test of RMC input	
19.5.3	Test of DTM input	
19.5.4	Test of GBS input	
19.5.5	Test of VBW input	
19.5.6	Test of VTG input	
19.5.7	Test of HDT/THS input	
19.5.8 19.5.9	Test of different inputs	
19.5.9	Test of multiple inputs	
	Test of multiple inputsst of high-speed output	
19.6 Tes 19.6.1	Method of measurement	
19.6.2	Required results	
	h-speed output interface performance	
19.7.1	Method of measurement	
19.7.2	Required results	
	put of undefined VDL messages	
19.8.1	Method of measurement	
19.8.2	Required results	128
19.9 Tes	st of high-speed input	128
ttps://sta19.9.1	General	128
19.9.2	Test of VSD input sentence	
19.9.3	Test of SSD input sentence	128
19.9.4	Test of EPV input sentence	
19.9.5	Test of the pilot port access level	129
20 Long-ran	ge functionality tests	130
20.1 Lon	g-range application by two-way interface	
20.1.1	LR interrogation	130
20.1.2	LR "all ships" interrogation	
20.1.3	Consecutive LR "all ships" interrogations	
	g-range application by broadcast	
20.2.1	Long-range broadcast	
20.2.2	Multiple assignment operation	
•	rmative) Block diagram of AIS	
	mative) AIS interface overview (see Table 13)	
	rmative) Block diagram of standard test environment	
Annex C (norr	mative) DSC functionality	137
C.1 DS	C compatibility	137
C.2 DS	C receiver tests	
C.2.1	Maximum sensitivity	137
C.2.2	Error behaviour at high input levels	137

C.2.3	Co-channel rejection	138
C.2.4	Adjacent channel selectivity	138
C.2.5	Spurious response rejection	138
C.2.6	Intermodulation response rejection	139
C.2.7	Blocking or desensitisation	140
C.2.8	Conducted spurious emissions from the receiver	141
C.3 DS	C functionality tests	141
C.3.1	Definition	141
C.3.2	Method of measurement	141
C.3.3	Required results	142
Annex D (info	rmative) - Alarm Alert handling with ALR/ACK	147
Annex E (info	mative) Optional PI port sentences	
Annex E (norr	native) Calculation of area size and distance	150
E.1 Imp	ortance of a common method for area size and distance calculations	150
E.2 Cal	culation of area sizes	150
E.3 Cal	culation of general distances	151
E.3.1	General	151
E.3.2	Great-circle	151
E.3.3	Rhumb-line distance	151
	native) New interface sentences – Sender signature authentication	
,	LIEU Statuarus	
Annex G (nor	native) Updated interface sentences	154
G.1 Ger	eral (fittps://standards.item.al)	154
G.2 VSI	D – AIS voyage static data	154
Annex H (norr	native) Transmission of binary Messages 25 and 26	
	rmative) Conversion between IEC 61162-1 sentences and IEC 61162-3	
	up numbers 150 61993-2:2018	
Annex I (norm	ative) Extended tow dimension values. 4278-81cc-b795dfc46385/jec-61	162
I.1 Pur	pose and background	162
I.2 Met	hod	162
Bibliography .		164
Figure 1 – OS	I layer model	40
Figure 2 – Po	wer versus time characteristics	41
Figure 3 – For	mat for repeating four-packet cluster	67
· ·	asurement arrangement for frequency error	
•	asurement arrangement for carrier power	
_		
•	ission mask for slotted transmission	
_	asurement arrangement for modulation accuracy	
Figure 8 – Me	asurement arrangement	94
Figure 9 – Me	asurement arrangement with two generators	95
Figure 10 - S	NAD or PER/BER measuring equipment	97
_	est set-up	
•	ransmit to receive switching time measurement setup	
•	egional area scenario	
1 1401 C 13 - K	uqiuiiai alba subilaliu	1 14

Figure C.1 – Measurement arrangement for inter-modulation	140
Figure D.1 – State diagram of IEC 61993-2 Ed.2 Alert handling	149
Figure I.1 – Input, extension and transmitted dimensional values	163
Table - Integrity alarm conditions signalled using ALR sentence formatter	
Table - Property identifier	
Table 1 –Talker IDs for automatic detection of electronic position fixing system type	
Table 2 – Information reporting intervals for autonomous mode	23
Table 3 – Required conditions for BIIT and reaction of the system to the condition detected	27
Table 4 – Classification of required alerts	
Table 5 – Mapping between BAM alert states and ALR alert states	
Table 6 – Sensor status indications signalled using TXT sentence formatter	
Table 7 – Position sensor fall-back conditions	
Table 8 – Use of accuracy (PA) flag	
Table 9 – ROT sensor fallback conditions	
Table 10 – Identification of locating devices when active	
Table 11 – Identification of locating devices when in test mode	
Table 12 – Identification of locating devices for type approval testing	
Table 13 – Message display on MKD	
Table 14 – Position quality	30
Table 15 Transmitter personal and	37
Table 15 – Transmitter parameters	41
Table 16 – Power versus time characteristics	
Table 17 – Receiver parameters	
Table 18 – Use of VDL messages	
Table 19 – Presentation interface access	
Table 20 – IEC 61162-1 sensor sentences	
Table 21 – AIS high-speed input data and formats	
Table 22 – AIS high-speed output data and formats	
Table 23 – Property identifiers	
Table 24 – AIS Long-range communications input data and formats	
Table 25 – LR output data formats	
Table 26 – Default input transmission groups with applicable sentences	
Table 27 – TAG block parameters	
Table 28 – CRP sentences applicable for Class A AIS	
Table 29 – Tests to be repeated for IEC 61162-450 interface	61
Table 30 – LR data types	
Table 31 – Content of first two packets	67
Table 32 – Fixed PRS data derived from Recommendation ITU-T 0.153	68
Table 33 – Peak frequency deviation versus time	93
Table 34 – Tests to be performed	99
Table 35 – Primary channels for each region	114
Table D 1 – IFC 61993-2:2012 alert states	148

Table D.2 – IEC 61993-2:2012 alert events	148
Table E.1 – Coordinate points	150
Table H 1 – Conversion between IEC 61162-1 and IEC 61162-3	160

INTERNATIONAL ELECTROTECHNICAL COMMISSION

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

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.
- 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.

This redline version of the official IEC Standard allows the user to identify the changes made to the previous edition. A vertical bar appears in the margin wherever a change has been made. Additions are in green text, deletions are in strikethrough red text.

International Standard IEC 61993-2 has been prepared by IEC technical committee 80: Maritime navigation and radiocommunication equipment and systems.

This third edition cancels and replaces the second edition published in 2012. This edition constitutes a technical revision.

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

- a) it incorporates the technical characteristics included in Recommendation ITU-R M.1371-5:2014;
- b) it introduces the concept of locating device groups in order to include EPIRB AIS and MOB AIS in addition to AIS SART;
- c) it adds security features for configuration input by introducing a new sentence SSA;
- d) it adds optional implementation of IEC 61162-450/460 interfaces;
- e) it adds requirements for bridge alert management (BAM);
- f) it introduces extended dimension values used by towing vessels;
- g) it adds a software update requirement.

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

FDIS	Report on voting
80/888/FDIS	80/890/RVD
	unuarus

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

A list of all parts in the IEC 61993 series, published under the general title *Maritime* navigation and radiocommunication equipment and systems – Automatic identification systems (AIS), can be found on the IEC website.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under "http://webstore.iec.ch" in the data related to the specific document. At this date, the document will be

- · reconfirmed,
- withdrawn,
- · replaced by a revised edition, or
- amended.

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.