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DIN EN 61993-2:2013-08

Entwurf

**Navigations- und Funkkommunikationsgeräte und -systeme für die Seeschifffahrt –
Automatische Identifikationssysteme (AIS) –
Teil 2: Geräte der Klasse A des universellen automatischen Identifikationssystems (AIS) für Schiffe – Betriebs- und Leistungsanforderungen, Prüfverfahren und geforderte Prüfergebnisse (IEC 80/801/CD:2016);
Text in English**

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 80/801/CD:2016);
Text in English

Matériels et systèmes de navigation et de radiocommunications maritimes –
Systèmes d'identification automatique (AIS) –
Partie 2: Equipements AIS de type Classe A embarqués – Exigences d'exploitation et de fonctionnement, méthodes d'essai et résultats d'essai exigés (IEC 80/801/CD:2016);
Text en Anglaise

Anwendungswarnvermerk

Dieser Norm-Entwurf mit Erscheinungsdatum 2017-03-03 wird der Öffentlichkeit zur Prüfung und Stellungnahme vorgelegt.

Weil die beabsichtigte Norm von der vorliegenden Fassung abweichen kann, ist die Anwendung dieses Entwurfs besonders zu vereinbaren.

Stellungnahmen werden erbeten

- vorzugsweise online im Norm-Entwurfs-Portal von DIN unter www.din.de/go/entwuerfe bzw. für Norm-Entwürfe der DKE auch im Norm-Entwurfs-Portal der DKE unter www.entwuerfe.normenbibliothek.de, sofern dort wiedergegeben;
- oder als Datei per E-Mail an dke@vde.com möglichst in Form einer Tabelle. Die Vorlage dieser Tabelle kann im Internet unter www.din.de/go/stellungnahmen-norm-entwuerfe oder für Stellungnahmen zu Norm-Entwürfen der DKE unter www.dke.de/stellungnahme abgerufen werden;
- oder in Papierform an die DKE Deutsche Kommission Elektrotechnik Elektronik Informationstechnik in DIN und VDE, Stresemannallee 15, 60596 Frankfurt am Main.

Die Empfänger dieses Norm-Entwurfs werden gebeten, mit ihren Kommentaren jegliche relevanten Patentrechte, die sie kennen, mitzuteilen und unterstützende Dokumentationen zur Verfügung zu stellen.

Gesamtumfang 124 Seiten

DKE Deutsche Kommission Elektrotechnik Elektronik Informationstechnik in DIN und VDE

Nationales Vorwort

Die englische Originalfassung des internationalen Dokuments IEC 80/801/CD:2016 „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“ (CD, en: Committee Draft) ist unverändert in diesen Norm-Entwurf übernommen worden.

Das internationale Dokument wurde vom TC 80 „Maritime navigation and radiocommunication equipment and systems“ der Internationalen Elektrotechnischen Kommission (IEC) erarbeitet und den nationalen Komitees zur Stellungnahme vorgelegt.

Die IEC und das Europäische Komitee für Elektrotechnische Normung (CENELEC) haben vereinbart, dass ein auf IEC-Ebene erarbeiteter Entwurf für eine Internationale Norm zeitgleich (parallel) bei IEC und CENELEC zur Umfrage (CDV-Stadium) und Abstimmung als FDIS (en: Final Draft International Standard) bzw. Schluss-Entwurf für eine Europäische Norm gestellt wird, um eine Beschleunigung und Straffung der Normungsarbeit zu erreichen. Dokumente, die bei CENELEC als Europäische Norm angenommen und ratifiziert werden, sind unverändert als Deutsche Normen zu übernehmen.

Da der Abstimmungszeitraum für einen FDIS bzw. Schluss-Entwurf prEN nur 2 Monate beträgt, und dann keine sachlichen Stellungnahmen mehr abgegeben werden können, sondern nur noch eine „JA/NEIN“-Entscheidung möglich ist, wobei eine „NEIN“-Entscheidung fundiert begründet werden muss, wird bereits der CD als DIN-Norm-Entwurf veröffentlicht, um die Stellungnahmen aus der Öffentlichkeit frühzeitig berücksichtigen zu können.

Für dieses Dokument ist das nationale Arbeitsgremium K 738 „Elektronische Navigationsinstrumente“ der DKE Deutsche Kommission Elektrotechnik Elektronik Informationstechnik in DIN und VDE (www.dke.de) zuständig.

Für den Fall einer undatierten Verweisung im normativen Text (Verweisung auf ein Dokument ohne Angabe des Ausgabedatums und ohne Hinweis auf eine Abschnittsnummer, eine Tabelle, ein Bild usw.) bezieht sich die Verweisung auf die jeweils aktuellste Ausgabe des in Bezug genommenen Dokuments.

Für den Fall einer datierten Verweisung im normativen Text bezieht sich die Verweisung immer auf die in Bezug genommene Ausgabe des Dokuments.

Der Zusammenhang der zitierten Dokumente mit den entsprechenden Deutschen Dokumenten ergibt sich, soweit ein Zusammenhang besteht, grundsätzlich über die Nummer der entsprechenden IEC-Publikation. Beispiel: IEC 60068 ist als EN 60068 als Europäische Norm durch CENELEC übernommen und als DIN EN 60068 ins Deutsche Normenwerk aufgenommen.

Das Präsidium des DIN hat mit Präsidialbeschluss 1/2004 festgelegt, dass DIN-Normen, deren Inhalt sich auf internationale Arbeitsergebnisse der Informationsverarbeitung gründet, unter bestimmten Bedingungen allein in englischer Sprache veröffentlicht werden dürfen. Diese Bedingungen sind für den vorliegenden Normentwurf erfüllt.

Da sich die Benutzer des vorliegenden Normentwurfs der englischen Sprache als Fachsprache bedienen, wird die Englische Fassung der IEC 61993-2 veröffentlicht. Zu deren Abschnitt 1, der den Anwendungsbereich enthält und Abschnitt 3, der die Begriffe festlegt, wurde eine Übersetzung angefertigt und als informativer Nationaler Anhang NA des vorliegenden Normentwurfs hinzugefügt. Für viele der verwendeten Begriffe existieren keine gebräuchlichen deutschen Benennungen, da sich die deutschen Anwender in der Regel ebenfalls der englischen Benennungen bedienen. Dieser Normentwurf steht nicht in unmittelbarem Zusammenhang mit Rechtsvorschriften und ist nicht als Sicherheitsnorm anzusehen.

Es ist vorgesehen, auch bei der entsprechenden zukünftigen Deutschen Norm auf die deutsche Sprachfassung zu verzichten und diese in der englischsprachigen Fassung zu veröffentlichen.

Es wird auf die Möglichkeit hingewiesen, dass einige Elemente dieses Dokuments Patentrechte berühren können. ISO [und/oder] IEC sind nicht dafür verantwortlich, einige oder alle diesbezüglichen Patentrechte zu identifizieren.

Änderungen

Gegenüber DIN EN 61993-2:2013-08 wurden folgende Änderungen vorgenommen:

- a) Einführung von Ortungsgerätegruppen mit zusätzlichen Alarmen, um neben AIS SART auch EPIRB AIS und MOB AIS zu unterstützen;
- b) Einführung der Betriebsart Sende-Abschaltung;
- c) Klarstellung, dass aufgezeichnete Ereignisdaten auf der Minimaltastatur mit -anzeige (MKD) angezeigt werden müssen;
- d) Ergänzung von TXT-Meldungs Kennungen für Tanker im Sendebetrieb mit kleiner Leistung;
- e) Ergänzung einer Funktion zur Anzeige von Statusinformation auf der MKD;
- f) Festlegung einer Anzeigefunktion für Namen von SAR-Luftfahrzeugen;
- g) Ergänzung einer Funktion zur Ausgabe von ACS-Datensätzen, wenn ACA-Datensätze abgefragt wurden;
- h) Änderung der Definition für Anzeige und Speicherung sicherheitsrelevanter Meldungen;
- i) Klarstellung des Passwortschutzes für Konfigurationseingaben;
- j) Ergänzung einer Funktion zur Übertragung der Meldung 24B;
- k) Klarstellung des Kanalmanagements bei einer mittels MMSI adressierten Meldung 22;
- l) Optionale Implementierung einer IEC 61162-450/460 Schnittstelle;
- m) Festlegung von Kommunikationsmeldungen für die Kommunikation mit abgesetztem MKD;
- n) Einführung einer Tabelle von Merkmalskennungen, die mit der EPV-Meldung benutzt werden im Hauptteil und Entfernung des entsprechenden Anhangs E;
- o) Festlegung der Kanäle 75 und 76 zur Anwendung mit weitreichender Rundsendung;
- p) Klarstellung der Leistungsprüfung bei Umweltprüfungen;
- q) Prüfungserweiterung für den Empfang und das Rundsenden der Meldung 26 einschließlich der Prüfung der Byte-Anordnung (re ITU-R M.1371-5 Tabelle 28/82);
- r) Änderung der maximalen Länge von Meldungen, die mehrere Slots lang sind, von 5 auf 3 Slots;
- s) Der Abstand zwischen den GNSS-Antennen wurde beim Prüfen nicht übereinstimmender Positionen hinzugefügt;
- t) Ergänzung einer Prüfung des Gültigkeitsbereichs von MKD-Eingabedaten;
- u) Reorganisation der Prüfung der Priorität von Gruppen-Zuweisungen;
- v) Klarstellung der Prüfung der Eingaben an der Hochgeschwindigkeitsschnittstelle;
- w) Ergänzung einer Übersetzungstabelle zwischen IEC 61162-1 Meldungen und IEC 61162-3 PGNs als informativer Anhang F;
- x) Änderung der Alert-Beschreibungstabelle durch Information zur Alert-Klassifizierung entsprechend IMO MSC.302(87);
- y) Ergänzung einer Prüfung für eine VER-Meldung;
- z) Anhang H wurde entfernt, da die darin beschriebenen Datensätze in IEC 61162-1 Ed. 5 veröffentlicht werden;
- aa) AIS Klasse-B SO und Ortungsgeräte sollen als eine indirekte Synchronisationsquelle für UTC akzeptiert werden;
- bb) Ortungsgeräte dürfen nicht als empfangene Stationen für die Entscheidung über den Semaphore-Modus gezählt werden.

Nationaler Anhang NA (informativ)

Auszugsweise Übersetzung^{N1)}

1 Anwendungsbereich

Dieser Teil der IEC 61993 legt die minimalen Betriebs- und Leistungsanforderungen, Prüfverfahren und erforderlichen Prüfergebnisse entsprechend den durch IMO mit Resolution MSC.74(69), Anhang 3 Shipborne Automatic Identification System“ angenommenen Leistungsnormen fest. Die vorliegende Norm umfasst die anwendbaren technischen Eigenschaften für Geräte der Klasse A für Schiffe, wie in der Empfehlung ITU-R M.1371 enthalten und berücksichtigt die ITU-Funkregulierung, soweit anwendbar. Zusätzlich wird die IMO-Resolution A.694(17) berücksichtigt, mit der die IEC 60945 verknüpft ist. Wenn eine Anforderung der vorliegenden Norm verschieden ist zu der von IEC 60945, dann gilt die der vorliegenden Norm vorrangig.

Dieser Teil der IEC 61993 legt auch die Minimalanforderungen für beides, die Mittel zur Eingabe und zur Anzeige von Daten und für die Schnittstellen zu anderen Geräten für die Eingabe und Anzeige von Daten fest

ANMERKUNG Der Text dieser Norm, der identisch zu dem in der IMO-Resolution MSC.74(69), Anhang 3 oder zu dem in der Empfehlung ITU-R M.1371 ist, ist kursiv gedruckt und Verweisungen zur Resolution (abgekürzt als „A3“ oder zur Empfehlung (abgekürzt als „M.1371“) und die Abschnittsnummern sind in Klammern, zum Beispiel (A3/3.3) beziehungsweise (M.1371/A2-3.3) angegeben.

3 Abkürzungen

AIS	Automatisches Identifizierungssystem	(en: automatic identification system)
AIS-SART	AIS-Such- und Rettungssender	(en: AIS search and rescue transmitter)
BIIT	eingebaute Integritätsprüfung	(en: built-in integrity tests)
BT	Zeit-Bandbreite-Produkt	(en: bandwidth-time)
COG	Fahrt- (oder Bewegungs-)richtung über Grund	(en: course over ground)
CommState	Kommunikationsstatus (siehe Anmerkung 1)	(en: communication state (see note 1))

ANMERKUNG 1 Kommunikationsstatus ist in der ITU-Empfehlung ITU-R M.1371 definiert. Er wird verwendet, um Daten zur Organisation des Zugriffs auf die Zeitschlitz zwischen den Stationen auszutauschen.

ECDIS	elektronisches Kartendarstellungs- und Informationssystem	(en: electronic chart display and information system)
EPFS	elektronisches Positionsbestimmungssystem	(en: electronic position-fixing systems)
ETA	geschätzte Ankunftszeit	(en: estimated time of arrival)
EUT	Gerät im Test	(en: equipment under test)
FATDMA	Zeitvielfachzugriff auf definierten Zeitschlitz	(en: fixed access time division multiple access)

^{N1)} Nationale Fußnote: Die Nummerierung aus IEC 80/801/CD:2016-05-06 wurde beibehalten.

GMSK	Gaußsche Minimalmodulation	(en: Gaussian minimum shift keying)
HDG	anliegender Kurs	(en: heading)
IMO	Internationale Seeschiffahrtsorganisation	(en: International Maritime Organization)
ITDMA	schrittweiser Zeitvielfachzugriff	(en: incremental time division multiple access)
Locating device	Ortungsgerät	(en: locating device)
LR	Weitbereich	(en: long-range)
MAC	Medienzugriffssteuerung	(en: medium access control)
MKD	Minimaltastatur und -anzeige	(en: minimum keyboard and display)
MMSI	mobile Seeschiffahrtsdienstekennung	(en: maritime mobile service identity)
MOB-AIS	AIS-Gerät für Mann über Bord	(en: man overboard AIS device)
NavStatus	Navigationsstatus (siehe Anmerkung 2)	(en: navigational status (see note 2))

ANMERKUNG 2 Navigationsstatus ist in der ITU-Empfehlung ITU-R M.1371-4 definiert. Er besteht aus Information, die durch die Schiffsbesatzung eingegeben werden kann, um anzuzeigen, ob das Schiff unterwegs, festgemacht, usw. ist.

NSS	nominaler Anfangssendezeitschlitz	(en: nominal start slot)
NTS	nominaler Sendezeitschlitz	(en: nominal transmission slot)
NUC	nicht unter Befehl	(en: not under command)
PC	Leistungskontrolle	(en: performance check)
PER	Paketfehlerrate	(en: packet error rate)
PI	Präsentationsschnittstelle	(en: presentation interface)
PT	Leistungsprüfung	(en: performance test)
RAIM	autonome Empfänger Integritätsüberwachung	(en: receiver autonomous integrity monitoring)
RATDMA	Zeitmehrfachzugriff auf Zufallszeitschlitz	(en: random access time division multiple access)
RF	Funkfrequenz	(en: radio frequency)
ROT	Drehgeschwindigkeit	(en: rate of turn)
SI	Auswahl-Intervall	(en: selection interval)
SOG	Fahrt (oder Geschwindigkeit) über Grund	(en: speed over ground)
SOTDMA	sich selbst organisierender Zeitmehrfachzugriff	(en: self organizing time division multiple access)

UTC	Koordinierte Weltzeit	(en: universal time co-ordinated)
VDL	VHF-Datenverbindung	(en: VHF data link)
VSWR	Stehwellenverhältnis	(en: voltage standing wave ratio)
Rx	Empfänger	(en: Receive)
Tx	Sender	(en: Transmit)

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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

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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:

It incorporates the technical characteristics included in Recommendation ITU-R M.1371-5 which was published in 2014.

The changes and clarifications in this edition include:

- Introduction of Locating device groups including additional alarms in order to include EPIRB AIS and MOB AIS in addition to AIS SART

- Introduced silent mode function
- Clarification that event log data shall be displayed on MKD
- Added TXT-sentence identifiers for tanker low-power mode
- Added function to display status information on MKD
- Specified display function for SAR aircraft names
- Added function to output of ACS when interrogated for ACA
- Amended the definition of indication and storage of safety related messages
- Clarified password protection of configuration input
- Added function for transmission of Message 24B
- Clarified channel management on MMSI-addressed Message 22
- Optional implementation of IEC 61162-450/460 interface
- Defined communication messages for communication with remote MKD
- Introduced table of property identifiers used with EPV-sentence in body text and removed related Annex E
- Defined channels 75 and 76 for use with long range broadcast
- Clarified performance check for environmental tests
- Extended test for receiving and broadcast of Message 26 including check of byte alignment (re ITU-R M.1371-5 Table 28/82)
- Changed maximum length of multiple slot messages from 5 to 3 slots
- Added distance between GNSS antennas test for GNSS position mismatch test
- Added check for valid range of MKD input data
- Re-organized group assignment priority test
- Clarified high-speed input test
- Added translation table between IEC 61162-1 sentences and IEC 61162-3 PGNs as informative annex F
- Amended Alert description table with information on alert classification in accordance with IMO MSC.302(87)
- Added test for VER sentence
- Removed Annex H as the sentences described therein will be published in IEC 61162-1 Ed.5.
- AIS Class-B SO and locating devices shall be accepted as a synchronisation source for UTC indirect
- Locating devices shall not be counted as received stations for semaphore selection

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

CDV	Report on voting

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 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
- amended.

A bilingual version of this publication may be issued at a later date.

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

1 Scope

This part of IEC 61993 specifies the minimum operational and performance requirements, methods of testing and required test results conforming to performance standards adopted by the IMO in Resolution MSC.74(69), Annex 3, Shipborne Automatic Identification System. This standard incorporates the applicable technical characteristics of Class A shipborne equipment included in Recommendation ITU-R M.1371 and takes into account the ITU Radio Regulations, where applicable. In addition, it takes account of IMO Resolution A.694(17) to which IEC 60945 is associated. When a requirement in this standard is different from IEC 60945, the requirement of this standard takes precedence.

This part of IEC 61993 also specifies the minimum requirements both for the means to input and display data and for the interfaces to other equipment suitable to be used as means of input and display data.

NOTE All text of this standard, that is identical to that in IMO resolution MSC.74(69), Annex 3 or to that in ITU-R Recommendation M.1371 is printed in *italics* and references to the resolution (abbreviated to "A3") or the recommendation (abbreviated to "M.1371") and paragraph numbers are indicated in parentheses, for instance (A3/3.3) or (M.1371-5/A2-3.3) respectively.

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 60945:2002, *Maritime navigation and radiocommunication equipment and systems – General requirements – Methods of testing and required test results*

IEC 61108 (all parts), *Maritime navigation and radiocommunication equipment and systems – Global navigation satellite systems (GNSS)*

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

IEC 61162-2, *Maritime navigation and radiocommunication equipment and systems – Digital interfaces – Part 2: Single talker and multiple listeners, high-speed transmission*

IEC 61162-450, *Maritime navigation and radiocommunication equipment and systems – Digital interfaces – Part 450: Multiple talkers and listeners – Ethernet interconnection*
IEC 61162-460, *Maritime navigation and radiocommunication equipment and systems – Digital interfaces – Part 460: Multiple talkers and listeners – Ethernet interconnection – Safety and security*

IEC 62288, *Maritime navigation and radiocommunication equipment and systems – Presentation of navigation-related information on shipborne navigational displays – General requirements, methods of testing and required test results*

IEC 62388, *Maritime navigation and radiocommunication equipment and systems – Shipborne radar – Performance requirements, methods of testing and required test results*

IMO Resolution A.694(17), *General requirements for shipborne radio equipment forming part of the Global Maritime Distress and Safety System (GMDSS) and for electronic navigational aids*

IMO Resolution MSC.43(64), as amended by MSC.111(73), *Guidelines and Criteria for Ship Reporting Systems*

IMO Resolution MSC.74(69) Annex 3, *Recommendation on performance standards for AIS*

IMO Resolution MSC.302(87) Adoption of performance standards for bridge alert management

ITU-R Recommendation M.493-13, *Digital selective-calling system for the use in the maritime mobile service*

ITU-R Recommendation M.541-9, *Operational procedures for the use of digital selective-calling (DSC) equipment 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.1084-5, *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.1371-5:2014, *Technical characteristics for an 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 and definitions

AIS	automatic identification system
AIS-SART	AIS search and rescue transmitter
BIIT	built-in integrity tests
BT	bandwidth-time
COG	course over ground
CommState	communication state (see NOTE 1)

NOTE 1 Communication state is defined in Recommendation ITU-R M.1371. It is used to indicate whether the AIS is using the message structure for SOTDMA or ITDMA.

ECDIS	electronic chart display and information system
EPFS	electronic position-fixing systems
EPIRB-AIS	emergency positioning indicating radio beacon AIS
ETA	estimated time of arrival
EUT	equipment under test
FATDMA	fixed access time division multiple access
GMSK	Gaussian minimum shift keying
HDG	Heading
IMO	International Maritime Organization
ITDMA	incremental time division multiple access
Locating device	A group of devices including AIS-SART, EPIRB-AIS and MOB-AIS
LR	long-range
MAC	medium access control
MKD	minimum keyboard and display

MMSI	maritime mobile service identity
MOB-AIS	man overboard AIS device
NavStatus	navigational status (see NOTE 2)

NOTE 2 Navigational status is defined in Recommendation ITU-R M.1371. It consists of information that may be input by the ship's crew to indicate whether the ship is underway, moored, etc.

NSS	nominal start slot
NTS	nominal transmission slot
NUC	not under command
PC	performance check
PER	packet error rate
PI	presentation interface
PT	performance test
RAIM	receiver autonomous integrity monitoring
RATDMA	random access time division multiple access
RF	radio frequency
ROT	rate of turn
SI	selection interval
SOG	speed over ground
SOTDMA	self organizing time division multiple access
UTC	universal time co-ordinated
VDL	VHF data link
VSWR	voltage standing wave ratio
Rx	Receive
Tx	Transmit

4 General requirements

4.1 General

4.1.1 Overview

Requirements contained in this clause are requirements not taken up in other clauses and are verified by observation and inspection of documented evidence. These requirements include the applicable general and operational requirements of IEC 60945:2002, as detailed in Clause 6 (Operational checks), Clause 13 (Maintenance), Clause 14 (Equipment manuals) and Clause 15 (Marking and identification).

The manufacturer shall declare compliance with these requirements and shall provide relevant documentation. The declarations, documentation and, where necessary, the EUT shall be checked or verified by inspection.

The manufacturer shall also declare the composition of the EUT and the category for durability and resistance to environmental conditions for each unit of the EUT as specified in IEC 60945.

4.1.2 General requirements

(A3/1.1) *This standard specifies the requirements for the AIS.*

(A3/1.2) *The AIS shall 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:*

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

4.1.3 Capabilities of the AIS

(A3/1.3) *The AIS shall 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 shall be with the minimum involvement of ship's personnel and with a high level of availability.*

4.1.4 Additional requirements

(A3/1.4) *The installation, in addition to meeting the requirements of the Radio Regulations, applicable ITU-R Recommendations and the general requirements as set out in resolution A.694 (17), shall comply with the following performance standards, as contained in the following clauses.*

4.1.5 Transmitter shutdown procedure

(M.1371-5/A2-2.13) *An automatic transmitter hardware shutdown procedure and indication shall be provided in case a transmitter continues to transmit for more than 2 s. This shutdown procedure shall be independent of software control.*

4.1.6 Quality assurance

The Administration shall require that the manufacturers have a quality control system audited by a competent authority to ensure continuous compliance with the type approval conditions. Alternatively, the Administration may use final product verification procedures where a competent authority verifies compliance with the type approval certificate before the product is installed on board ships.

NOTE The ISO 9000 series, as applicable, meets this requirement.

4.2 Modes of operation

(A3/2.1) *The system shall be capable of operating in a number of modes:*

- 1) *an "autonomous and continuous" mode for operation in all areas. This mode shall be capable of being switched to/from one of the following alternate modes by a competent authority;*
- 2) *an "assigned" mode for operation in an area subject to a competent authority responsible for traffic monitoring such that the data transmission interval and/or time slots may be set remotely by that authority;*
- 3) *a "polling" or controlled mode where the data transfer occurs in response to interrogation from a ship or competent authority.*

The Class A AIS shall be capable to receive and process DSC channel management telecommands conforming to the provisions of Recommendations ITU-R M.493, ITU-R M.541, ITU-R M.825 (see Annex C).

A user shall be able to switch off transmissions. There shall be a visual indication when Class A AIS will not transmit (silent mode). Interrogations shall not be responded in this mode.

NOTE IMO resolution A.917(22), paragraph 21 states that *AIS should always be in operation when ships are underway or at anchor. If the master believes that the continual operation of AIS might compromise the safety or security of his/her ship, the AIS may be switched off.*

4.3 A user shall be able to set the Class A AIS to respond to interrogation from AIS base stations while in silent mode (receive mode).Manuals

In addition to the requirements of IEC 60945:2002, Clause 14, the manuals shall include:

- the type and details of all external connectors (including the pilot plug) referred to in 7.6
- the needed information for correct siting of the antennas; and
- the requirements for external illumination, as appropriate.

4.4 Marking and identification

In addition to the requirements of IEC 60945:2002, Clause 15, the markings shall include:

- details of the power supply from which the equipment is intended to be operated; and,
- if applicable, the date by which batteries need to be replaced.

5 Other requirements

5.1 Environmental, power supply, special purpose and safety requirements

The AIS shall be tested for compliance with the environmental, power supply, special-purpose and safety requirements of IMO A.694(17) as detailed in IEC 60945. The required tests, for which a repeatable method of measurement has been defined, are given in Clauses 11, 12 and 13 of this standard. The declaration of category to IEC 60945:2002 Clause 4, shall define the relevant tests to be applied as follows:

- AIS equipment declared for protected installation shall meet the requirements described in Table 3 column "protected" of IEC 60945:2002;
- exposed AIS equipment shall meet the requirements described in Table 3 column "exposed" of IEC 60945:2002;
- portable AIS equipment shall meet the requirements of Table 3 of IEC 60945:2002 "protected" or "exposed" as appropriate.

5.2 Display of information

The AIS shall be tested as applicable against the requirements for presentation of information contained in IEC 62288 (see 14.7.9).

6 Performance requirements

6.1 Composition

(A3/3.1) *The AIS shall comprise (see Annex A):*

- 1) *a communication processor, capable of operating over a range of maritime frequencies, with an appropriate channel selecting and switching method, in support of both short (VHF) and long (beyond VHF) range applications.* For long-range applications the AIS shall provide a two-way interface (see 7.6.4);
- 2) *at least one transmitter, two TDMA receiving processes and one dedicated continuous DSC receiving process tuned to channel 70;*
- 3) *a means of processing data from an electronic position-fixing system which provides a resolution of one ten thousandth of a minute of arc and uses the WGS 84 datum.*

An interface (see 7.6.2) shall be provided to input the position used for navigation. Position information, if available from other EPFS, shall be used only as a back up and the user shall be informed of this (see 6.10).

- 4) *a means to automatically input data from other sensors meeting the provisions as specified in 6.5.1 point 2); a means, external to the AIS, to comply with this requirement shall be tested to the applicable requirements of IEC 60945.*
- 5) *a means to input and retrieve data manually.* The possibility of manual input and retrieval as described in 6.11 shall be demonstrated based on the manufacturer's documentation.
- 6) *a means of error checking the transmitted and received data (see Clause 7); and*
- 7) *built-in test equipment (BIIT) as specified in 6.10.1.*

(A3/3.2) *The AIS shall be capable of:*

- 1) *providing information automatically and continuously to a competent authority and other ships, without involvement of ship's personnel;*
- 2) *receiving and processing information from other sources, including that from a competent authority and from other ships;*

- 3) *responding to high priority and safety related calls with a minimum of delay;*
- 4) *providing positional and manoeuvring information at a data rate adequate to facilitate accurate tracking by a competent authority and other ships. (See 6.5.2).*

6.2 Time and position

6.2.1 Source for UTC

The AIS shall be provided with an internal GNSS receiver as primary UTC source which is required for synchronisation purposes and for fall back position, COG and SOG.

NOTE UTC includes a provision for leap seconds.

The internal GNSS receiver shall meet the following requirements of the IEC 61108 series: position accuracy, COG / SOG, acquisition, re-acquisition, receiver sensitivity, RF dynamic range, interference susceptibility, position update, failure warnings, status indications and integrity flag.

NOTE IMO Resolution MSC.74(69), Annex 3 requires the AIS to have a means of processing data from an electronic position fixing system that provides a resolution of one ten-thousandth of a minute of arc and uses the WGS 84 datum (see 6.1).

If the manufacturer intends to use the internal GNSS as the ship's position source, the internal GNSS receiver shall be type approved in accordance with IEC 61108 under the highest load condition of the AIS processor and the sentences DTM, GNS, GBS, and RMC shall be output on a dedicated port.

If date and time from the internal GNSS is not available and Message 4 or 11 is being received, the unit shall use date and time from that message, the seconds shall be omitted.

6.2.2 Source for AIS position reporting

The source for position reporting may vary depending on the conditions specified in 6.10.3.5.

When the external position is unavailable, the internal GNSS receiver may be used as a source for AIS position reporting.

When the internal GNSS receiver is performing as a source for AIS position reporting

- an appropriate BIIT indication shall be output on the presentation interface (see 6.10.1),
- the position data shall be available on the minimum keyboard and display (see 6.11.1),
- the internal GNSS receiver shall be capable of being differentially corrected, at least by evaluation of Message 17.

Where DGNSS corrections are received from multiple sources, the DGNSS corrections from the nearest DGNSS reference station should be used taking into account the Z count, and the health of the DGNSS reference station.

6.3 User interface

(A3/4) *To enable a user to access, select and display the information on a separate system, the AIS shall be provided with an interface conforming to an appropriate international marine interface standard.*

All interfacing shall be made via the system interface as described in 7.6 (called the presentation interface).

6.4 Identification

(See 14.1)

(A3/5) *For the purpose of ship and message identification, the appropriate Maritime Mobile Service Identity (MMSI) number shall be used.*

The unit shall be supplied with a default MMSI of "000000000" (this is not a valid MMSI).

The unit shall check that any programmed MMSI is between 200000000 and 799999999 or between 982000000 and 987999999 otherwise the unit shall reject the programming and be

not capable of transmitting. However a reset to the default value “000000000” shall be accepted, but the unit shall not be capable to transmit with this MMSI.

6.5 Information

(See 14.2)

6.5.1 Information provided by the AIS

(A3/6.1) *The information provided by the AIS shall include:*

1) Static:

- *IMO number (where available)*
- *Call sign & name*
- *Length and beam*
- *Type of ship*
- *Location of the in use position-fixing antenna on the ship (aft of bow and port or starboard of centreline)*

Static information and the MMSI shall be stored in non-volatile memory devices.

2) Dynamic:

- *Ship's position referenced to WGS 84 datum with accuracy indication and integrity status*
- *Time in UTC, the date is established by the receiving equipment*
- *Course over ground (COG)*
- *Speed over ground (SOG)*
- *Heading*
- *Navigational status (e.g. not under command (NUC), at anchor, etc.- manual input)*
- *Rate of turn (where available)*

3) Voyage related:

- *Ship's draught*
- *Hazardous cargo (type; as required by a competent authority)*
- *Destination and estimated time of arrival (ETA) (at master's discretion)*

4) Short safety-related messages

However pre-configured safety related messages (for example with “MAYDAY”, “DISTRESS” and distress communication text) shall not be provided.

NOTE IMO COMSAR.1/Circ.46 of February 2009 advises that short safety-related messages are not incorporated in AIS equipment because there is no SAR infrastructure in place to accommodate them.

6.5.2 Information reporting intervals

(A3/6.2) *The different information types are valid for a different time period and thus need a different reporting interval.*

Static information: Every 6 min, when data has been amended, and on request.

*Dynamic Information: Dependent on speed and course alteration according to Table 1
Every 3 min for long range broadcast message (see 8.3).*

Voyage related information: Every 6 min, when data has been amended, and on request

Safety-related message: As required

NOTE An SSD or VSD sentence that does not amend the data does not generate a transmission of Message 5.

Table 1 – Information reporting intervals for autonomous mode

<i>Type of Ship</i>	<i>Reporting interval</i>	
<i>Ship at anchor</i> or moored and not moving faster than 3 knots	3	<i>min</i>
Ship at anchor or moored and moving faster than 3 knots	10	s
<i>Ship with a speed of between 0 – 14 knots (default)</i>	10	s
<i>Ship with a speed of between 0 – 14 knots and changing course ^a</i>	3 1/3	s
<i>Ship with a speed of between 14 – 23 knots</i>	6	s
<i>Ship with a speed of between 14 – 23 knots and changing course</i>	2	s
<i>Ship with a speed of greater than 23 knots</i>	2	s
<i>Ship with a speed of greater than 23 knots and changing course</i>	2	s
^a Indicated by a change in ship's heading.		

(M.1371-5/A1-4.2.1) *The reporting interval shall decrease to 2 s when the station determines that it is the semaphore.*

If the autonomous mode requires a shorter reporting interval than the assigned mode, the AIS shall use the autonomous mode reporting interval.

When transmitting on a single channel, the reporting interval shall be maintained by doubling the number of transmissions on the active channel.

When NavStatus is “at anchor”, “moored”, “aground” or “undefined” and the vessel is moving faster than 3 kn alarm ID 10 (see Table 2) shall be generated; the reporting interval shall be in accordance with Table 1.

When NavStatus is under way and SOG is less than 1 kn for more than 2 h, alarm ID 10 shall be generated.

6.5.3 Ship reporting capacity

(A3/6.2) *The system shall be able to handle a minimum of 2 000 reports per minute, to adequately provide for all operational scenarios envisioned.*

However, the AIS mobile unit shall be capable of processing of all messages on the VDL.

6.6 Event log

(See 14.3)

(A3/6.3) *A security mechanism shall be provided to detect disabling of the AIS and to prevent unauthorised alteration of input or transmitted data. To protect the unauthorised dissemination of data, the IMO guidelines (IMO Resolution MSC.43(64), Guidelines for Ship Reporting Systems) shall be followed.*

Means shall be provided to automatically record all periods when the AIS installation is not transmitting position reports according to required reporting interval as described in Table 1 of ITU-R M.1371-5 for more than 15 minutes, for instance when the power is switched off, when the AIS is in silent mode or not transmitting for other reasons.

The last 10 times when the equipment was non-functioning for more than 15 min shall be recorded, in UTC time and duration, in a non-volatile event log. The recorded data shall be displayed on the MKD and output on request using the TRL sentence. It shall not be possible for the user to alter any information recorded in the event log.

Transmission of position reports as a response to interrogation shall not be used as an indicator of functioning.

Unit in silent mode that answers to interrogations shall be considered as nonfunctioning.

6.7 Permissible initialization period

(See 14.4)

(A3/7) *The installation shall be operational within 2 min of switching on.*

NOTE Sensors used with the AIS meet the requirements of their individual product standards (for example – IEC 61108-1 for GPS which permits 30 min to operation when there is no valid almanac data available, or IEC 61108-2 for GLONASS).

6.8 Power supply

(A3/8) *The AIS and associated sensors shall be powered from the ship's main source of electrical energy. In addition, it shall be possible to operate the AIS and associated sensors from an alternative source of electrical energy.*

6.9 Technical characteristics

(See 14.5)

(A3/9) *The technical characteristics of the AIS such as variable transmitter output power, operating frequencies (dedicated internationally and selected regionally), modulation, and antenna system shall comply with the appropriate ITU-R Recommendations.*

Additionally, there shall be a low power setting of 1 W which is automatically adopted when the vessel type is a “tanker” and the NavStatus is “moored” and not moving faster than 3 kn. This is to facilitate low power operation when loading and unloading.

There shall be an indication to the user when the low power setting is in operation and output of appropriate TXT sentences to the PI.

6.10 Alarms and indications, fall-back arrangements

(See 14.6)

6.10.1 Built-in test equipment

The AIS shall be equipped with BIIT. These tests shall run continuously or at appropriate intervals simultaneously with the standard functions of the equipment.

If any failure or malfunction is detected that will significantly reduce integrity or stop operation of the AIS, an alarm is initiated. In this case (see Annex D)

- the alarm shall be displayed on the MKD,
- the alarm relay shall be set “active”,
- an appropriate alarm message shall be output via the presentation interface upon occurrence and repeated every 30 s.

If a change of a relevant system status as described below is detected, an indication is given to the user. In this case

- the indication shall be accessible on the MKD,
- an appropriate TXT sentence shall be output via the presentation interface.

6.10.2 Alarm messages

6.10.2.1 Using the ALR formatter

An ALR-sentence is used to indicate a failure or malfunction that will significantly reduce integrity or stop operation of the AIS.

Alarm messages shall be IEC 61162-1 compliant “\$AIALR”-sentences on the presentation interface output port.

The following parameters of this sentence formatter:

- time of alarm condition change (UTC);
- unique alarm number (identifier) at alarm source;

- alarm condition;
- alarm's acknowledge state;
- alarm's description text;

shall be set according to Table 2.

The "alarm condition" field shall be set to "A" when the alarm condition threshold is exceeded, and "V" when the alarm condition returns to a level that does not exceed the threshold. During healthy conditions (no alarm condition) an empty ALR sentence shall be sent at one-minute intervals.

The acknowledged state flag shall be set after acknowledgement of an alarm internally by means of the MKD or externally by a corresponding ACK sentence.

The local alarm identifiers (alarm ID) given in Table 2 are defined for the use with formatters ALR, ACK, and as text identifiers in TXT sentences to link associated messages. ALR-sentences with "alarm numbers" greater than 099 cannot be followed by TXT-sentences containing additional information by using the TXT-sentence's "text identifier". The "text identifier" is limited to the range of 01 to 99.

Additional numbers may be used by the manufacturer for other purposes but shall be in the range 051 to 099.

6.10.2.2 Monitoring of functions and integrity

In case a failure is detected in one or more of the following functions or data, an alarm shall be triggered and the system shall react as given in Table 2.

Table 2 – Classification of alerts

Alert title (16 char)	Alert description text	Alert priority	Alert category	Escalation	Alert ALR ID	BAM Alert ID	Reaction of the system to the alert condition threshold exceeded
AIS:Tx fail	AIS: Tx malfunction	W	B	A	001	-	Stop transmission
AIS:Ant VSWR	AIS: Antenna VSWR exceeds limit	W	B	W	002	-	Continue operation
AIS:Rx 1 fail	AIS: Rx channel 1 malfunction	W	B	A	003	-	Stop transmission on affected channel
AIS:Rx 2 fail	AIS: Rx channel 2 malfunction	W	B	A	004	-	Stop transmission on affected channel
AIS:Rx 70 fail	AIS: Rx channel 70 malfunction	C	B	-	005	-	Continue operation
AIS:Gen fail	AIS: general failure	W	B	A	006	-	Stop transmission
AIS:No sync	AIS: UTC sync invalid	C	B	-	007	-	Continue operation using indirect or semaphore synchronisation
AIS:MKD fail	AIS: MKD connection lost	C	B	-	008	-	Continue operation with "DTE" set to "1" _a
AIS:Pos mismatch	AIS: internal/external GNSS position mismatch	C	B	-	009	-	Continue operation
AIS:NavStatus	AIS: NavStatus incorrect	C	B	-	010	-	Continue operation
AIS:HDG offset	Heading sensor offset	C	B	-	011	-	Continue operation
AIS:Active SART	AIS: active AIS-SART	W	B	A	014	-	Continue operation
AIS:Active MOB	AIS: active MOB-AIS	W	B	A	015	-	Continue operation
AIS:Active EPIRB	AIS: active EPIRB-AIS	W	B	A	016	-	Continue operation

Alert title (16 char)	Alert description text	Alert priority	Alert category	Escalation	Alert ALR ID	BAM Alert ID	Reaction of the system to the alert condition threshold exceeded
AIS:No ext EPFS	AIS: external EPFS lost	C	B	-	025	-	Continue operation (refer to IEC 61993-2 Ed.2 Table 4)
AIS:No position	AIS: no position sensor in use	W	B	A	026	-	Continue operation (refer to IEC 61993-2 Ed.2 Table 4, priority 6)
AIS:No SOG	AIS: no valid SOG information	W	B	W	029	-	Continue operation using default data
AIS:No COG	AIS: no valid COG information	W	B	W	030	-	Continue operation using default data
AIS:No HDG	AIS: Heading lost/invalid	C	B	-	032	-	Continue operation using default data _b
AIS:No ROT	AIS: no valid ROT information	C	B	-	035	-	Continue operation using default data _b
C: Caution, W: Warning, A: Alarm a Applicable if MKD is only means of display. b When so configured.							

Alert priority, category, escalation and BAM alert ID are defined for future use.

Alert ALR ID 001 shall be activated when

- the integrity of the VDL would be degraded by incorrect transmitter behaviour (for instance in case of the Tx shutdown procedure has operated),
- the unit is not able to transmit for technical reasons or missing or invalid MMSI.

Alert ALR ID 11 shall be activated when SOG is greater than 5 kn and the difference between COG and HDT is greater than 45° for 5 min.

6.10.2.3 Alarm relay output

A normally closed (NC) earth free relay contact shall be provided as an independent and simple method for triggering an external alarm.

The alarm relay shall be “active” in case of power “off”.

The alarm relay shall be deactivated upon acknowledgement of an alarm either internally by means of minimum display and keyboard or externally by a corresponding ACK sentence.

6.10.3 Status messages

6.10.3.1 General

If any significant change in system operation occurs, but overall system operation is not affected, an indication is initiated. A TXT-sentence is used to indicate when such a significant change in system operation occurs.

6.10.3.2 Using the TXT formatter

Status messages shall be IEC 61162-1 compliant “\$AITXT”-sentences on the presentation interface output port. Status messages do not activate the alarm relay and do not require an acknowledgement.

The parameters of this sentence formatter

- Text identifier, and

- Text message

shall be set according to Table 3.

It shall be possible to monitor the current sensor status by means of a query sentence \$xxAIQ,TXT.

6.10.3.3 Channel management parameters changed

The TXT-sentence, Text Identifier 036, shall be followed by the appropriate ACA sentence(s) to report the affected AIS conditions.

The TXT and ACA sentence pair shall be transmitted only once when crossing the boundary of the region, when the parameters in use are changed by a new command.

6.10.3.4 Monitoring sensor data status

Indications shall be given and the system shall react as given in Table 3.

Table 3 – Sensor status indications signalled using TXT sentence formatter

Text Message	Text Identifier	Reaction of the system
AIS: external DGNSS in use	021	Continue operation
AIS: external GNSS in use	022	Continue operation
AIS: internal DGNSS in use (beacon)	023	Continue operation
AIS: internal DGNSS in use (Message 17)	024	Continue operation
AIS: internal GNSS in use	025	Continue operation
AIS: external SOG/ COG in use	027	Continue operation
AIS: internal SOG/ COG in use	028	Continue operation
AIS: Heading valid	031	Continue operation
AIS: Rate of Turn Indicator in use	033	Continue operation
AIS: Other ROT source in use	034	Continue operation
AIS: Channel management parameters changed	036	Continue operation
AIS : Low power tanker mode active	037	Continue operation
AIS: Low power tanker mode inactive	038	Continue operation

6.10.3.5 Position sensor fallback conditions

Priorities and affected position report data shall be as in Table 4.

Table 4 – Position sensor fallback conditions

Priority	Affected data in Message 1, 2, 3 ⇒				
	Position Sensor status	Position accuracy flag	Time stamp	RAIM flag	Position Latitude/Longitude
1	External DGNSS in use (corrected) ^a	1	UTC-s	1/ 0 *	Lat/Lon (external)
2	Internal DGNSS in use (corrected; Message 17)	1	UTC-s	1/ 0 *	Lat/Lon (internal)
3	Internal DGNSS in use (corrected; beacon) ^b	1	UTC-s	1/ 0 *	Lat/Lon (internal)
4	External EPFS in use (uncorrected) ^a	0	UTC-s	1/ 0 *	Lat/Lon (external)
5	Internal GNSS in use (uncorrected)	0	UTC-s	1/ 0 *	Lat/Lon (internal)
6	Dead reckoning position (from the external EPFS in use)	0	62	0	Lat/Lon (dead-reckon)

	Manual position input (from the external EPFS in use)		61		Lat/Lon (manual)
	No position		63		not available = 91/181
^a Applicable in all configurations (minimum requirement). ^b Applicable only if (optionally) an internal beacon receiver is provided. * if RAIM available “1”; if not, default “0”.					

The AIS shall automatically select the position source with the highest priority available. If data availability changes, the AIS shall automatically switch to the position source with the highest priority available after 5 s when switching downwards or 30 s when switching upwards. During this period, the latest valid position shall be used for reporting.

When the external position source is used and both external and internal positions are valid then the external and internal positions shall be compared once per minute and an alarm generated if the difference between the two positions is greater than 100 m + distance between the two GNSS antennas, for a period of 15 min.

If the valid position does not have a timestamp (time stamp not available = 60) transmit the position report with time stamp set to 60.

On changeover from one status to another a new Message 5 shall be transmitted immediately when the reference point for the reported position has changed and an “ALR” sentence as described above shall be output to the presentation interface.

If RAIM is available (indicated by a valid GBS sentence or equivalent information), the position accuracy flag shall be evaluated using Table 5.

Table 5 – Use of accuracy (PA) flag

Accuracy status from RAIM (for 95 % of position fixes)	RAIM flag	Differential correction status	Resulting value of position accuracy (PA) flag
No RAIM process available	0	Uncorrected	0 = low (> 10 m)
Expected error is < =10 m	1		1 = high (< =10 m)
Expected error is > 10 m	1		0 = low (> 10 m)
No RAIM process available	0	Corrected	1 = high (< =10 m)
Expected error is < =10 m	1		1 = high (< =10 m)
Expected error is > 10 m	1		0 = low (> 10 m)

The connected GNSS receiver indicates the availability of a RAIM process by a valid GBS sentence of IEC 61162-1. In this case the RAIM-flag shall be set to “1”. The position accuracy threshold for evaluation of the RAIM information is 10 m. The RAIM expected error is calculated based on the GBS parameters “expected error in latitude” and “expected error in longitude” using the following formula:

$$\text{Expected RAIM error} = \sqrt{(\text{expected error in latitude})^2 + (\text{expected error in longitude})^2}$$

The mode indicator in the position sentences of IEC 61162-1 received from the connected position sensor indicates the correction status.

6.10.3.6 SOG/COG sensor fallback conditions

SOG/COG information from the internal GNSS receiver shall be used, if this internal GNSS receiver is in use as a position source. This is to avoid transmission of information referenced to different points on the ship.

6.10.3.7 ROT sensor fallback conditions

The AIS shall automatically select the ROT source with the highest priority available as given in Table 6.

ROT data shall not be derived from COG information.

Table 6 – ROT sensor fallback conditions

Affected data in Message 1, 2, 3 ⇒		
Priority	Position sensor status	Contents of ROT field
1	Rate of turn indicator in use ^a	0...+126 = turning right at up to 708°/min or higher; 0...-126 = turning left at up to 708°/min or higher. Values between 0° and 708°/min shall be coded by $ROT_{AIS} = 4,733 \text{ SQRT}(ROT_{sensor})^{\circ}/\text{min}$ where ROT_{sensor} is the rate of turn as input by the external rate of turn indicator (TI). Values of 709°/min and above shall be cut to 708°/min
2	Other ROT source in use ^b	+127 = turning right at more than 5°/30 s (No TI available) -127 = turning Left at more than 5°/30 s (No TI available)
3	No valid ROT information available	-128 (80 hex) indicates no turn information available (default)
^a Rate of turn indicator according to IMO A.526(13); determined by talker ID.		
^b i.e. based on HDG information.		

6.11 Display, input and output

(See 14.7)

6.11.1 Minimum keyboard and display (MKD)

The MKD is an essential part of the AIS and it may be remote. If the MKD is remote then a facility shall be provided to ensure the integrity of the link using a HBT sentence.

The MKD is a display and manual input device to allow the following functions.

- Manual input of voyage related and static ship data and safety related messages, control of AIS and data selection. The method of entering the navigational status and voyage related data shall be readily available to the operator. It shall not be possible to input the Navigational status 14 by the Class A AIS station. It shall be possible to enter all other navigational statuses including those undefined or reserved for future use.
- Display of own ship transmitted static, dynamic and voyage related data.
- Display a minimum of 200 targets.
- Display at least three (3) lines of target data. Each line to display at least name of station, time elapsed, bearing, range of the last position report received. Horizontal scrolling of bearing and range and time elapsed is not allowed. The title of display data shall be visible.
- Display of alarms and status information

By default the target list is auto-sorted in ascending range. All active locating devices shall be displayed in ascending range above other targets.

The time out value for target display, other than locating devices, shall be 7 min. For active locating device the time out value shall be 18 min. The time out value for storing the static target data shall be 18 min.

It may be possible to filter the presentation of AIS targets (for example, by target range, CPA/TCPA or AIS target class A/B, etc.). If additional filtering or grouping is supported the manufacturer should document this functionality as an option. If display equipment provides

facilities for the calculation of CPA/TCPA then the facilities should comply with the relevant Clauses of IEC 62388. If a filter is applied, then there shall be a clear and permanent or persistent indication for the application, as appropriate. The filter criteria in use shall be readily available to the user.

It shall not be possible to remove individual AIS targets from the presentation.

The active locating devices shall be displayed on the top of the target list. The testing (including type approval testing) of a locating device should not be displayed or output on the PI during normal operation; however the AIS should have the capability to display and output on the PI the locating devices in test mode during periodical testing of own ship's locating devices.

The active and testing locating devices are identified according to 7 to Table 9.

Table 7 – Identification of locating devices when active

	AIS-SART	MOB-AIS	EPIRB-AIS
Identity range	970010000 to 970999999	972010000 to 972999999	974010000 to 974999999
NavStatus of Message 1	14	14	14
Name in the target list	AIS SART	MOB AIS	EPIRB AIS
Alarm ID	014	015	016

Table 8 – Identification of locating devices when in test mode

	AIS-SART	MOB-AIS	EPIRB-AIS
Identity range	970010000 to 970999999	972010000 to 972999999	974010000 to 974999999
NavStatus of Message 1	15	15	15
Name in the target list	SART TEST	MOB TEST	EPIRB TEST

Table 9 – Identification of locating devices for type approval testing

	AIS-SART	MOB-AIS	EPIRB-AIS
Identity range	970000000 to 970009999	972000000 to 972009999	974000000 to 974009999
NavStatus and name in Message 1 is identical to 7 and Table 8.			

The DTE flag (refer to Recommendation ITU-R M.1371-5/A8-3.3) shall only be set to “1” when there is no means of displaying received text messages. External equipment indicates the availability of a remote MKD functionality by a HBT sentence sent every 30 s. If an SSD sentence is applied the DTE field should be evaluated together with the HBT sentence to define if the external equipment is able to display text messages.

Table 10 describes the messages or target information derived from received messages which should be displayed on the MKD:

Table 10 – Message display on MKD

Message type	Information content	Remark
All messages below	MMSI	
Message 1, 2, 3 Position report	Position (Lat, Lon, Range, Bearing) Time in minutes since last position report was received (0-19) The name of locating device shall show according to 7, Table 8 and Table 9 as appropriate, followed by the MMSI. PA-flag, RAIM, time stamp, description of position quality as derived from Table 11 Navigational status	In graphical display by position on the chart
Message 5 Static data	Name of ship	
Message 4 Base station report	Position (Lat, Lon, Range, Bearing) Time in minutes since last position report was received Name shall show "BS:MMSI" unless the name is derived from a Message 24a PA-flag, RAIM, description of position quality as derived from Table 11	In graphical display by position on the chart
Message 9 SAR aircraft position report	Position (Lat, Lon, Range, Bearing, Altitude) Time in minutes since last position report was received Name shall show "SAR:MMSI" unless the name is derived from a Message 24a or Message 5 PA-flag, RAIM, time stamp, description of position quality as derived from Table 11	In graphical display by position on the chart. The range to SAR air craft should be by 2-dimensional calculation.
Message 11	The result of the communication test should be displayed.	The indication of the result should be automatically removed not later than 30 s
Message 12, 14 Safety related text message	Text content	
Message 18, 19	Position (Lat, Lon, Range, Bearing) Time in minutes since last position report was received PA-flag, RAIM, time stamp, description of position quality as derived from Table 11	In graphical display by position on the chart Maybe filtered in or out (and filtering indicated)
Message 19, 24a Class B position and static report	Name of ship	
Message 21 Aid to navigation report	Name of Aids to Navigation Time in minutes since last position report was received Position (Lat, Lon, Range, Bearing) PA-flag, RAIM, time stamp, description of position quality as derived from Table 11 Off-position flag Type of AtoN (IALA table) Virtual AtoN flag	Name plus indication it is an AtoN In graphical display by position on the chart

Table 11 – Position quality

Description	Criteria
No position	Latitude = 91° or longitude = 181° or time stamp = 63
Manual position	Time stamp = 61
Dead reckoning position	Time stamp = 62
Outdated position > 200 m	Predicted distance (from SOG and time elapsed) > 200 m
Position > 10 m	PA = 0 and RAIM = 0
Position with RAIM > 10 m	PA = 0 and RAIM = 1
Position < 10 m	PA = 1 and RAIM = 0
Position with RAIM < 10 m	PA = 1 and RAIM = 1
Valid position with no time stamp	Time stamp = 60
NOTE Detailed information about the Quality of Position is displayed in a sub-page.	

6.11.2 Communication test

The AIS shall have a means of testing communication over the VDL by transmitting an addressed Message 10 and verifying the response of the addressed station, Message 11.

It shall be possible to initiate the communication test manually by MKD. The MKD shall propose a target and allow the user to confirm this target or select an alternate Class A target. A different target shall be suggested if the test fails.

It shall also be possible to initiate the communication test via the presentation interface input using an AIR sentence (indicating Message 11 in the "Message ID" field). In response to the AIR sentence the AIS unit shall transmit a Message 10.

Upon reception of a Message 10 the AIS unit shall respond with a Message 11.

The result of the communication test shall be displayed. The operation manual shall provide guidance on use of this feature such that the selected addressed target is at a suitable range for example between 15 NM and 25 NM.

6.11.3 Alarms and status information

6.11.3.1 Alarms

The following alarms shall be indicated and displayed on request:

- as a result of the built-in integrity test (BIIT see 6.10.1 and Annex D);
- reception of Message 1 NavStatus 14. Once acknowledged for a given User ID the relay will not be activated and the ALR will indicate acknowledge. The acknowledgement shall stay in effect until it is removed from the target list due to time out.

A means to acknowledge alarms shall be provided.

6.11.3.2 Status information

The following status information shall be indicated and the information contents displayed on request:

- indications as a result of the built-in integrity test (BIIT see 6.10.1);
- sensor status information as provided by the TXT and ALR sentences;
- received safety related Message 14;
- received long-range interrogations;
- manual confirmation of long-range interrogation if in manual mode.

6.11.3.3 Indication, display and storage of received Message 12 and Message 14

All Messages 12 shall be displayed and cleared by the user individually. The most recent Message 12 not yet cleared shall be displayed foremost in the message queue.

At least the last 20 received safety related messages shall be available for display on request. In addition the user may select up to 20 messages that may be retained and displayed on request until deleted or until power is cycled.

6.11.4 Data protection

The following data shall be protected from unauthorised modification either by MKD or PI-sentences (for example by password):

- MMSI;
- Call sign;
- Name of ship;
- IMO number;
- Dimension/Reference for position;
- Type of ship on MKD only (type of cargo should not be protected);
- Interface configuration;
- Password(s);
- Message 27 tx channels.

Other data, if protected, should not be protected by the same password level.

6.11.5 If the EPV or SSD configuration sentences are used, a preceding valid SPW sentence shall provide authorization.Distance calculation

The AIS shall use the equations in Annex E to calculate all distances including range to other AIS stations and regional areas.

6.12 Protection from invalid controls

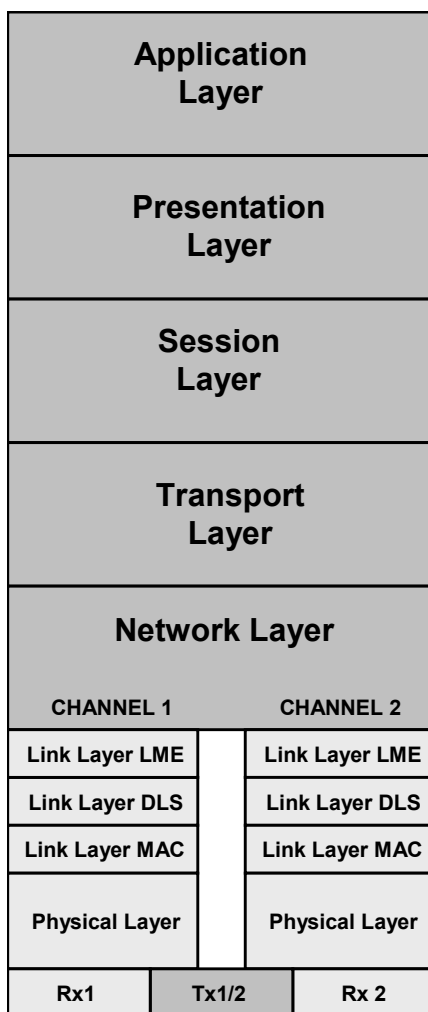
The AIS shall not accept the control commands sent from stations with invalid base station MMSI. Before accepting and processing the Messages 4, 16, 17, 20, 22 and 23, the AIS shall check the MMSI of the transmitting station. A valid base station MMSI is defined as "00xyyyyy" where x is between 2 and 7. The unit shall only accept and process received commands with a valid base station MMSI. See Annex C.

7 Technical requirements

7.1 General

(M.1371-5/A2-1.1) *This clause covers layers 1 to 4 (Physical Layer, Link Layer, Network Layer, Transport Layer) of the Open System Interconnection (OSI) model.*

Figure 1 illustrates the layer model of an AIS station (Physical Layer to Transport Layer) and the layers of the applications (Session Layer to Application Layer).



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Figure 1 – OSI layer model

7.2 Physical layer

(See Clause 15)

7.2.1 General

(M.1371-5/A2-2) *The Physical layer is responsible for the transfer of a bit-stream from an originator out, on to the data link.*

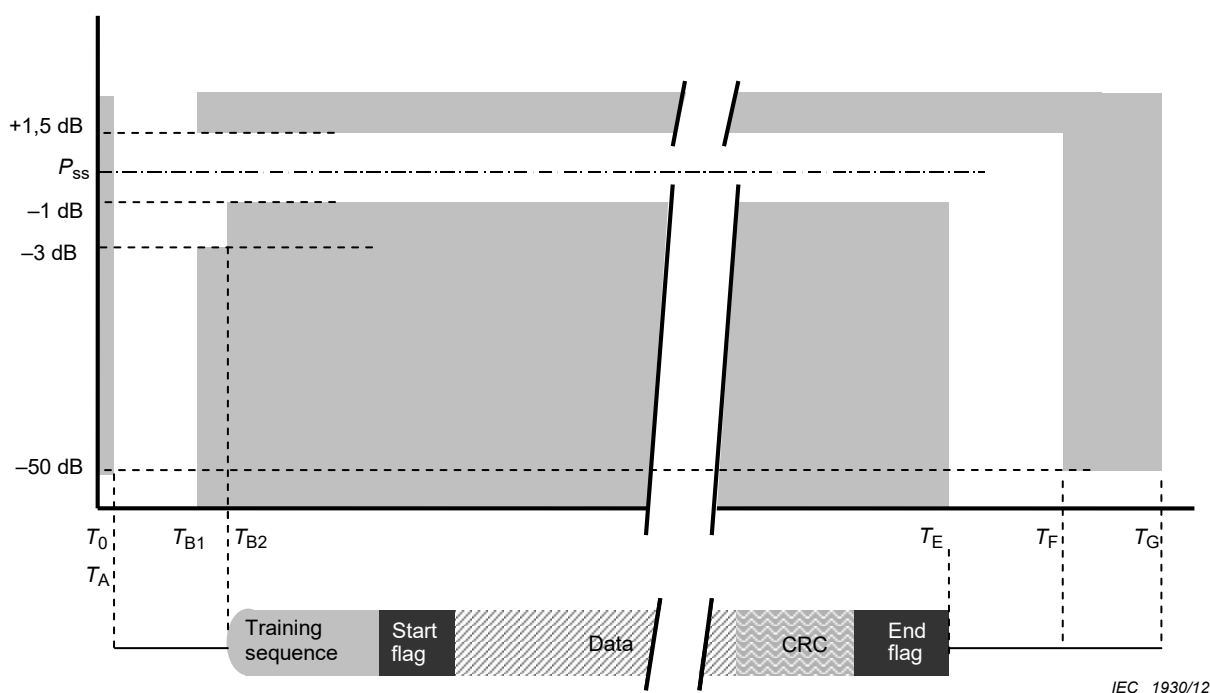
The Physical layer shall be designed in accordance with Recommendation ITU-R M.1371-5/A2-2.

7.2.2 Transmitter parameters

Transmitter parameters shall be as given in Table 12.

Table 12 – Transmitter parameters

Transmitter parameters	Requirement	Condition
Frequency error	± 500 Hz normal $\pm 1\,000$ Hz extreme	
Carrier power (P_{SS})	41 dBm high power setting 30 dBm low power setting	$\pm 1,5$ dB normal and ± 3 dB extreme, conducted
Modulation spectrum	-25 dBc -70 dBc slotted transmission	$\Delta f_c < \pm 10$ kHz ± 25 kHz $< \Delta f_c < \pm 62,5$ kHz
Modulation accuracy	1 740 $\pm$ 175 Hz normal ± 350 Hz extreme 2 400 $\pm$ 240 Hz normal ± 480 Hz extreme	Test signal 0101... Test signal 00001111...
Power versus time characteristics	Transmission delay: 0 s Ramp up time: 833 μ s Ramp down time: 833 μ s Transmission duration: $\leq 26\,624$ μ s	See Figure 2 and Table 13 Nominal 1 time slot transmission
Spurious emissions	-36 dBm -30 dBm	9 kHz ... 1 GHz 1 GHz ... 4 GHz



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Figure 2 – Power versus time characteristics

Table 13 – Power versus time characteristics

Reference		Bit	Time	Definition
T_0		0	0 ms	Start of transmission slot. Power shall NOT exceed –50 dBc (ref. P_{ss}) before T_0
T_A		0 to 6	0 to 0,625 ms	Power exceeds –50 dB of P_{ss}
T_B	T_{B1}	6	0,625 ms	Power shall be within +1,5 or –3 dB of P_{ss}
	T_{B2}	8	0,833 ms	Power shall be within +1,5 or –1 dB of P_{ss} ; (Start of training sequence)
T_E (includes 1 stuffing bit)		233	24,271ms	Power shall remain within +1,5 or –1 dB of P_{ss} during the period T_{B2} to T_E
T_F (includes 1 stuffing bit)		241	25,104 ms	Power shall be –50 dBc (ref. P_{ss} a) and stay below this
T_G		256	26,667 ms	Start of next transmission time period

7.2.3 Receiver parameters

Receiver parameters shall be as given in Table 14.

Table 14 – Receiver parameters

Receiver parameters	Requirement		
	Result in PER	Wanted signal	Unwanted signal(s)
Sensitivity	20 %	–107 dBm normal –104 dBm normal at ± 500 Hz offset –101 dBm extreme	
Error at high input levels	1 %	–7 dBm and –77 dBm	–
Co-channel rejection	20 %	–104 dBm –104 dBm	–114 dBm nominal –114 dBm at ± 1 kHz offset
Adjacent channel selectivity	20 %	–104 dBm –98 dBm extreme	–34 dBm normal –38 dBm extreme
Spurious response rejection	20 %	–104 dBm	–34 dBm
Intermodulation response rejection and blocking	20 %	–101 dBm	–27 dBm (< 5 MHz) –15 dBm (> 5 MHz)
Spurious emissions	–57 dBm –47 dBm	9 kHz ... 1 GHz 1 GHz ... 4 GHz	

7.3 Link layer

(See Clause 16)

7.3.1 General

(M.1371-5/A2-3) *The Link layer specifies how data shall be packaged in order to apply error detection and correction to the data transfer. The Link layer is divided into three (3) sublayers.*

7.3.2 Link sublayer 1: Medium Access Control (MAC)

(M.1371-5/A2-3.1) *The MAC sublayer provides a method for granting access to the data transfer medium, i.e. the VHF data link. The method used shall be a Time Division Multiple Access (TDMA) scheme using a common time reference.*

The Medium Access Control sublayer shall be designed in accordance with Recommendation ITU-R M.1371-5/A2-3.1.

7.3.3 Link sublayer 2: Data Link Service (DLS)

(M.1371-5/A2-3.2) The DLS sublayer provides methods for:

- 1) *data link activation and release;*
- 2) *data transfer; or*
- 3) *error detection and control.*

The Data Link Service sublayer shall be designed in accordance with Recommendation ITU-R M.1371-5/A2-3.2.

Repeated messages and Class B CS messages shall not be used in the indirect synchronisation process.

7.3.4 Link sublayer 3 – Link Management Entity (LME)

7.3.4.1 General

(M.1371-5/A2-3.3) *The LME controls the operation of the DLS, MAC and the physical layer.*

The Link Management Entity sublayer shall be designed in accordance with Recommendation ITU-R M.1371-5/A2-3.3.

Link sublayer 3 includes definition of VDL-messages. Table 15 shows the VDL messages that shall be used by a Class A shipborne mobile AIS device.

Table 15 – Use of VDL messages

Msg. No.	Name of message	M.1371-5 Ref.	R/P	O	T	Remark
0	Undefined	None	Yes	Yes	No	Reserved for future use
1	Position report (scheduled)	A8-3.1	Yes	Yes	Yes	For a locating device according to Table 8, the Message 1 should only be sent to the PI in special locating device test mode
2	Position report (assigned)	A8-3.1	Yes	Yes	Yes	
3	Position report (when interrogated)	A8-3.1	Yes	Yes	Yes	
4	Base station report	A8-3.2	Yes (5)	Yes	No	
5	Static and voyage related data	A8-3.3	Yes	Yes	Yes	
6	Addressed binary message	A8-3.4	Yes	Yes (1)	Yes	(1) Only if addressed to own station
7	Binary acknowledge	A8-3.5	Yes	INF (2)	Yes	(2) An ABK PI message shall be sent to the PI in any case
8	Binary broadcast message	A8-3.6	Yes	Yes	Yes	
9	Standard SAR aircraft position report	A8-3.7	Yes	Yes	No	
10	UTC and date inquiry	A8-3.8	Yes	INF	Yes	
11	UTC/ date response	A8-3.9	Yes	INF	Yes	
12	Addressed safety related message	A8-3.10	Yes	Yes (3)	Yes	(3) Only if addressed to own station