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Entwurf

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**Navigations- und Funkkommunikationsgeräte und -systeme für die Seeschifffahrt –
Geräte der Klasse B des automatischen Identifikationssystems (AIS) für Schiffe –
Teil 1: Zeitmultiplex-Vielfachzugriffstechniken mit Aktivitätserkennung (CSTDMA)
(IEC 80/793/CDV:2016);
Englische Fassung FprEN 62287-1:2016**

Maritime navigation and radiocommunication equipment and systems –
Class B shipborne equipment of the Automatic Identification System (AIS) –
Part 1: Carrier-sense time division multiple access (CSTDMA) technique
(IEC 80/793/CDV:2016);
English version FprEN 62287-1:2016

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

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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 99 Seiten

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Nationales Vorwort

Die Englische Fassung des europäischen Dokuments FprEN 62287-1:2016 „Navigations- und Funkkommunikationsgeräte und -systeme für die Seeschifffahrt – Geräte der Klasse B des automatischen Identifikationssystems (AIS) für Schiffe – Teil 1: Zeitmultiplex-Vielfachzugriffstechniken mit Aktivitätserkennung (CSTDMA)“ (Entwurf in der Umfrage) ist unverändert in diesen Norm-Entwurf übernommen worden.

Die Internationale Elektrotechnische Kommission (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. Dem entsprechend ist das internationale Dokument IEC 80/793/CDV:2016 „Maritime navigation and radiocommunication equipment and systems – Class B shipborne equipment of the Automatic Identification System (AIS) – Part 1: Carrier-sense time division multiple access (CSTDMA) technique“ unverändert in den Entwurf Englische Fassung FprEN 62287-1:2016 übernommen worden.

Das internationale Dokument wurde vom TC 80 „Maritime navigation and radiocommunication equipment and systems“ der Internationalen Elektrotechnischen Kommission (IEC) erarbeitet.

Bei der Abstimmung zu dem Europäischen Schluss-Entwurf bei CENELEC und dem Internationalen Schluss-Entwurf bei IEC [Final Draft International Standard (FDIS)] sind jeweils nur „JA/NEIN“-Entscheidungen möglich, wobei „NEIN“-Entscheidungen fundiert begründet werden müssen. Dokumente, die bei CENELEC als Europäische Norm angenommen und ratifiziert werden, sind unverändert als Deutsche Normen zu übernehmen.

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Da sich die Benutzer der vorliegenden Norm der englischen Sprache als Fachsprache bedienen, wird die Englische Fassung der FprEN 62287-1 veröffentlicht. Zu deren Abschnitt 1, der den Anwendungsbereich festlegt, und Abschnitt 3, der die Begriffe festlegt, wurde eine Übersetzung angefertigt und als Nationaler Anhang NA des vorliegenden Normentwurfs hinzugefügt. Für einige 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.

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Änderungen

Gegenüber DIN EN 62287-1:2011-08 und DIN EN 62287-1/A1:2014-10 wurden folgende Änderungen vorgenommen:

- a) Ausgabe stellt eine technische Überarbeitung dar;
- b) die direkte Synchronisation zu einer internen UTC-Quelle wird als Synchronisationsverfahren ergänzt.

Nationaler Anhang NA (informativ)

Auszugsweise Übersetzung^{N1)}

1 Anwendungsbereich

Dieser Teil der Internationalen Norm IEC 62287 legt die Mindest-Betriebs- und Leistungsanforderungen, die Prüfverfahren und geforderten Prüfergebnisse für AIS-Geräte der Klasse B mit CSTDMA-Technik auf Schiffen fest. Diese Norm berücksichtigt andere zugehörige Internationale Normen von IEC und anwendbare bestehende nationale Normen.

Die Norm ist anwendbar für AIS-Geräte, die auf Schiffen genutzt werden, für die nach SOLAS Kapitel V keine Verpflichtung zum Einsatz von AIS besteht.

Eine AIS-Station, die nur für den Empfangsbetrieb vorgesehen ist, fällt nicht unter mobile AIS-Station der Klasse B für Schiffe.

3 Abkürzungen

AIS	automatisches Identifikationssystem (en: Automatic Identification System)
BER	Bitfehlerrate (en: Bit Error Rate)
BT	Zeit-Bandbreite-Produkt (en: Bandwidth Time product)
COG	Fahrtrichtung über Grund (en: Course Over Ground)
CP	in Betracht gezogener Sendezeitschlitz (en: Candidate Period)
CPU	zentrale Verarbeitungseinheit (en: Central Processing Unit)
CRC	zyklische Redundanzprüfung (en: Cyclic Redundancy Check)
CS	Empfangspegel-Überprüfung (en: Carrier-Sense)
CSTDMA	Zeitmultiplexverfahren mit Träger Wahrnehmung (en: Carrier-Sense Time Division Multiple Access)
DGNSS	differentielles globales Satellitennavigationssystem (en: Differential Global Navigation Satellite System)
DLS	Daten-Verbindungsdienst (en: Data Link Service)
DSC	digitaler Selektivruf (en: Digital Selective Calling)
ECDIS	Anzeige- und Informationssystem für elektronische Seekarten (en: Electronic Chart Display and Information System)
EPFS	elektronisches Positionsbestimmungssystem (en: Electronic Position Fixing System)
ETA	geschätzte Ankunftszeit (en: Estimated Time of Arrival)
EUT	Gerät im Test (en: Equipment Under Test)
FCS	Prüfsumme (en: Frame Check Sequence)
FM	Frequenzmodulation (en: Frequency Modulation)
GMSK	Gaußsche Modulation mit minimaler Bandbreite (en: Gaussian Minimum Shift Keying)
GNSS	globales Satellitennavigationssystem (en: Global Navigation Satellite System)
HDG	Schiffsausrichtung (en: Heading)

^{N1)} Nationale Fußnote: Die Nummerierung aus IEC 80/793/CDV:2016-04 wurde beibehalten.

HDLC	bitorientiertes synchrones Datenübertragungsprotokoll HDLC (en: High level Data Link Control)
HSC	Hochgeschwindigkeitsfahrzeug (en: High Speed Craft)
IHO	Internationale Hydrografische Organisation (en: International Hydrographic Office)
IMO	Internationale Seeschiffahrtsorganisation (en: International Maritime Organization)
Lat	geografische Breite (en: Latitude)
LME	Verbindungsverwaltungseinrichtung (en: Link Management Entity)
Lon	geografische Länge (en: Longitude)
LR	Langstrecke (en: Long Range)
MAC	Medienzugriffssteuerung (en: Medium Access Control)
MMSI	Rufnummer des mobilen Seefunkdienstes (en: Maritime Mobile Service Identity)
NM	Seemeile oder Nautische Meile (en: Nautical Miles (1 NM = 1 852 m))
NRZI	NRZI-Übertragungskodierung (en: Non Return to Zero Inverted)
NTT	Soll-Übertragungszeit (en: Nominal Transmission Time)
NUC	manövrierunfähig (en: Not Under Command)
OSI	Verbindungsmodell für Offene Systeme (en: Open System Interconnection model)
P _{ss}	HF-Dauerausgangsleistung (en: Steady state RF output power)
PER	Paketfehlerrate (en: Packet Error Rate)
PI	Präsentationsschnittstelle (en: Presentation Interface)
PRS	pseudo-zufällige Folge (en: Pseudo Random Sequence)
RAIM	unabhängige Integritätsprüfung im GNSS-Empfänger (en: Receiver Autonomous Integrity Monitoring)
RF	Funkfrequenz (en: Radio Frequency)
RI	Berichtsintervall (en: Reporting Interval)
Rx	Empfang (en: Receive)
SINAD	Verhältnis der Gesamtsignalleistung zur Summe der Störsignale (en: Signal Interference Noise and Distortion ratio)
SOG	Geschwindigkeit über Grund (en: Speed Over Ground)
SOLAS	Internationales Übereinkommen zum Schutz menschlichen Lebens auf See (en: International Convention for the Safety Of Life At Sea)
TDMA	Zeitmehrfachzugriff (en: Time Division Multiple Access)
TI	Sendeintervall (en: Transmission Interval)
Tx	Senden (en: Transmit)
UTC	Koordinierte Weltzeit (en: Universal Time Co-ordinated)
VDL	VHF-Datenverbindung (en: VHF Data Link)
VHF	Ultrakurzwelle (en: Very High Frequency)
VSWR	Stehwellenverhältnis (en: Voltage Standing Wave Ratio)
VTS	Schiffsverkehrsdienste (en: Vessel Traffic Services)

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

**MARITIME NAVIGATION AND RADIOCOMMUNICATION
EQUIPMENT AND SYSTEMS –
CLASS B SHIPBORNE EQUIPMENT OF
THE AUTOMATIC IDENTIFICATION SYSTEM (AIS) –****Part 1: Carrier-sense time division multiple access
(CSTDMA) techniques**

FOREWORD

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International Standard IEC 62287-1 has been prepared by IEC technical committee 80: Maritime navigation and radiocommunication equipment and systems.

This third edition of IEC 62287-1 cancels and replaces the second edition published in 2010 together with its amendment 1 published in 2013, of which it constitutes a technical revision.

This significant change in this edition is in the synchronisation method where direct synchronisation from an internal UTC source is now permitted.

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

FDIS	Report on voting
80/XX/FDIS	80/XX/RVD

293
294 Full information on the voting for the approval of this standard can be found in the report on
295 voting indicated in the above table.

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

297 A list of all parts of the IEC 62287 series published under the general title *Maritime navigation*
298 *and radiocommunication equipment and systems – Class B shipborne equipment of the*
299 *automatic identification system (AIS)*, can be found on the IEC website.

300 The committee has decided that the contents of the base publication and its amendment will
301 remain unchanged until the stability date indicated on the IEC web site under
302 "http://webstore.iec.ch" in the data related to the specific publication. At this date, the
303 publication will be

- 304 • reconfirmed,
- 305 • withdrawn,
- 306 • replaced by a revised edition, or
- 307 • amended.

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

309

310 The National Committees are requested to note that for this publication the stability date
311 is 2023.

312 THIS TEXT IS INCLUDED FOR THE INFORMATION OF THE NATIONAL COMMITTEES AND WILL BE
313 DELETED AT THE PUBLICATION STAGE.

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**MARITIME NAVIGATION AND RADIOCOMMUNICATION
EQUIPMENT AND SYSTEMS –
CLASS B SHIPBORNE EQUIPMENT OF
THE AUTOMATIC IDENTIFICATION SYSTEM (AIS) –
Part 1: Carrier-sense time division multiple access
(CSTDMA) techniques**

1 Scope

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

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

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

2 Normative references

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

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

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

IEC 62320-1, *Maritime navigation and radiocommunication equipment and systems – Automatic identification systems (AIS) – Part 1: AIS Base Stations – Minimum operational and performance requirements, methods of testing and required test results*

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

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

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

359 ITU-R Recommendation M.1371-5, *Technical characteristics for a universal shipborne*
360 *automatic identification system using time division multiple access in the VHF maritime mobile*
361 *band*

362 ITU Radio Regulations, Appendix 18, <http://www.itu.int/publ/R-REG-RR/en>

363

364 **3 Abbreviations**

365	AIS	Automatic Identification System
366	BER	Bit Error Rate
367	BT	Bandwidth Time product
368	COG	Course Over Ground
369	CP	Candidate Period
370	CPU	Central Processing Unit
371	CRC	Cyclic Redundancy Check
372	CS	Carrier-Sense
373	CSTDMA	Carrier-Sense Time Division Multiple Access
374	DGNSS	Differential Global Navigation Satellite System
375	DLS	Data Link Service
376	DSC	Digital Selective Calling
377	ECDIS	Electronic Chart Display and Information System
378	EPFS	Electronic Position Fixing System
379	ETA	Estimated Time of Arrival
380	EUT	Equipment Under Test
381	FCS	Frame Check Sequence
382	FM	Frequency Modulation
383	GMSK	Gaussian Minimum Shift Keying
384	GNSS	Global Navigation Satellite System
385	HDG	Heading
386	HDLC	High level Data Link Control
387	HSC	High Speed Craft
388	IHO	International Hydrographic Office
389	IMO	International Maritime Organization
390	Lat	Latitude
391	LME	Link Management Entity
392	Lon	Longitude
393	LR	Long Range
394	MAC	Medium Access Control
395	MMSI	Maritime Mobile Service Identity
396	NM	Nautical Miles (1 NM = 1 852 m)
397	NRZI	Non Return to Zero Inverted
398	NTT	Nominal Transmission Time

399	NUC	Not Under Command
400	OSI	Open System Interconnection model
401	P _{ss}	Steady state RF output power
402	PER	Packet Error Rate
403	PI	Presentation Interface
404	PRS	Pseudo Random Sequence
405	RAIM	Receiver Autonomous Integrity Monitoring
406	RF	Radio Frequency
407	RI	Reporting Interval
408	Rx	Receive
409	SINAD	Signal Interference Noise and Distortion ratio
410	SOG	Speed Over Ground
411	SOLAS	International Convention for the Safety Of Life At Sea
412	TDMA	Time Division Multiple Access
413	TI	Transmission Interval
414	Tx	Transmit
415	UTC	Universal Time Co-ordinated
416	VDL	VHF Data Link
417	VHF	Very High Frequency
418	VSWR	Voltage Standing Wave Ratio
419	VTS	Vessel Traffic Services

420 **4 General requirements**

421 **4.1 General**

422 **4.1.1 Capabilities of the Class B“CS” AIS**

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

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

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

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

436 The Class B“CS” AIS shall only transmit if it has verified that the time period intended for
 437 transmission does not interfere with transmissions made by AIS equipment defined in ITU-R
 438 M.1371-5 A1/2 (excluding Class B“CS”). Transmissions of the Class B“CS” AIS shall not
 439 exceed one nominal time period (except when responding to a base station with Message 19).

4.1.2 Quality assurance

(see 10.1.1)

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

NOTE The ISO 9000 series, as applicable, meets the requirements of a quality control system.

4.1.3 Safety of operation

(see 10.1.2)

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

4.1.4 Additional features

(see 10.1.3)

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

4.1.5 Modes of operation**4.1.5.1 General**

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

4.1.5.2 Autonomous and continuous mode

(see 10.2.1)

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

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

4.1.5.3 Assigned mode

(see 10.2.2)

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

474 4.1.5.4 Interrogation mode

475 (see 10.2.3)

476 A “polling” or “controlled” mode where the Class B“CS” AIS responds to interrogations by
477 Messages 18 and 24 from a Class A AIS, a SAR aircraft or a base station. A base station
478 interrogation for Message 19 specifying transmission offset shall also be answered. An
479 interrogation overrides a silent period defined by Message 23 (see 7.3.4.4.4).

480 NOTE Since Message 19 is a message occupying two time periods, this requires the reservation of the respective
481 time periods by Message 20 prior to interrogation.

482 A Class B“CS” AIS shall not interrogate other stations.

483 4.2 Manuals

484 The manuals shall include:

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

488 4.3 Marking and identification

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

- 492 • identification of the manufacturer;
- 493 • equipment type number or model identification;
- 494 • serial number of the unit;
- 495 • power supply requirements; and
- 496 • compass safe distance.

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

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

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

501 5 Environmental, power supply, interference and safety requirements

502 (see Clause 9)

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

- 505 • inter-unit connection (interfaces other than IEC 61162 are allowed; see 6.7.3);
- 506 • power supply;
- 507 • extreme power supply;
- 508 • excessive conditions;
- 509 • power supply short-term variation and power supply failure (the Class B“CS” AIS shall not
510 enter an undefined or unstable state in case of undervoltage);
- 511 • durability and resistance to environmental conditions;

- 512 • interference;
- 513 • electromagnetic compatibility;
- 514 • compass safe distance;
- 515 • safety precautions;
- 516 • protection against accidental access to dangerous voltages;
- 517 • electromagnetic radiofrequency radiation;
- 518 • X-radiation.

519 The manufacturer shall declare the category of the equipment as follows:

- 520 a) portable;
- 521 b) protected from the weather;
- 522 c) exposed to the weather;
- 523 d) submerged or in continuous contact with sea water.

524 **6 Performance requirements**

525 **6.1 Composition**

526 The B“CS” AIS shall comprise:

- 527 • a communication processor, capable of operating in a part of the VHF Maritime Mobile
528 Service band, in support of short range (VHF) applications;
- 529 • at least one transmitter and three receiving processes for TDMA and one for DSC on
530 channel 70. The DSC process may use the receiving resources on a time-share basis as
531 described in 7.2.2.7. Outside the DSC receiving periods, the two TDMA receiving
532 processes shall work independently and simultaneously on AIS channel A and channel B¹;
- 533 • a means for automatic channel switching in the maritime mobile band (by Message 22 and
534 DSC). Manual channel switching shall not be provided;
- 535 • an internal GNSS position sensor, which provides a resolution of one ten thousandth of a
536 minute of arc and uses the WGS-84 datum (see 6.3). The internal GNSS position sensor
537 may provide an optional internal UTC synchronisation source (see 7.3.2.2.1).

538 **6.2 Operating frequency channels**

539 (see 10.4)

540 The Class B“CS” AIS shall operate on the frequency channels with 25 kHz bandwidth at least
541 in the range from 161,500 MHz to 162,025 MHz of the ITU Radio Regulations Appendix 18
542 and in accordance with Recommendation ITU-R M.1084-4, Annex 4. The DSC receiving
543 process shall be tuned to channel 70.

544 The Class B“CS” AIS shall automatically revert to receive-only mode on the channels AIS 1
545 and AIS 2 when commanded to change to frequency channels outside its operating range
546 and/or bandwidth.

547 **6.3 GNSS receiver for position reporting**

548 (see 10.5, 10.6.1.3)

¹ In some regions, the competent authority may not require DSC functionality.

549 The Class B“CS” AIS shall have an internal GNSS receiver as a source for position, COG and
550 SOG.

551 The internal GNSS receiver shall meet the following requirements of a receiver as specified in
552 the IEC 61108 series:

- 553 • position accuracy; static and dynamic (5 s);
- 554 • COG/SOG accuracy;
- 555 • position update (5 s);
- 556 • interference susceptibility; and
- 557 • status indications (RAIM optional).

558 The internal GNSS receiver may be capable of being differentially corrected, for example by
559 evaluation of Message 17.

560 An input port for an external GNSS receiver may be provided. The data of an external GNSS
561 receiver shall only be used if:

- 562 • datum information is received which indicates that the WGS-84 datum is in use;
- 563 • RAIM information is received which indicates an expected error of less than 10 m in Lat or
564 Lon;
- 565 • internal position is available and the external position is within 26 m of the internal
566 position, and
- 567 • the input format complies with the IEC 61162 series including mode indicator and
568 checksum.

569 6.4 Identification

570 For the purpose of ship and message identification, the appropriate Maritime Mobile Service
571 Identity (MMSI) number shall be used. The unit shall only transmit if an MMSI has been
572 programmed (see 6.5.1.2).

573 The unit shall be supplied with a default MMSI of “000000000” that is not a valid MMSI.

574 The unit shall check that the programming MMSI is between 200000000 and 799999999,
575 otherwise the unit shall reject the programming and not be capable of transmitting.

576 6.5 AIS information

577 6.5.1 Information content

578 (see 10.6.1)

579 6.5.1.1 General

580 The information provided by the Class B“CS” AIS shall include the following.

581 6.5.1.2 Static

582 The list of static information includes:

- 583 • identification (MMSI);
- 584 • name of ship;
- 585 • type of ship;
- 586 • vendor ID (optional);

- 587 • call sign;
- 588 • dimensions of ship and reference for position.

589 The default value for type of ship shall be 37 (pleasure craft). Defaults for other static data
590 shall be chosen such that it is obvious that the equipment has been properly initialised, in
591 particular, the default MMSI shall be set to 000000000 and the equipment shall be designed
592 such that transmissions are inhibited with this default setting (see 6.7.2).

593 6.5.1.3 Dynamic

594 The list of dynamic information includes:

- 595 • ship's position with accuracy indication and integrity status
- 596 • time in UTC;

597 NOTE Date to be established by receiving equipment.

- 598 • course over ground (COG);
- 599 • speed over ground (SOG);
- 600 • true heading (optional).

601 6.5.1.4 Configuration information

602 The following information about configuration and options active in the specific unit shall be
603 provided:

- 604 • AIS Class B"CS" unit;
- 605 • availability of minimum keyboard/display facility;
- 606 • availability of DSC channel 70 receiver;
- 607 • ability to operate in the whole marine band or the upper 525 kHz part of the band (see
608 6.2);
- 609 • ability to process channel management Message 22.

610 6.5.1.5 Short safety-related messages

611 Short safety-related messages as described in ITU-R M.1371 (Message 14) shall not be
612 transmitted.

613 NOTE IMO COMSAR.1/Circ.46 of February 2009 advises that pre-configured safety-related messages should not
614 be incorporated in AIS equipment.

615 6.5.2 Information reporting intervals

616 (see 10.6.2)

617 The Class B"CS" AIS shall transmit position reports (Message 18) in reporting intervals of

- 618 • 30 s if SOG > 2 kn,
- 619 • 3 min if SOG ≤ 2 kn,

620 provided that transmission time periods are available. A command received by Message 23
621 shall override the reporting interval. A reporting interval of less than 5 s is not required.

622 Static data submessages 24A and 24B shall be transmitted every 6 min in addition to and
623 independent of the position report (see 7.4.2). Message 24B shall be transmitted within 1 min
624 following Message 24A.

6.5.3 Permissible initialisation period

(see 10.7)

The AIS shall start transmitting position reports within

- cold start: 30 min;
- warm start (if off for less than 1 h): 5 min;
- short signal loss (GNSS signal lost for less than 5 min): resume within a time of twice the reporting interval.

6.6 Alarms and indications, fall-back arrangements**6.6.1 Integrity and protection**

(see 10.8.1)

The Class B“CS” AIS shall be equipped with built-in integrity tests (BIIT). The BIIT 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 Class B“CS” AIS, a visual indication shall be given (for example a LED, see 6.7.1). This includes the detection of background noise above –77 dBm (see 7.3.2.4).

The Class B“CS” AIS installation, when operating, shall not be damaged by the effects of open-circuited or short-circuited antenna terminals.

6.6.2 Transmitter shutdown procedure

(see 10.8.3)

An automatic transmitter shutdown shall be provided in the case where a transmitter does not discontinue its transmission within 1 s of the end of its nominal transmission. This procedure shall be independent of the operating software.

6.6.3 Position sensor fallback conditions

(see 10.6.1.3, 10.8.4)

Priorities and affected position report data (refer to ITU-R M.1371-5 A8/3.16) shall be as indicated in Table 1.

653

Table 1 – Position sensor fallback conditions

Priority	Position sensor status		Affected data in Message 18			
			Position accuracy flag	Time stamp	RAIM-flag	Position Latitude/Longitude
1.	External DGNSS in use (corrected) ^a		1 ^d	UTC-s	1/0 ^d	Lat/Lon (external)
2.	Internal DGNSS in use (corrected; Message 17)		1 ^d	UTC-s	1/0 ^d	Lat/Lon (internal)
3.	Internal DGNSS in use (corrected; e.g. beacon) ^c		1 ^d	UTC-s	1/0 ^d	Lat/Lon (internal)
4.	External GNSS in use (uncorrected) ^a		0 ^d	UTC-s	1/0 ^d	Lat/Lon (external)
5.	Internal GNSS in use (uncorrected) ^b		0 ^d	UTC-s	1/0 ^d	Lat/Lon (internal)
6.	No sensor position in use	Manual position input	N/A	61	N/A	Do not transmit
		Dead reckoning position		62		Do not transmit
		No position		63		Do not transmit

^a Applicable only if an input from an external GNSS receiver is provided (see 6.3) which may only be used if the conditions specified in 6.3 are fulfilled.

^b Applicable in all configurations (minimum requirement).

^c Applicable only if (optionally) an internal beacon receiver is provided.

^d If RAIM available “1”; if not, default “0”.

654

655 If RAIM is available (indicated by a GBS sentence or equivalent information), the position
656 accuracy flag shall be evaluated using Table 2.

657

Table 2 – Use of accuracy (PA) flag

		PA flag	RAIM flag
Uncorrected	No RAIM, GBS not provided	0	0
	GBS provided, expected error <5 m	1	1
	GBS provided, expected error >5 m	0	1
Corrected	No RAIM, GBS not provided	0	0
	GBS provided, expected error <15 m	1	1
	GBS provided, expected error >15 m	0	1

658

659 If the GNSS sensor is inoperative, the unit shall not transmit scheduled Messages 18 and 24
660 unless interrogated by a base station.

661 NOTE In this case, the synchronisation process will not take into account distance delays.

662 The Class B“CS” AIS shall automatically select the position source with the highest priority
663 available. If data availability changes, the Class B“CS” AIS shall maintain the position source
664 for the next scheduled position report and automatically switch to the position source with the
665 highest priority available afterwards. During this period, the latest valid position shall be used
666 for reporting.

667 6.6.4 SOG/COG sensor fallback conditions

668 (see 10.8.5)

669 SOG/COG information shall be of the same source as position and follow the same fallback
670 rules. This is to avoid transmission of information referenced to different points on the ship.

671 6.7 User interface**672 6.7.1 Indicators and display**

673 (see 10.9.1)

674 The Class B“CS” AIS shall be provided with the following indicators.

675 Power: power on and fully operable (transmitting and receiving properly).

676 Tx timeout: if the unit has not transmitted a position report during the last two reporting
677 intervals (nominal reporting interval cannot be maintained for operational
678 reasons, for example Message 23 quiet period, high VDL load).

679 Error: detection of an error as a result of the BIIT (see 6.6.1).

680 If a display for received messages is provided, it shall:

- 681 • display received Messages 12 and 14 and the position report from AIS-SART in active
682 mode;
- 683 • not display messages addressed to other stations.

684 6.7.2 Static data input

685 (see 10.9.3)

686 Means shall be provided to input and verify the static data prior to use. It shall not be possible
687 for the user to alter the MMSI once programmed.

688 6.7.3 External interfaces

689 (see 10.9.4)

690 To enable a user to access, select and display the information on a separate system, the
691 Class B“CS” AIS may be provided with an interface. If implemented, the formats and protocol
692 for this data stream should be as defined by the IEC 61162 series. If provided, this interface
693 shall not output information addressed to other stations.

694 The Class B“CS” AIS may be provided with an interface to input sensor data. If provided, an
695 input interface for position sensor data shall be compliant with the IEC 61162 series.

696 6.8 Protection from invalid control commands

697 The Class B“CS” AIS shall not accept control commands sent from stations with invalid base
698 station MMSI. Before accepting and processing the Messages 17, 20, 22 and 23, the unit
699 shall check the MMSI of the sender station. When the MMSI is “00xyyyyy” where x is
700 between 2 and 7, the unit shall accept and process the received command, otherwise the unit
701 shall ignore it. (See 8.4.3).

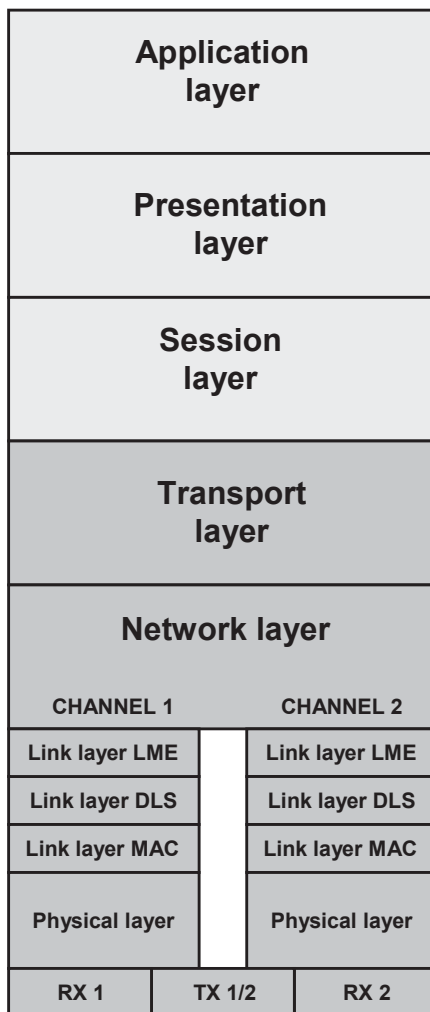
702

7 Technical requirements

7.1 General

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 a Class B“CS” AIS station (Physical Layer to Transport Layer) and the layers of the applications (Session Layer to Application Layer).



IEC 257/06

Figure 1 – OSI layer model

7.2 Physical layer

(see Clause 11)

7.2.1 General

The Physical Layer is responsible for the transfer of a bit-stream from an originator to the data link.

731 **7.2.2 Transceiver characteristics**732 **7.2.2.1 General**

733 General transceiver characteristics shall be as specified in Table 3.

734 **Table 3 – Transceiver characteristics**

Symbol	Parameter name	Value	Tolerance
PH.RFR	Regional frequencies (range of frequencies within RR Appendix 18) ^a (MHz) Full range 156,025 to 162,025 is also allowed. This capability will be reflected in Message 18.	161,500 to 162,025	-
PH.CHS	Channel spacing (encoded according to RR Appendix 18 with footnotes) ^a (kHz)	25	-
PH.CHB	Channel bandwidth (kHz)	Wide 25	
PH.AIS1	AIS 1 (default channel 1) (2087) ^a (MHz)	161,975	$\pm 3 \times 10^{-6}$
PH.AIS2	AIS 2 (default channel 2) (2088) ^a (MHz)	162,025	$\pm 3 \times 10^{-6}$
PH.BR	Bit rate (bit/s)	9 600	$\pm 50 \times 10^{-6}$
PH.TS	Training sequence (bits)	24	-
PH.TXTB	GMSK transmitter BT-product	0,4	
PH.RXBT	GMSK receiver BT-product	0,5	
PH.MI	GMSK modulation index	0,5	
^a See Recommendation ITU-R M.1084-4, Annex 4.			

735

736 **7.2.2.2 Dual channel operation**

737 The AIS shall be capable of operating on two parallel channels in accordance with 7.4.2. Two
 738 separate TDMA receive channels or processes shall be used to simultaneously receive
 739 information on two independent frequency channels. One TDMA transmitter shall be used to
 740 alternate TDMA transmissions on two independent frequency channels.

741 Data transmissions shall default to AIS 1 and AIS 2 unless otherwise specified by a
 742 competent authority, as described in 7.4.2 and Annex C.

743 **7.2.2.3 Bandwidth**

744 The Class B"CS" AIS shall operate on 25 kHz channels according to Recommendation ITU-R
 745 M.1084-4 and Appendix 18 of the Radio Regulations.

746 **7.2.2.4 Modulation scheme**

747 The modulation scheme is bandwidth adapted frequency modulated Gaussian filtered
 748 minimum shift keying (GMSK/FM). The NRZI encoded data shall be GMSK coded before
 749 frequency modulating the transmitter.

750 **7.2.2.5 Training sequence**

751 Data transmission shall begin with a 24-bit demodulator training sequence (preamble)
 752 consisting of one segment synchronisation. This segment shall consist of alternating zeros
 753 and ones (0101....). This sequence shall always start with a 0.

7.2.2.6 Data encoding

The NRZI waveform is used for data encoding. The waveform is specified as giving a change in the level when a zero (0) is encountered in the bit stream.

Forward error correction, interleaving or bit scrambling is not used.

7.2.2.7 DSC operation

The Class B"CS" AIS shall be capable of receiving DSC channel management commands. It shall either have a dedicated receive process, or it shall be capable of retuning its TDMA receivers to channel 70 on a time sharing basis, with each TDMA receiver taking alternate turns to monitor channel 70 (for details see Annex C).²

7.2.3 Transmitter requirements

Transmitter parameters shall be as given in Table 4.

Table 4 – Transmitter parameters

Transmitter parameters	Required results	Condition
Frequency error	± 500 Hz normal $\pm 1\,000$ Hz extreme	
Carrier power (P_{SS})	33 dBm $\pm 1,5$ dB normal ± 3 dB extreme	Conducted
Modulation spectrum	–25 dBW –60 dBW	$\Delta f_c < \pm 10$ kHz ± 25 kHz $< \Delta f_c < \pm 62,5$ kHz
Modulation accuracy	$< 3\,400$ Hz normal and extreme $2\,400 \pm 480$ Hz normal and extreme $2\,400 \pm 240$ Hz normal ± 480 Hz extreme $1\,740 \pm 175$ Hz normal ± 350 Hz extreme $2\,400 \pm 240$ Hz normal ± 480 Hz extreme	Bit 0, 1 Bit 2, 3 Bit 4 ... 31 Bit 32 ... 199: For a bit pattern of 0101 For a bit pattern of 00001111
Power versus time characteristics	Transmission delay: $2\,083\ \mu\text{s}$ Ramp up time: $\leq 313\ \mu\text{s}$ Ramp down time: $\leq 313\ \mu\text{s}$ Transmission duration: $\leq 23\,333\ \mu\text{s}$	Nominal 1 time period transmission
Spurious emissions	–36 dBm –30 dBm	9 kHz ... 1 GHz 1 GHz ... 4 GHz

7.2.4 Receiver requirements

Receiver parameters shall be as given in Table 5.

² In some regions, the competent authority may not require DSC functionality.

770

Table 5 – Receiver parameters

Receiver parameters	Required results		
	Result in PER	Wanted signal	Unwanted signal(s)
Sensitivity	20 %	–107 dBm normal ^a –101 dBm extreme –104 dBm normal at ±500 Hz offset	
Error at high input levels	2 %	–77 dBm	
	10 %	–7 dBm	
Co-channel rejection	20 %	–101 dBm	–111 dBm –111 dBm normal at ±1 kHz offset
Adjacent channel selectivity	20 %	–101 dBm	–31 dBm normal
Spurious response rejection	20 %	–101 dBm	–31 dBm
Intermodulation response rejection	20 %	–101 dBm	–36 dBm
Blocking and desensitisation	20 %	–101 dBm	–23 dBm (<5 MHz) –15 dBm (>5 MHz)
Spurious emissions	–57 dBm	9 kHz ... 1 GHz	
	–47 dBm	1 GHz ... 4 GHz	
^a Normal and extreme test conditions as defined in 8.2.			

771

772 **7.3 Link layer**

773 (see Clause 12)

774 **7.3.1 General**

775 The Link layer specifies how data shall be packaged in order to apply error detection to the
776 data transfer. The Link layer is divided into three sublayers.

777 **7.3.2 Link sublayer 1: Medium access control (MAC)**778 **7.3.2.1 General**

779 The MAC sublayer provides a method for granting access to the data transfer medium, i.e. the
780 VHF data link. The method used shall be Time Division Multiple Access (TDMA).

781 **7.3.2.2 Synchronisation**782 **7.3.2.2.1 Synchronisation method**

783 Synchronisation shall be determined either indirectly as described in section 7.3.2.2.3 or
784 directly from an internal UTC synchronisation source as described in 7.3.2.2.5.

785 **7.3.2.2.2 CS time period**

786 Synchronisation shall be used to determine the nominal start of the CS time period (T_0).

787 **7.3.2.2.3 Sync mode 1: AIS stations other than Class B"CS" are received**

788 Sync mode 1 shall not apply if UTC synchronisation is implemented.

789 If signals from other AIS stations complying with IEC 61993-2 or from base stations are
790 received, the Class B"CS" shall synchronise its time-periods to their scheduled position
791 reports (suitable account shall be taken of the propagation delays from the ...)

792 stations). This applies to Message types 1, 2, 3, 4 as far as they are providing position data
793 and have not been repeated (repeat indicator = 0).

794 Synchronisation jitter shall not exceed ± 3 bits ($\pm 312 \mu\text{s}$) from the average of the received
795 position reports. The average shall be calculated over a rolling 60 s period.

796 If these AIS stations are no longer received, the unit shall maintain synchronisation for a
797 minimum of 30 s and then switch back to sync mode 2.

798

799 **7.3.2.2.4 Sync mode 2: no station other than Class B"CS" is received**

800 Sync mode 2 shall not apply if UTC synchronisation is implemented.

801 In the case of a population of Class B"CS" stations alone (in the absence of any other class of
802 station that can be used as a synchronisation source) the Class B"CS" station shall determine
803 the start of time-periods (T_0) according to its internal timing.

804 Time periods that are reserved by a base station using Message 20 shall be respected.

805 If the Class B"CS" unit receives an AIS station that can be used as a synchronisation source
806 (being in sync mode 2) it shall evaluate timing and synchronise for its next transmission to
807 this station.

808 **7.3.2.2.5 UTC Synchronisation**

809 Where an internal UTC synchronisation source is implemented and UTC is available, the
810 Class B"CS" shall synchronise its time-periods to the UTC source.

811 Synchronisation jitter shall not exceed ± 3 bits ($\pm 312 \mu\text{s}$) from nominal start of UTC time-period
812 (T_0).

813 If UTC synchronisation becomes unavailable, the unit shall maintain synchronisation within
814 ± 3 bits ($\pm 312 \mu\text{s}$) from the nominal start of UTC time-period (T_0) for a minimum of 30 s.

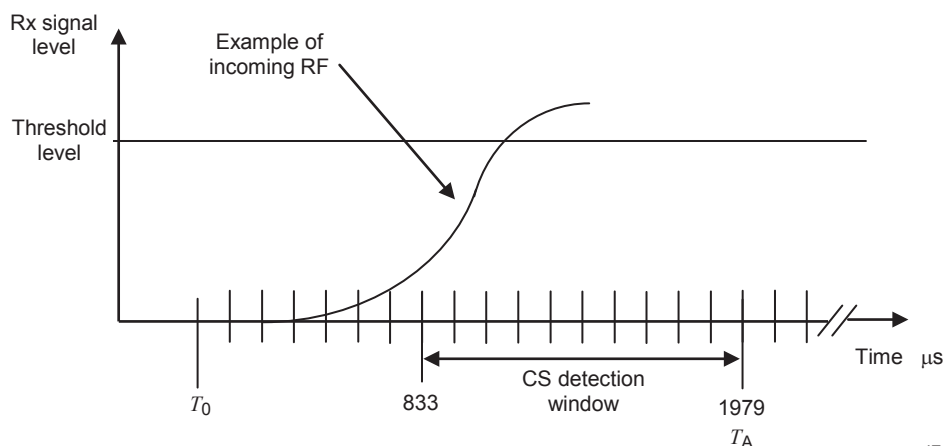
815 **7.3.2.3 Carrier-sense (CS) detection method**

816 Within a time window of $1\,146 \mu\text{s}$, starting at $833 \mu\text{s}$ and ending at $1\,979 \mu\text{s}$ after the start of
817 the time period intended for transmission (T_0), the AIS Class B"CS" shall detect if that time
818 period is used (CS detection window).

819 NOTE Signals within the first 8 bit ($833 \mu\text{s}$) of the time period are excluded from the decision (to allow for
820 propagation delays and ramp down periods of other units).

821 The Class B"CS" AIS shall not transmit on any time period in which, during the CS detection
822 window, a signal level greater than the "CS detection threshold" (7.3.2.4) is detected.

823 The transmission of a CSTDMA packet shall commence 20 bits ($T_A = 2\,083 \mu\text{s} + T_0$) after the
824 nominal start of the time period (see Figure 2).



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Figure 2 – Carrier-sense timing

7.3.2.4 CS detection threshold

The CS detection threshold shall be determined over a rolling 60 s interval on each receive channel separately. The threshold shall be determined by measuring the minimum energy level (representing the background noise) plus an offset of 10 dB. The minimum CS detection threshold shall be -107 dBm and background noise shall be tracked for a range of at least 30 dB (-77 dBm).

NOTE The following example is compliant with the requirement: Sample the RF signal strength at a rate >1 kHz, average the samples over a sliding 20 ms period and over a 4 s interval determine the minimum period value. Maintain a history of 15 such intervals. The minimum of all 15 intervals is the background level. Add a fixed 10 dB offset to give the CS detection threshold.

An indication shall be given if the background noise exceeds -77 dBm.

7.3.2.5 VDL access

The transmitter shall begin transmission by turning on the RF power immediately after the duration of the carrier-sense window (T_A).

The transmitter shall be turned off after the last bit of the transmission packet has left the transmitting unit; nominal transmission end (T_E assuming no bit stuffing).

The access to the medium is performed as shown in Figure 3 and Table 6.