DIN EN IEC 63135

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Navigations- und Funkkommunikationsgeräte und -systeme für die Seeschifffahrt – Automatische Identifikationssysteme (AIS) – Ausrüstung für Such- und Rettungs-Fluggeräte – Betriebs- und Leistungsanforderungen, Prüfverfahren und geforderte Prüfergebnisse (IEC 63135:2018); Englische Fassung EN IEC 63135:2019

Maritime navigation and radiocommunication equipment and systems – Automatic identification systems (AIS) – SAR Airborne equipment – Operational and performance requirements, methods of test and required test results (IEC 63135:2018); English version EN IEC 63135:2019

Matériels et systèmes de navigation et de radiocommunication maritimes – Systèmes d'identification automatique (AIS) – Equipement aéroporté SAR – Exigences d'exploitation et de fonctionnement, méthodes d'essai et résultats d'essai exigés (IEC 63135:2018); Version anglaise EN IEC 63135:2019

Gesamtumfang 80 Seiten

DKE Deutsche Kommission Elektrotechnik Elektronik Informationstechnik in DIN und VDE
DIN-Normenstelle Schiffs- und Meerestechnik (NSMT)

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Anwendungsbeginn

Anwendungsbeginn für die von CENELEC am 2018-12-28 angenommene Europäische Norm als DIN-Norm ist 2019-09-01.

Nationales Vorwort

Vorausgegangener Norm-Entwurf: E DIN EN 63135:2018-02.

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.

Die enthaltene IEC-Publikation wurde vom TC 80 „Maritime navigation and radiocommunication equipment and systems“ erarbeitet.

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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.

Da sich die Benutzer der vorliegenden Norm der englischen Sprache als Fachsprache bedienen, wird die Englische Fassung der EN IEC 63135 veröffentlicht. Zu deren Abschnitt 1, der den Anwendungsbereich festlegt, und Abschnitt 3, der die Begriffe und Abkürzungen festlegt, wurde eine Übersetzung angefertigt und als informativer Nationaler Anhang NA der vorliegenden Norm hinzugefügt. Für die meisten der verwendeten Begriffe existieren keine gebräuchlichen deutschen Benennungen, da sich die deutschen Anwender in der Regel ebenfalls der englischen Benennungen bedienen. Diese Norm steht nicht in unmittelbarem Zusammenhang mit Rechtsvorschriften und ist nicht als Sicherheitsnorm anzusehen.

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 die vorliegende Norm erfüllt.

Das Original-Dokument enthält Bilder in Farbe, die in der Papierversion in einer Graustufen-Darstellung wiedergegeben werden. Elektronische Versionen dieses Dokuments enthalten die Bilder in der originalen Farbdarstellung.

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Nationaler Anhang NA
(informativ)

Auszugsweise Übersetzung

Reihenfolge und Inhalt der folgenden Abschnitte sind identisch mit denen in den jeweiligen Abschnitten der Englischen Fassung.

1 Anwendungsbereich

Dieses Dokument legt die Mindest-Betriebs- und Leistungsanforderungen, Prüfverfahren und erforderlichen Prüfergebnisse für automatische Identifizierungssysteme (en: automatic identification system, AIS) VHF-Datenverbindung (VDL en: VHF data link)-bezogene Teile von einer AIS-SAR-Station an Bord von Luftfahrzeugen fest. Dieses Dokument beinhaltet die anwendbaren technischen Merkmale von AIS-SAR, gegebenenfalls die ITU-Vollzugsordnung für den Funkdienst.

Dieses Dokument legt auch die Mindestanforderungen für die Schnittstellen zu anderen Geräten für die Eingabe und Anzeige von Daten fest.

Es wird darauf hingewiesen, dass andere besondere Anforderungen an Geräte an Bord von Luftfahrzeugen existieren können, die über den Anwendungsbereich von diesem Dokument hinausgehen.

3 Begriffe, Symbole und Abkürzungen

3.1 Begriffe

In diesem Dokument werden keine Begriffe aufgeführt.

ISO und IEC stellen terminologische Datenbanken für die Verwendung in der Normung unter den folgenden Adressen bereit:

– IEC Electropedia: verfügbar unter http://www.electropedia.org/
– ISO Online Browsing Platform: verfügbar unter http://www.iso.org/obp

3.2 Symbole und Abkürzungen

Für die Anwendung dieses Dokuments gelten die folgenden Abkürzungen.

AIS	automatisches Identifizierungssystem (en: automatic identification system)
AIS-SART	AIS-Such- und Rettungssender (en: AIS search and rescue transmitter)
BITE	interne Prüfeinrichtung (en: built-in test equipment)
BT	Zeit-Bandbreite-Produkt (en: bandwidth-time)
COG	Fahrt-/Bewegungsrichtung über Grund (en: course over ground)
CommState	Kommunikationsstatus (en: communication state)

ANMERKUNG 1 Kommunikationsstatus ist in der Empfehlung ITU-R M.1371 festgelegt. Er wird verwendet, um die Zeitschlitzzuweisung für SOTDMA oder ITDMA zu organisieren.

EPFS	elektronisches Positionsbestimmungssystem (en: electronic position-fixing systems)
EPIRB-AIS	Satelliten-Notfunkbaken-AIS (en: emergency positioning indicting radio beacon AIS)

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ETA	geschätzte Ankunftszeit (en: estimated time of arrival)
EUT	zu prüfendes Gerät (en: equipment under test)
FATDMA	Zeitvielfachzugriff auf definierten Zeitschlitz (en: fixed access time division multiple access)
GMSK	Gaußsche Minimalmodulation (en: Gaussian minimum shift keying)
IMO	Internationale Seeschifffahrtsorganisation (en: International Maritime Organization)
ITDMA	schrittweiser Zeitvielfachzugriff (en: incremental time division multiple access)
Ortungsgerät	Gruppe von Geräten, zu der unter anderem AIS-SART, EPIRB-AIS und MOB-AIS gehören (en: locating device)
MAC	Medienzugriffssteuerung (en: medium access control)
MMSI	mobile Seeschiffahrtsdienstekennung (en: maritime mobile service identity)
MOB-AIS	AIS-Gerät für Mann über Bord (en: man overboard AIS device)
NavStatus	Navigationsstatus (en: navigational status)

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

NSS	nominaler Anfangssendezeitschlitz (en: nominal start slot)
NTS	nominaler Sendezeitschlitz (en: nominal transmission slot)
PER	Paketfehlerrate (en: packet error rate)
PI	Präsentationsschnittstelle (en: presentation interface)
RAIM	autonome Empfänger-Integritätsüberwachung (en: receiver Autonomous integrity monitoring)
RATDMA	Zeitmehrfachzugriff mit Direktzugriff (en: random access time division multiple access)
RF	Funkfrequenz (en: radio frequency)
SI	Auswahl-Intervall (en: Electron interval)
SOG	Fahrt-/Geschwindigkeit über Grund (en: speed over ground)
SOTDMA	sich selbst organisierender Zeitmehrfachzugriff (en: see 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	Empfang (en: receive)
Tx	Senden (en: transmit)

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EUROPEAN STANDARD

NORME EUROPÉENNE

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Maritime navigation and radiocommunication equipment and systems - Automatic identification systems (AIS) - SAR Airborne equipment - Operational and performance requirements, methods of test and required test results (IEC 63135:2018)

Matériels et systèmes de navigation et de radiocommunication maritimes - Systèmes d'identification automatique (AIS) - Equipement aéroporté SAR - Exigences d'exploitation et de fonctionnement, méthodes d'essai et résultats d'essai exigés (IEC 63135:2018)

Navigations- und Funkkommunikationsgeräte und -systeme für die Seeschifffahrt - Automatische Identifikationssysteme (AIS) - Ausrüstung für Such- und Rettungs-Fluggeräte - Betriebs- und Leistungsanforderungen, Prüfverfahren und geforderte Prüfergebnisse (IEC 63135:2018)

This European Standard was approved by CENELEC on 2018-12-28. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

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European foreword

The text of document 80/875/CDV, future edition 1 of IEC 63135, prepared by IEC/TC 80 "Maritime navigation and radiocommunication equipment and systems" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN IEC 63135:2019.

The following dates are fixed:

- latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2019-09-28
- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2021-12-28

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CENELEC shall not be held responsible for identifying any or all such patent rights.

Endorsement notice

The text of the International Standard IEC 63135:2018 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following notes have to be added for the standards indicated:

IEC 61097-14	NOTE	Harmonized as EN 61097-14
IEC 61108-1	NOTE	Harmonized as EN 61108-1
IEC 61108-2	NOTE	Harmonized as EN 61108-2
IEC 61108-3	NOTE	Harmonized as EN 61108-3
IEC 61162-2	NOTE	Harmonized as EN 61162-2
IEC 61162-3	NOTE	Harmonized as EN 61162-3
IEC 61162-450	NOTE	Harmonized as EN IEC 61162-450
IEC 61162-460	NOTE	Harmonized as EN IEC 61162-460
IEC 61993-2	NOTE	Harmonized as EN IEC 61993-2
IEC 62287-1	NOTE	Harmonized as EN 62287-1
IEC 62287-2	NOTE	Harmonized as EN 62287-2
IEC 62320-1	NOTE	Harmonized as EN 62320-1
IEC 62320-2	NOTE	Harmonized as EN 62320-2
ISO 9000	NOTE	Harmonized as EN ISO 9000

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Annex ZA
(normative)

Normative references to international publications with their corresponding European publications

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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.

NOTE 1 Where an International Publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

NOTE 2 Up-to-date information on the latest versions of the European Standards listed in this annex is available here: www.cenelec.eu.

Publication	Year	Title	EN/HD	Year
IEC 61162-1	-	Maritime navigation and radiocommunication equipment and systems - Digital interfaces - Part 1: Single talker and multiple listeners	-	-
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	-	-

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MARITIME NAVIGATION AND RADIOCOMMUNICATION EQUIPMENT AND SYSTEMS – AUTOMATIC IDENTIFICATION SYSTEMS (AIS) – SAR AIRBORNE EQUIPMENT – OPERATIONAL AND PERFORMANCE REQUIREMENTS, METHODS OF TEST AND REQUIRED TEST RESULTS

1 Scope

This document specifies the minimum operational and performance requirements, methods of testing and required test results as applicable for automatic identification systems (AIS) VHF data link (VDL) related parts of an AIS SAR airborne station. This document incorporates the applicable technical characteristics of AIS SAR airborne equipment included in Recommendation ITU-R M.1371 and takes into account the ITU Radio Regulations, where applicable.

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

Attention is drawn on that other requirements specific for airborne equipment can exist and are beyond the scope of this document.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 61162-1, *Maritime navigation and radiocommunication equipment and systems – Digital interfaces – Part 1: Single talker and multiple listeners*

ITU-R Recommendation M.1371-5:2014, *Technical characteristics for an automatic identification system using time division multiple access in the VHF maritime mobile frequency band*

ITU-T Recommendation O.153, *Basic parameters for the measurement of error performance at bit rates below the primary rate*

3 Terms, definitions, symbols and abbreviated terms

3.1 Terms and definitions

No terms and definitions are listed in this document.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at http://www.electropedia.org/
- ISO Online browsing platform: available at http://www.iso.org/obp

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3.2 Symbols and abbreviated terms

For the purpose of this document, the following abbreviated terms apply.

AIS	automatic identification system
AIS-SART	AIS search and rescue transmitter
BITE	built-in test equipment
BT	bandwidth-time
COG	course over ground
CommState	communication state

NOTE 1 Communication state is defined in Recommendation ITU-R M.1371. It is used to organize the slot allocation for SOTDMA or ITDMA.

EPFS	electronic position-fixing systems
EPIRB-AIS	emergency positioning indicting radio beacon AIS
ETA	estimated time of arrival
EUT	equipment under test
FATDMA	fixed access time division multiple access
GMSK	Gaussian minimum shift keying
IMO	International Maritime Organization
ITDMA	incremental time division multiple access
locating device	group of devices including AIS-SART, EPIRB-AIS and MOB-AIS
MAC	medium access control
MMSI	maritime mobile service identity
MOB-AIS	man overboard AIS device
NavStatus	navigational status

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

NSS	nominal start slot
NTS	nominal transmission slot
PER	packet error rate
PI	presentation interface
RAIM	receiver autonomous integrity monitoring
RATDMA	random access time division multiple access
RF	radio frequency
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

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4 General requirements

4.1 General

4.1.1 Overview

Requirements contained in Clause 4 are requirements not taken up in other clauses and are verified by observation and inspection of documented evidence.

This document specifies the requirements for the AIS SAR airborne station. The AIS SAR airborne station shall support search and rescue operations involving SAR aircraft.

4.1.2 Capabilities of the AIS

The AIS SAR airborne station shall be capable of providing to ships, and to competent authorities, information from the SAR aircraft, automatically and with the required accuracy and frequency, to facilitate accurate tracking. Transmission of the data shall be with the minimum involvement of personnel.

4.1.3 Transmitter shutdown procedure

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.

4.2 Modes of operation

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;
4) a "receive only" mode where the station does not transmit.

5 Performance requirements

5.1 Composition

The AIS SAR airborne station 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;
2) at least one transmitter and two TDMA receiving processes;
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 6.6.2) may be provided to input the position used for navigation;
4) a means to automatically input data from other sensors meeting the provisions as specified in 5.5.1 2) may be provided;
5) a means of error checking the transmitted and received data (see Clause 6); and
6) built-in test equipment (BITE) as specified in 5.8.1.

The AIS SAR airborne station shall be capable of:

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7) providing information automatically and continuously to other AIS stations, without involvement of personnel;
8) receiving and processing information from other AIS stations;
9) responding to high priority and safety related calls with a minimum of delay;
10) providing positional and manoeuvring information at a data rate adequate to facilitate accurate tracking by a competent authority and other AIS stations (see 5.5.2).

5.2 Time and position

5.2.1 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 position, COG and SOG.

NOTE UTC includes a provision for leap seconds.

The internal GNSS receiver shall meet appropriate requirements for position accuracy, COG/SOG, acquisition, re-acquisition, receiver sensitivity, RF dynamic range, interference susceptibility, position update, failure warnings, status indications and integrity flag.

If an external source of UTC is provided, it shall fulfil the requirement for synchronization timing.

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

5.2.2 Source for AIS position reporting

The source for position reporting may vary depending on the conditions specified in 5.8.3.4.

When the external position is unavailable, the internal GNSS receiver shall 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 BITE indication shall be output on the presentation interface (see 5.8.1).

The internal GNSS receiver may be capable of being differentially corrected.

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.

5.3 User interface

To enable a user to access, select and display the information on a separate system, the AIS SAR airborne station shall be provided with an interface conforming to an appropriate international interface standard.

All interfacing shall be made via the system interface as described in 6.6 (called the "presentation interface").

5.4 Identification

(See 11.1)

For the purpose of station and message identification, the appropriate Maritime Mobile Service Identity (MMSI) shall be used.

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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 111200000 and 111799999, 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.

5.5 Information

(See 11.2)

5.5.1 Information provided by the AIS SAR airborne station

The information provided by the AIS SAR airborne station shall include:

1) Static:
   - MMSI;
   - call sign and name;
   - location of the in use position-fixing antenna on the aircraft if an external position input is implemented.

   Static information, voyage related information and the MMSI shall be stored in non-volatile memory.
2) Dynamic:
   - position of aircraft 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);
   - altitude of aircraft, including source.
3) Voyage related:
   - optional destination and estimated time of arrival (ETA).
4) Short safety-related messages.

5.5.2 Information reporting intervals

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:	Every 10 s.
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 24 A or Message 5.

The manufacturer can specify further reporting intervals of dynamic information. In this case, the reporting interval in use is set by configuration.

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.

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5.5.3 AIS station reporting capacity

The SAR airborne station shall be able to handle a minimum of 2 000 reports per minute per channel, to adequately provide for all operational scenarios envisioned.

The SAR airborne station shall be capable of processing of all message types on the VDL.

5.6 Permissible initialization period

(See 11.3)

The installation shall be operational within 2 min of switching on.

NOTE Sensors used with the AIS SAR airborne station 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).

5.7 Technical characteristics

(See 11.4)

The technical characteristics of the AIS SAR airborne station, 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.

5.8 Alarms and indications, fall-back arrangements

(See 11.5)

5.8.1 Built-in test equipment

The AIS SAR airborne station shall be equipped with BITE. 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 SAR airborne station, an alarm is initiated. In this case (see Table 1), 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 is detected, an indication is given to the user. In this case, an appropriate TXT sentence shall be output via the presentation interface.

5.8.2 Alarm messages

5.8.2.1 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 SAR airborne station.

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

The following parameters of this sentence formatter shall be set according to Table 1:

- time of alarm condition change (UTC);
- unique alarm number (identifier) at alarm source;
- alarm condition;
- alarm's acknowledge state;

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- alarm's description text.

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 either internally, or externally by a corresponding ACK sentence.

The local alarm identifiers (alarm ID) given in Table 1 are defined for the use with formatters ALR and ACK to link associated messages.

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

5.8.2.2 Monitoring of functions and integrity

In case a failure is detected in one or more functions or data, an alarm shall be triggered and the system shall react as given in Table 1.

Table 1 – Integrity alarm conditions signalled using ALR sentence formatter

Alarm's description text	Alarm condition threshold exceeded	Alarm condition not exceeded	Alarm ID or text identifier	Reaction of the system to the alarm condition threshold exceeded
AIS: Tx malfunction	A	V	001	Stop transmission
AIS: Antenna VSWR exceeds limit	A	V	002	Continue operation
AIS: Rx channel 1 malfunction	A	V	003	Stop transmission on affected channel
AIS: Rx channel 2 malfunction	A	V	004	Stop transmission on affected channel
AIS: Rx channel 70 malfunction	A	V	005	Continue operation
AIS: general failure	A	V	006	Stop transmission
AIS: UTC sync invalid	A	V	007	Continue operation using indirect or semaphore synchronisation
AIS: active AIS-SART	A	V	014	Continue operation
AIS: active MOB-AIS	A	V	015	Continue operation
AIS: active EPIRB-AIS	A	V	016	Continue operation
AIS: external EPFS lost	A	V	025	Continue operation (refer to Table 3) Only if external EPFS is implemented
AIS: no position sensor in use	A	V	026	Continue operation (refer to Table 3, priority 6)
AIS: no valid SOG information	A	V	029	Continue operation using default data
AIS: no valid COG information	A	V	030	Continue operation using default data

Alarm ID 001 shall be activated when:

- the integrity of the VDL would be degraded by incorrect transmitter behaviour (for instance in the case that the Tx shutdown procedure has operated);

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- the unit is not able to transmit for technical reasons or missing or invalid MMSI.

5.8.3 Status messages

5.8.3.1 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.

5.8.3.2 Using the TXT formatter

Status messages shall be IEC 61162-1 compliant "$AITXT"-sentences on the presentation interface output port. Status messages do not require an acknowledgement.

The following parameters of this sentence formatter shall be set according to Table 2:

- text identifier; and
- text message.

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

5.8.3.3 Monitoring sensor data status

Indications shall be given and the system shall react as given in Table 2.

Table 2 – 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: Channel management parameters changed	036	Continue operation

5.8.3.4 Position sensor fall-back conditions

5.8.3.4 is only applicable if external sensor input is implemented.

Priorities and affected position report data shall be as in Table 3.

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Table 3 – Position sensor fall-back conditions

	Affected data in Message 9 ⇒				
Priority	**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 [c]	Lat/Lon (external)
2	Internal DGNSS in use (corrected; Message 17)	1	UTC-s	1/ 0 [c]	Lat/Lon (internal)
3	Internal DGNSS in use (corrected; beacon) [b]	1	UTC-s	1/ 0 [c]	Lat/Lon (internal)
4	External EPFS in use (uncorrected) [a]	0	UTC-s	1/ 0 [c]	Lat/Lon (external)
5	Internal GNSS in use (uncorrected)	0	UTC-s	1/ 0 [c]	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.

[c] 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 time stamp (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, if implemented, 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 4.

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Table 4 – Use of position 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. 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.

5.8.3.5 SOG/COG sensor fall-back 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 aircraft.

6 Technical requirements

6.1 General

Clause 6 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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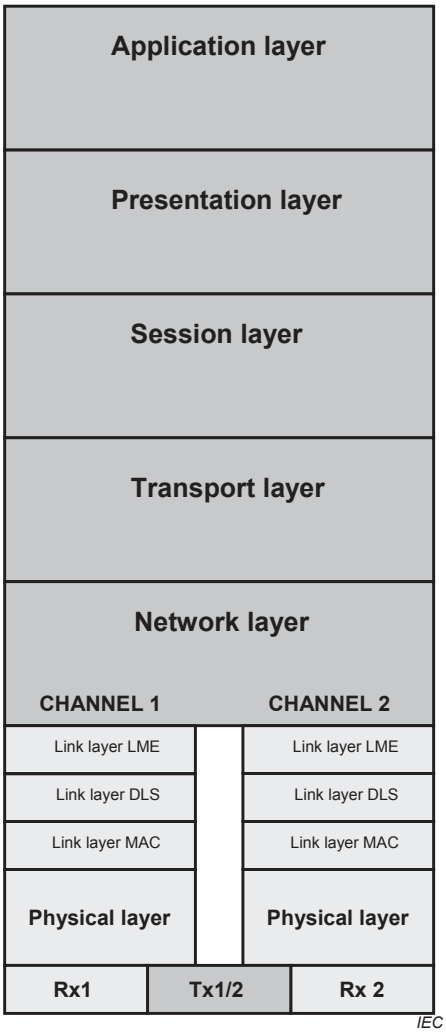

Figure 1 – OSI layer model

6.2 Physical layer

(See Clause 12)

6.2.1 General

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.

6.2.2 Transmitter parameters

Transmitter parameters shall be as given in Table 5.

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Table 5 – Transmitter parameters

Transmitter parameters	Requirement	Condition
Frequency error	±500 Hz normal ±1 000 Hz extreme	
Carrier power (P_{SS})	41 dBm high power setting 30 dBm low power setting	±1,5 dB normal and ±3 dB extreme, conducted
Modulation spectrum	−25 dBc −70 dBc slotted transmission	$\Delta f_c <$ ± 10 kHz ± 25 kHz < $\Delta f_c <$ ± 62,5 kHz
Modulation accuracy	1 740 Hz ± 175 Hz normal ± 350 Hz extreme 2 400 Hz ± 240 Hz normal ± 480 Hz extreme	Test signal 0101… Test signal 00001111…
Power versus time characteristics	Transmission delay: 0 s Ramp up time: 833 µs Ramp down time: 833 µs Transmission duration: ≤ 26 624 µs	See Figure 2 and Table 6 Nominal 1 time slot transmission
Spurious emissions	−36 dBm −30 dBm	9 kHz … 1 GHz 1 GHz … 4 GHz

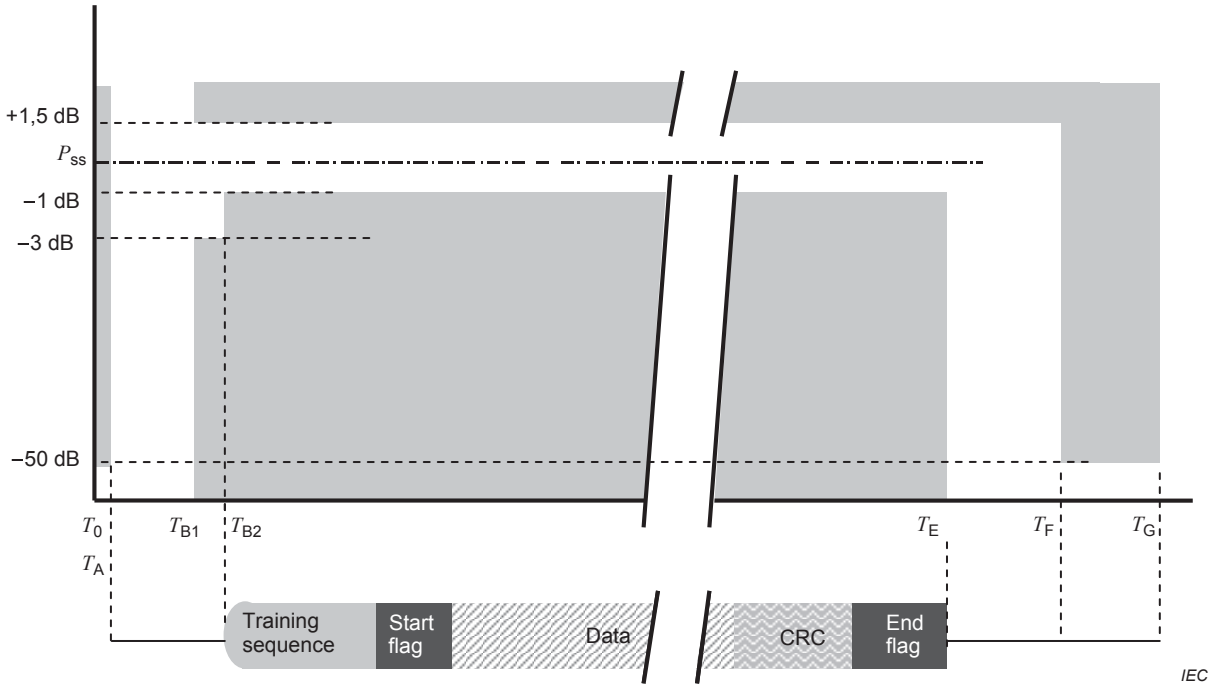

Figure 2 – Power versus time characteristics

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