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Ersatz für
DIN EN 62320-2:2008-11
Siehe Anwendungsbeginn

**Navigations- und Funkkommunikationsgeräte und -systeme für die Seeschifffahrt –
Automatische Identifikationssysteme (AIS) –
Teil 2: AIS-AtoN-Stationen – Betriebs- und Leistungsanforderungen, Prüfverfahren und geforderte Prüfergebnisse
(IEC 62320-2:2016);
Englische Fassung EN 62320-2:2017**

Maritime navigation and radiocommunication equipment and systems –
Automatic identification system (AIS) –
Part 2: AIS AtoN Stations – Operational and performance requirements, methods of testing and required test results
(IEC 62320-2:2016);
English version EN 62320-2:2017

Equipements et systèmes de navigation et de radiocommunication maritimes –
Systèmes d'identification automatique (AIS) –
Partie 2: Stations AIS AtoN Exigences minimales opérationnelles et de performance, méthodes de mesure et résultats de test minimum attendus
(IEC 62320-2:2016);
Version anglaise EN 62320-2:2017

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DIN-Normenstelle Schiffs- und Meerestechnik (NSMT)

Anwendungsbeginn

Anwendungsbeginn für die von CENELEC am 2016-12-05 angenommene Europäische Norm als DIN-Norm ist 2017-07-01.

Für DIN EN 62320-2:2008-11 besteht eine Übergangsfrist bis 2019-12-05.

Nationales Vorwort

Vorausgegangener Norm-Entwurf: E DIN EN 62320-2:2016-04.

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.

Das IEC-Komitee hat entschieden, dass der Inhalt dieser Publikation bis zu dem Datum (stability date) unverändert bleiben soll, das auf der IEC-Website unter „<http://webstore.iec.ch>“ zu dieser Publikation angegeben ist. Zu diesem Zeitpunkt wird entsprechend der Entscheidung des Komitees die Publikation

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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 die vorliegende Norm erfüllt.

Da sich die Anwender der vorliegenden Norm der englischen Sprache als Fachsprache bedienen, wird die Englische Fassung der EN 62320-2 veröffentlicht. Zu deren Abschnitt 1, der den Anwendungsbereich festlegt, und deren Abschnitt 3, der die Begriffe festlegt, wurde eine Übersetzung angefertigt und als Nationaler Anhang NA der vorliegenden Norm hinzugefügt. Für einige 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 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.

Änderungen

Gegenüber DIN EN 62320-2:2008-11 wurden folgende Änderungen vorgenommen:

- a) zusätzliche Cyber-Security Maßnahmen;

- b) aktualisierte Beschreibung der Konfiguration mittels VDL;
- c) aktualisierte Anforderungen im VDL-Zugriffsschema;
- d) neue PI-Meldungen und VDL-Meldungsstrukturen mit zusätzlicher Beschreibung für optionale TAG-Blöcke;
- e) ergänzte Anforderung für zumindest eine Standardmethode zur Konfiguration bei der Anwendung von PI-Meldungen;
- f) aktualisiertes Prüfverfahren und aktualisierte Anhänge.

Frühere Ausgaben

DIN EN 62320-2: 2008-11

Nationaler Anhang NA (informativ)

Auszugsweise Übersetzung^{N1)}

Die deutsche Übersetzung der Begriffe hat Empfehlungscharakter und kann nur die ungefähre Begrifflichkeit in Deutsch wiedergeben. Unter Experten wird empfohlen, ausschließlich die englischen Fachbegriffe zu verwenden, um die Gefahr von Missverständnissen zu reduzieren.

1 Anwendungsbereich

Dieser Teil 2 der IEC 62320 legt die betrieblichen und Leistungsanforderungen, Prüfverfahren und geforderten Prüfergebnisse für AIS-AtoN-Stationen kompatibel zu den mit IMO-Resolution MSC.74(69), Annex 3, Universal AIS, angenommenen Leistungsstandards fest. Er beinhaltet die technischen Kennwerte für nicht-schiffsseitige AIS-AtoN-Geräte nach ITU-R-Empfehlung M.1371 und IALA-Empfehlung A-126. Wo zutreffend, werden auch die ITU-Funkregulierungen mit berücksichtigt. Diese Norm beachtet auch andere zugehörige internationale IEC-Normen sowie existierende nationale Normen, wenn anwendbar.

Diese Norm ist anwendbar bei automatischen Schiffs-Identifikationssystem (AIS) Installationen an Schiffsfahrtszeichen.

3 Begriffe und Abkürzungen

3.1 Begriffe

Für die Anwendung dieses Dokuments gelten die folgenden Begriffe.

3.1.1

Schifffahrtszeichen

(en: aids to navigation)

nicht auf Schiffen installiertes Gerät oder System, das so gestaltet ist und betrieben wird, um die sichere und effiziente Navigation von Schiffen und des Schiffsverkehrs zu verbessern

3.1.2

Meldung 21

(en: Message 21)

AtoN-Meldung, die durch eine AIS-Station über die VHF-Datenverbindung übertragen wird

3.1.3

reales AIS AtoN

(en: real AIS AtoN)

AIS-AtoN-Station, die physisch an einem Schifffahrtszeichen angeordnet ist

Anmerkung 1 zum Begriff: IMO MSC.1/Circ.1473 legt fest, dass ein physisches AIS-AtoN eine AIS-Meldung 21 darstellt, die ein Schifffahrtszeichen repräsentiert, das physikalisch existiert.

3.1.4

synthetisches AIS AtoN

(en: synthetic AIS AtoN)

Meldung 21, die durch eine AIS-Station übertragen wird, die entfernt vom Schifffahrtszeichen angeordnet ist

Anmerkung 1 zum Begriff: IMO MSC.1/Circ.1473 legt fest, dass ein physisches AIS-AtoN eine AIS-Meldung 21 darstellt, die ein Schifffahrtszeichen repräsentiert, das physikalisch existiert.

^{N1)} Nationale Fußnote: Die Nummerierung aus IEC 62320-2:2016-10 wurde beibehalten.

3.1.5**virtuelles AIS AtoN**

(en: virtual AIS AtoN)

Meldung 21, die durch eine AIS-Station stellvertretend für ein Schifffahrtszeichen übertragen wird, das physisch nicht existiert

3.2 Abkürzungen

AES	fortschrittlicher Verschlüsselungsstandard (en: Advanced Encryption Standard)
AIS	automatisches Schiffs-Identifikationssystem (en: automatic identification system)
BIIT	integrierte Integritätsprüfung (en: built-in Integrity test)
BT	Zeit-Bandbreite-Produkt (en: bandwidth-time product)
CSTDMA	Zeitmehrfachzugriff mit Trägerprüfung (en: carrier sense time division multiple access)
DGNSS	differentielles globales Satellitennavigationssystem (en: differential global navigation satellite system)
EPFS	elektronisches Positionsbestimmungssystem (en: electronic position fixing system)
EUT	Gerät im Test (en: equipment under test)
FATDMA	Zeitmehrfachzugriff mit festen Zeitschlitzten (en: fixed access time division multiple access)
GNSS	globales Satellitennavigationssystem (en: global navigation satellite system)
IMO	Internationale Seeschifffahrtsorganisation (en: International Maritime Organization)
MMSI	Rufnummer des mobilen Seefunkdienstes (en: Maritime Mobile Service Identity)
NRZI	NRZI-Übertragungskodierung (en: non-return to zero inverted)
PER	Paketfehlerrate (en: packet error rate)
PI	Präsentationsschnittstelle (en: presentation interface)
RAIM	unabhängige Integritätsüberwachung für Empfänger (en: receiver autonomous integrity monitoring)
RATDMA	Zeitmehrfachzugriff mit Direktzugriff (en: random access time division multiple access)
RF	Funkfrequenz (en: radio frequency)
Rx	Empfänger (en: receive)
SBAS	Satelliten basiertes Zusatzsystem zur Positionsverbesserung (en: satellite-based augmentation system)
SOTDMA	selbst organisierter Zeitmehrfachzugriff (en: self-organizing time division multiple access)
TDMA	Zeitmehrfachzugriff (en: time division multiple access)
Tx	Sender (en: transmit)
UTC	Koordinierte Weltzeit (en: Coordinated Universal Time)
VDL	VHF-Datenverbindung (en: VHF data link)
VHF	Ultrakurzwelle (en: very high frequency)
VSWR	Stehwellenverhältnis (en: voltage standing wave ratio)

– Leerseite –

English Version

**Maritime navigation and radiocommunication equipment and
systems - Automatic identification system (AIS) -
Part 2: AIS AtoN Stations - Operational and performance
requirements, methods of testing and required test results
(IEC 62320-2:2016)**

Equipements et systèmes de navigation et de
radiocommunication maritimes - Systèmes d'identification
automatique (AIS) - Partie 2: Stations AIS AtoN Exigences
minimales opérationnelles et de performance, méthodes de
mesure et résultats de test minimum attendus
(IEC 62320-2:2016)

Navigations- und Funkkommunikationsgeräte und -systeme
für die Seeschifffahrt - Automatische Identifikationssysteme
(AIS) - Teil 2: AIS-AtoN-Stationen - Betriebs- und
Leistungsanforderungen, Prüfverfahren und geforderte
Prüfergebnisse
(IEC 62320-2:2016)

This European Standard was approved by CENELEC on 2016-12-05. 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: Avenue Marnix 17, B-1000 Brussels

European foreword

The text of document 80/817/FDIS, future edition 2 of IEC 62320-2, 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 62320-2:2017.

The following dates are fixed:

- latest date by which the document has to be (dop) 2017-09-05
implemented at national level by
publication of an identical national
standard or by endorsement
- latest date by which the national (dow) 2019-12-05
standards conflicting with the
document have to be withdrawn

This document supersedes EN 62320-2:2008.

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

Endorsement notice

The text of the International Standard IEC 62320-2:2016 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 61162-1	NOTE	Harmonized as EN 61162-1.
IEC 61162-2	NOTE	Harmonized as EN 61162-2.
IEC 61162-460	NOTE	Harmonized as EN 61162-460.
IEC 61993-2	NOTE	Harmonized as EN 61993-2.

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1 Scope

This part of IEC 62320 specifies the operational and performance requirements, methods of testing and required test results for AIS AtoN Stations compatible with the performance standards adopted by IMO Resolution MSC.74(69), Annex 3, Universal AIS. It incorporates the technical characteristics of non-shipborne AIS AtoN equipment, included in Recommendation ITU-R M.1371 and IALA Recommendation A-126. Where applicable, it also takes into account the ITU Radio Regulations. This standard takes into account other associated IEC International Standards and existing national standards, as applicable.

This document is applicable for automatic identification system (AIS) installations on aids to navigation (AtoN).

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, *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 62287-1, *Maritime navigation and radiocommunication equipment and systems – Class B shipborne equipment of the automatic identification system (AIS) – Part 1: Carrier-sense time division multiple access (CSTDMA) techniques*

IEC 62320-3:2015, *Maritime navigation and radiocommunication equipment and systems – Automatic identification systems (AIS) – Part 3: Repeater station – Minimum operational and performance requirements – Methods of test and required test results*

ITU Radio Regulations, Appendix 18, *Table of transmitting frequencies in the VHF maritime mobile band*

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*

IALA Recommendation A-126, *The Use of Automatic Identification System (AIS) in Marine Aids to Navigation*

3 Terms, definitions and abbreviations

3.1 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1.1

aids to navigation

AtoN

device or system external to vessels that is designed and operated to enhance the safe and efficient navigation of vessels and/or vessel traffic

3.1.2

Message 21

AtoN report transmitted on the VHF data link by an AIS station

3.1.3

real AIS AtoN

AIS AtoN station which is physically located on the aid to navigation

Note 1 to entry: IMO MSC.1/Circ.1473 states that physical AIS AtoN is an AIS Message 21 representing an aid to navigation that physically exists.

3.1.4

synthetic AIS AtoN

Message 21 transmitted from an AIS station located remotely from the aid to navigation

Note 1 to entry: IMO MSC.1/Circ.1473 states that physical AIS AtoN is an AIS Message 21 representing an aid to navigation that physically exists.

3.1.5

virtual AIS AtoN

Message 21 transmitted from an AIS station for an aid to navigation which does not physically exist

3.2 Abbreviated terms

AES	Advanced Encryption Standard
AIS	automatic identification system
BIIT	built-in integrity test
BT	bandwidth-time product
CSTDMA	carrier sense time division multiple access
DGNSS	differential global navigation satellite system
EPFS	electronic position fixing system
EUT	equipment under test
FATDMA	fixed access time division multiple access
GNSS	global navigation satellite system
IMO	International Maritime Organization
MMSI	Maritime Mobile Service Identity
NRZI	non-return to zero inverted
PER	packet error rate
PI	presentation interface
RAIM	receiver autonomous integrity monitoring
RATDMA	random access time division multiple access
RF	radio frequency
Rx	receive
SBAS	satellite-based augmentation system
SOTDMA	self-organizing time division multiple access
TDMA	time division multiple access
Tx	transmit
UTC	Coordinated Universal Time
VDL	VHF data link
VHF	very high frequency

VSWR voltage standing wave ratio

4 Description

4.1 Types of AIS AtoN stations

There are three types of AIS AtoN stations as defined in Table 1. The AIS AtoN stations may optionally include additional capabilities as defined in the comments column. Table 2 describes the use of the messages.

Table 1 – Description of AIS AtoN stations

Requirements	Type 1 AIS AtoN station	Type 2 AIS AtoN station	Type 3 AIS AtoN station	Comments
VDL receiver	No receiver	Receiver for query, configuration, or control functions only	Two receiving processes for autonomous mode (RATDMA)	When RATDMA is not used, only one receiving process is required for autonomous mode.
Transmitted messages	21			See Table 2.
Access mode for Message 21	FATDMA	FATDMA	FATDMA & RATDMA	
Access Mode for messages other than 21, if implemented	FATDMA	FATDMA	FATDMA & RATDMA	CSTDMA (Type 3)
Configuration / communication method	Standard sentences of Table 14 Physical interface defined by manufacturer			Defined by the manufacturer with standard sentences and optionally using TAG Blocks.
Physical communication interface	At least one shall be provided by the manufacturer for test. Not required for operation.			The electrical and physical characteristics shall be defined by the manufacturer.
Transmit power	Nominal 12,5 W			As defined by the manufacturer
Transmitter capability	Frequency agile			Single frequency
Synthetic and Virtual AtoN	Not Required			Yes
Positioning device	EPFS and surveyed position			Surveyed position only (no EPFS)
UTC synchronisation	UTC Direct			UTC indirect or semaphore (Type 3)
Assignment	Shall not respond to assignment Messages 16 and 23			
Interrogation	Shall respond with the Message 21 of the Real AIS AtoN MMSI only.			
Default (initial factory setting)	MMSI = 000000000 No schedule configured No virtual AtoN configured Radio parameters configured per Table 6 No surveyed position Encryption key = all zeros AtoN status bits = all zeros			

Table 2 – Use of VDL messages

Msg. No.	Name of message	M.1371-5 Ref.	R/P Type 2	R/P Type 3	PI Output	T Type 1&2	T Type 3	Remark
0	Undefined	None	No	No	No	No	No	Reserved for future use
1	Position report (scheduled)	A8-3.1	No	Yes	Yes	No	Opt	Comm State requires evaluation if RATDMA enabled Only implemented to repeat active AIS-SART messages
2	Position report (assigned)	A8-3.1	No	Yes	Yes	No	No	Comm State requires evaluation if RATDMA enabled
3	Position report (when interrogated)	A8-3.1	No	Yes	Yes	No	No	Comm State requires evaluation if RATDMA enabled
4	Base station report	A8-3.2	No	Yes	Yes	No	No	Comm State requires evaluation if RATDMA enabled
5	Static and voyage related data	A8-3.3	No	No	Yes	No	No	
6	Addressed binary message	A8-3.4	Opt	Opt	Yes	Opt	Opt	Only if addressed to own station including virtual MMSIs associated with own station, or 0
7	Binary acknowledge	A8-3.5	Opt	Opt	Opt	No	Opt	
8	Binary broadcast message	A8-3.6	No	No	Yes	Opt	Opt	
9	Standard SAR aircraft position report	A8-3.7	No	Yes	Yes	No	No	Comm State requires evaluation if RATDMA enabled
10	UTC and date inquiry	A8-3.8	No	No	Opt	No	No	
11	UTC/ date response	A8-3.9	No	No	Opt	No	No	
12	Addressed safety related message	A8-3.10	No	Opt	Yes	Opt	Opt	Only if addressed to own station including virtual MMSIs associated with own station, or 0
13	Safety related acknowledge	A8-3.11	No	Opt	Opt	No	Opt	
14	Safety related broadcast message	A8-3.12	No	Opt	Yes	Opt	Opt	
15	Interrogation	A8-3.13	Opt	Opt	Opt	No	No	Shall respond with the Message 21 of the Real AIS AtoN MMSI only
16	Assigned mode command	A8-3.14	No	No	Opt	No	No	
17	DGNSS	A8-3.15	No	Opt	Opt	No	No	

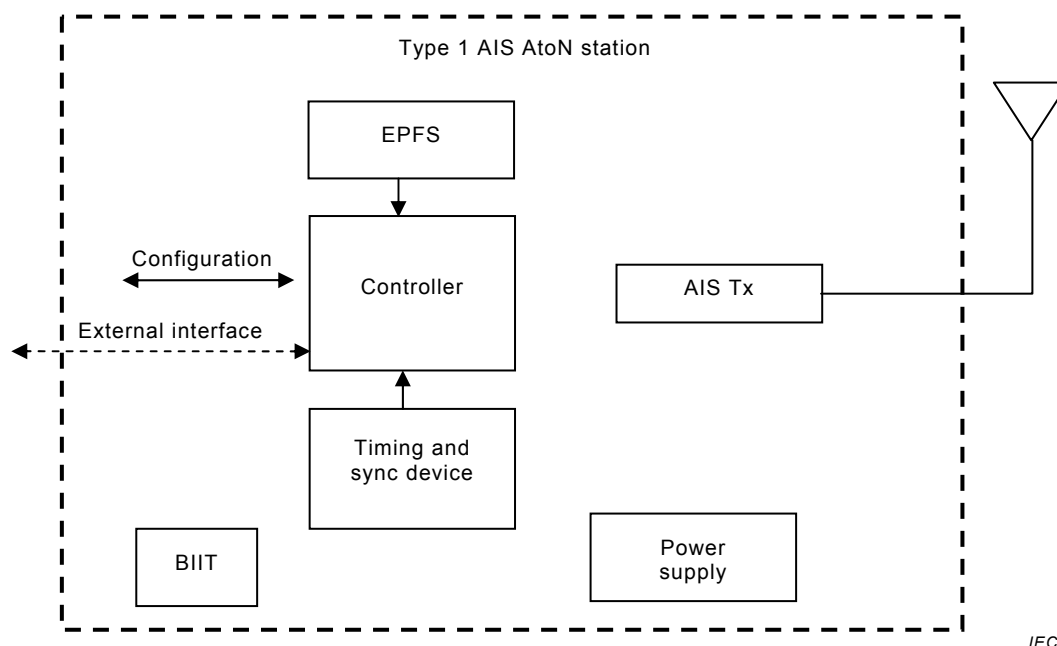
Msg. No.	Name of message	M.1371-5 Ref.	R/P Type 2	R/P Type 3	PI Output	T Type 1&2	T Type 3	Remark
18	Standard Class B equipment position report	A8-3.16	No	Yes	Yes	No	No	Comm State requires evaluation if RATDMA enabled
19	Extended Class B equipment position report	A8-3.17	No	No	Opt	No	No	
20	Data link management message	A8-3.18	No	No	Opt	No	No	
21	Aids-to-Navigation report	A8-3.19	No	No	Yes	Yes	Yes	
22	Channel management message	A8-3.20	No	No	Opt	No	No	
23	Group assignment command	A8-3.21	No	No	Opt	No	No	
24	Static data report (single slot, two parts)	A8-3.22	No	No	Yes	No	No	
25	Single slot binary message	A8-3.23	Opt	Opt	Yes	Yes	Yes	Only if addressed to own station including virtual MMSIs associated with own station, or 0
26	Multiple slot binary message	A8-3.24	Opt	Yes	Yes	Yes	Yes	Comm State requires evaluation if RATDMA enabled Only if addressed to own station including virtual MMSIs associated with own station, or 0
27	Long-range AIS broadcast message	A8-3.25	No	No	Opt	No	No	
28 to 63	Undefined	None	No	No	No	No	No	Reserved for future use
Key: R/P: Receive and process internally, e.g. prepare for output via PI, act upon the received information, and use the received information internally. O: Output message content via PI using PI VDM messages T: Transmission by own station: "Yes" = required; "No" = shall not be transmitted INF: VDL message will be output via PI using a PI VDM message for information only. This function may be suppressed by the configuration setting.								

4.2 Type 1 AIS AtoN station

4.2.1 Characteristics

4.2.1.1 General

Type 1 AIS AtoN station has no receiver. It transmits on FATDMA slots given in its configuration. Figure 1 shows the functional block diagram of a Type 1 AIS AtoN station.



IEC

Figure 1 – Functional block diagram of a Type 1 AIS AtoN Station

The characteristics of the type 1 AIS AtoN station are:

- transmits using FATDMA;
- no receive capability, therefore:
 - cannot be configured via the VDL,
 - cannot synchronise to other stations;
- configuration interface as defined by the manufacturer;
- 12,5 W nominal transmitter power or as defined by the manufacturer;
- dual channel transmission.

4.2.1.2 Controller

The controller composes Message 21 and ensures the correct operation of the AIS AtoN station on the VDL.

4.2.1.3 Timing and synchronisation device

This device provides the time and synchronisation for the controller.

4.2.1.4 Power supply

The power supply generates the internal voltages.

4.2.1.5 BIIT

The built-in integrity tests (BIIT) shall provide integrity monitoring.

4.2.1.6 EPFS

Electronic position fixing system (EPFS) provides the current position of the AtoN.

4.2.1.7 Configuration

The interface used to configure the AIS AtoN station.

4.2.2 Capability

Type 1 AIS AtoN station is capable of transmitting Message 21 using FATDMA.

4.2.3 Alternatives

4.2.3.1 Additional controller capability

In addition to Message 21, the controller shall compose optional output messages to the VDL using FATDMA as described in Table 3. No other messages are allowed. Also the Type 1 AIS AtoN station should not retransmit the addressed binary message (Messages 6 and 12). The number of retries should be set to 0.

Table 3 – Summary of optional Type 1 AIS AtoN Station messages

Msg. ID	Message name	Message description	Application examples
6	Binary addressed message	Binary data for addressed communication	Monitoring of AtoN lantern, power supply, etc.
8	Binary broadcast message	Binary data for broadcast communication	Meteorological and hydrological data
12	Addressed safety related message	Safety related data for addressed communication	Warn AtoN malfunctioning
14	Broadcast safety related message	Safety related data for broadcast communication	Warn AtoN malfunctioning
25	Single slot binary message	Binary data for addressed or broadcast communication	Status report

4.2.3.2 Configuration method

The type 1 AIS AtoN station may be configured using standard configuration sentences (IEC 61162-1 and as described in NMEA 1083:June 2012).

4.2.3.3 No EPFS

When a surveyed position is used, the EPFS may not be required.

4.2.3.4 TDMA transmitter (AIS Tx)

The TDMA transmitter may operate on a single channel.

4.2.3.5 External interface

The external interface(s) may be used for communication with external devices (for example AtoN lantern, AtoN power supply, hydrological and meteorological instruments, etc.).

4.2.3.6 Synthetic and Virtual AtoN

The AIS AtoN station may be capable of transmitting Message 21 for synthetic and virtual AIS AtoN.

4.3 Type 2 AIS AtoN station

4.3.1 Characteristics

Type 2 AIS AtoN station transmits on FATDMA slots.

Type 2 AIS AtoN station has a control receiver for messages containing configuration sentences (see NMEA 0183:June 2012). Figure 2 shows the functional block diagram of a type 2 AIS AtoN station.

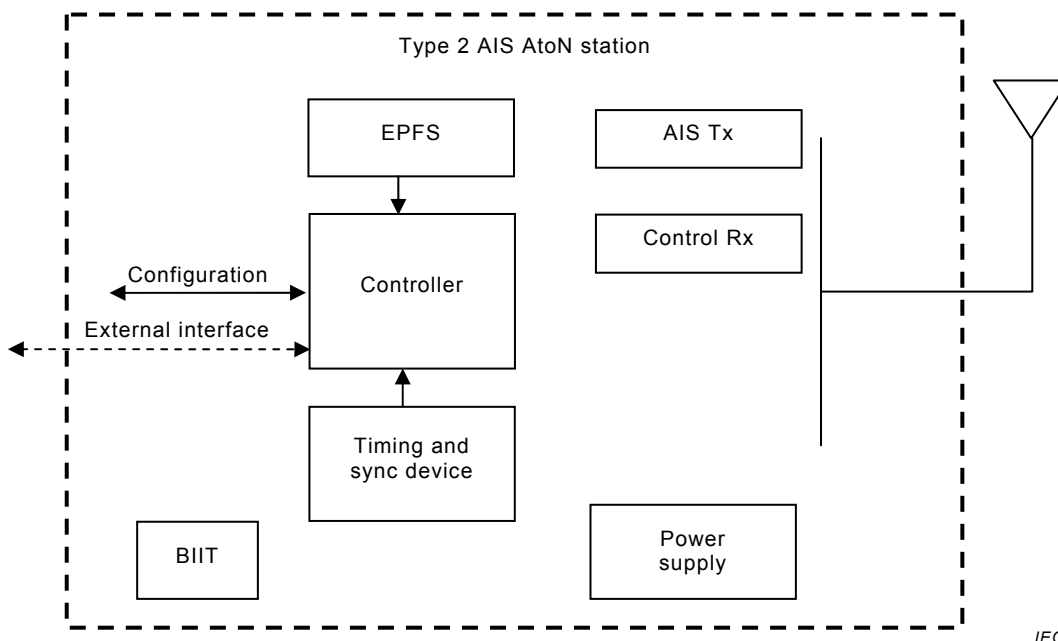


Figure 2 – Functional block diagram of a type 2 AIS AtoN station

The characteristics of the type 2 AIS AtoN station are:

- transmits using FATDMA;
- limited receiver capability, therefore cannot maintain a slot map and cannot use RATDMA access scheme;
- configuration interface as defined by the manufacturer;
- 12,5 W nominal transmitter power or as defined by the manufacturer;
- dual channel transmission.

4.3.2 Capability

A type 2 AIS AtoN station has the capabilities of a type 1 AIS AtoN station, with the addition of a control receiver.

4.3.3 Control receiver

The type 2 AIS AtoN station shall have a receiver operating on an AIS channel for control functions only.

4.3.4 Alternatives

The type 2 AIS AtoN station alternatives include all the type 1 AIS AtoN station alternatives as described in Table 3.

4.4 Type 3 AIS AtoN Station

4.4.1 Characteristics

Type 3 AIS AtoN station has AIS receive and transmit capabilities in accordance with Recommendation ITU-R M.1371. Figure 3 shows the functional block diagram of a type 3 AIS AtoN station.

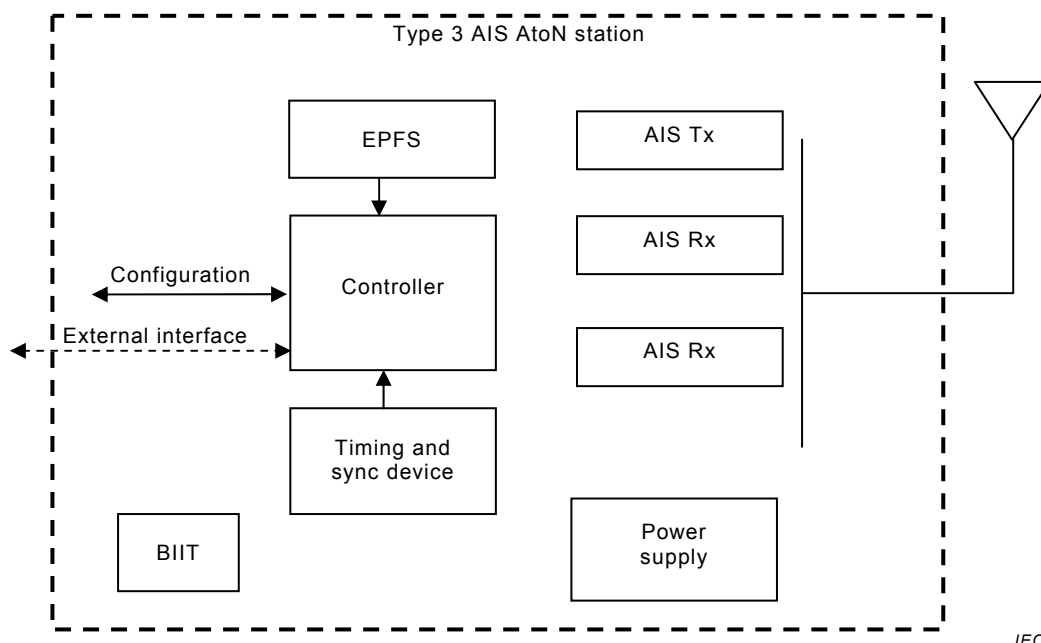


Figure 3 – Functional block diagram of a type 3 AIS AtoN station

The characteristics of the Type 3 AIS AtoN station are:

- reception capability on both AIS channels,
- transmission using FATDMA.

4.4.2 Capability

A type 3 AIS AtoN station has the capability of a type 1 AIS AtoN station, with the addition of AIS receivers.

4.4.3 AIS receiver (AIS Rx)

The type 3 AIS AtoN station shall have two AIS (TDMA) receiving processes to produce and maintain a slot map for autonomous interaction with the VDL.

4.4.4 Alternatives

4.4.4.1 General

The type 3 AIS AtoN station alternatives include all the type 1 and type 2 AIS AtoN station alternatives, with the additions of 4.4.4.2, 4.4.4.3 and 4.4.4.4.

4.4.4.2 Additional controller capability

In addition to Message 21, the controller composes optional output messages to the VDL as described in Table 4. No other messages are allowed, except repeating of SART messages, see 5.4.

Table 4 – Summary of optional Type 3 AIS AtoN Station messages

Msg. ID	Message name	Message description	Application examples
6	Binary addressed message	Binary data for addressed communication	Monitoring of AtoN equipment
7	Binary acknowledge message	Acknowledge of addressed binary message	
8	Binary broadcast message	Binary data for broadcast communication	Meteorological and hydrological data
12	Addressed safety related message	Safety related data for addressed communication	Warn AtoN malfunctioning
13	Safety related acknowledge message	Acknowledge of addressed safety related message	
14	Broadcast safety related message	Safety related data for broadcast communication	Warn AtoN malfunctioning
25	Single slot binary message	Binary data for addressed or broadcast communication	Status report
26	Multiple slot binary message	Binary data for addressed or broadcast communication	Status report

4.4.4.3 Access mode

4.4.4.3.1 Message 21

Transmits using FATDMA or RATDMA.

4.4.4.3.2 Messages other than Message 21

For each message other than Message 21, the type 3 AIS AtoN station may use FATDMA, CSTDMA or RATDMA.

4.4.4.4 Indirect and semaphore synchronisation

A type 3 AIS AtoN station may optionally synchronise to other AIS stations using UTC indirect synchronisation or other AIS stations acting as semaphore.

4.5 Optional direct configuration via VDL (types 2 and 3)

An AIS AtoN station can be configured via the VDL using Messages 6 or 25 with encrypted binary data as defined in Annex A.

The AIS AtoN station shall attempt to decrypt the binary data, and check that it is the intended recipient of the message before processing the message any further (see Table 5).

AES encryption with a key length of 128 bits is used to encrypt the configuration data over the VDL. The manufacturer may implement a longer key length. This shall be mentioned in the manual.

4.6 Optional configuration via VDL using chaining (type 3)

A chain of AIS AtoN stations allows for communication from a configuring AIS station to AIS AtoN stations that may be unable to communicate directly with the configuring AIS station. The messages are passed from station to station until the intended recipient is reached, see Figure 4.

The concept requires an AIS AtoN station to have knowledge of other AIS AtoN stations in the chain, namely its parent and all children below it in the chain. A “parent station” is a station that is in the direction of the configuring AIS station. A “child station” is a station that is directed away from a configuring AIS station. In order to prevent unnecessary retransmission of the messages, each AIS AtoN station in a chain shall have only one parent, but may have multiple children (this includes all synthetic and virtual AIS AtoN).

Message 6 or 25 is used for the transfer of the encrypted binary field. It is assumed that the whole chain has the same encryption key. The source ID and “MMSI of AtoN” fields of Message 6 or 25 is used to determine whether the received message is from a parent or child station. If not, then the received message is ignored.

When Message 6 is used, the destination ID shall be own station MMSI or zero. If the destination is zero, the message shall not be processed unless the source ID is the parent.

The encrypted binary data field is decrypted to obtain the function ID and “MMSI of AtoN”. If the source ID of the message is set to the parent station ID and the function ID is a configuration, query request or function, and the MMSI of the AIS AtoN station is in the chain, then the message shall be retransmitted, with the source ID set to its own MMSI. If the source ID of the message is set to a child MMSI and the function ID is a query response, then the message shall be retransmitted, with the destination ID set to the parent MMSI. Any other combination of known or unknown MMSI is ignored (see Table 5).

The AIS AtoN station shall attempt to decrypt the binary data, and check that it, or one of its children, is the intended recipient of the message, before processing the message any further.

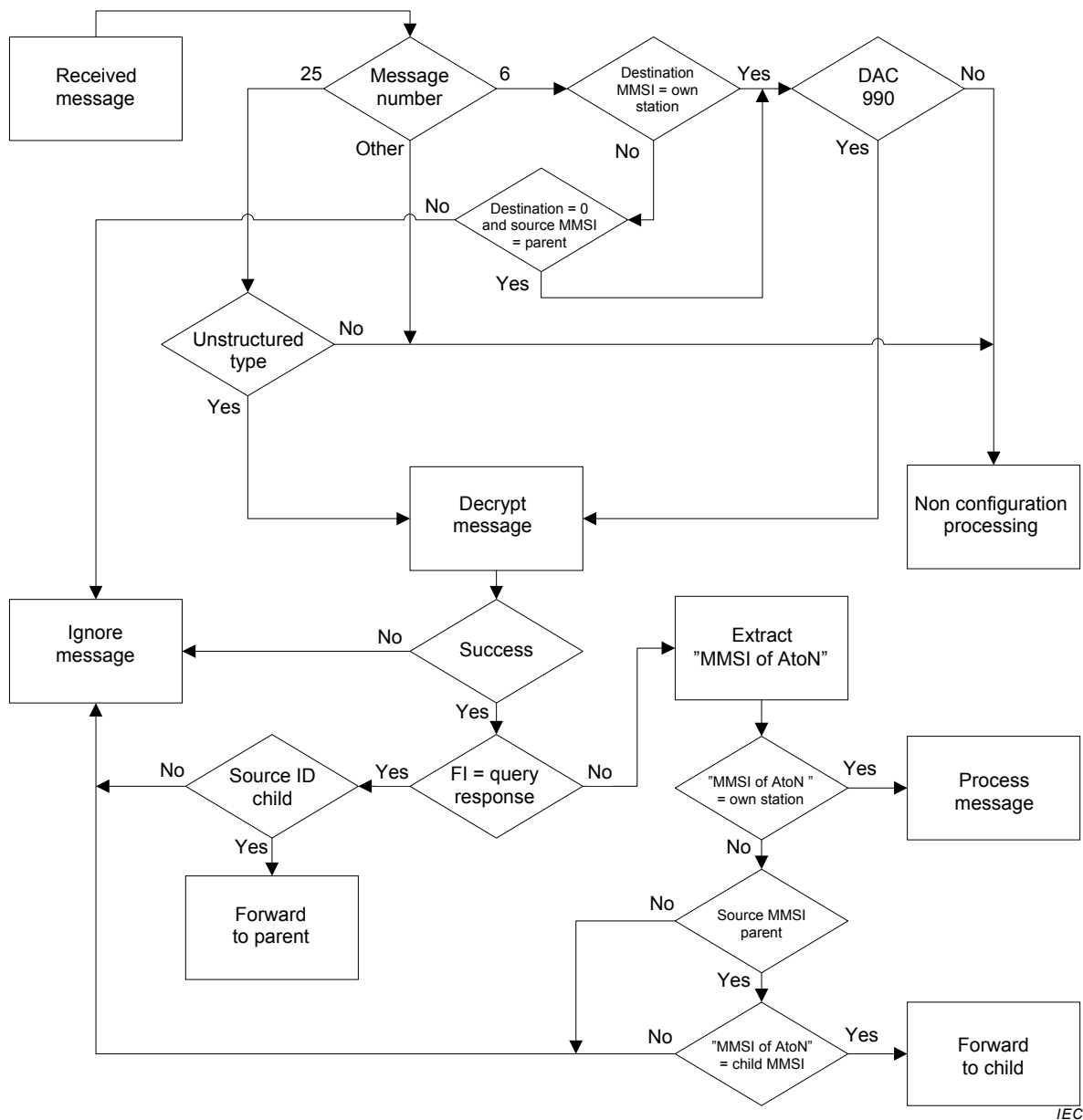


Figure 4 – VDL configuration decision tree

Table 5 – Configuration of AIS AtoN stations via VDL

Source ID	Type of Message according to function ID from Table in A.1	“MMSI of AtoN” from encrypted binary field	Action by own station
Parent	Query response	Any	Ignore
Parent	Configuration, functional or query request	Not own station	Verify that the destination ID = own MMSI or 0 ^b , then verify intended recipient is a child and re-transmit message with source ID set to own station MMSI.
Parent	Configuration or functional	Own station	Verify that the destination ID = own MMSI or 0 ^b , then process
Parent	Query request	Own station	Verify that the destination ID = own MMSI or 0 ^b , then send response with “MMSI of AtoN” = own station
Child	Query response	Any	Re-transmit message to the parent without changing the “MMSI of AtoN”
Child	Configuration, query request or functional	Any	Ignore
Other ^a	Configuration or functional	Own station	Verify that the destination ID = own MMSI ^b , then process
Other ^a	Query request	Own station	Verify that the destination ID = own MMSI ^b , then send response with “MMSI of AtoN” = own station
Other ^a	Any	Not own station	Ignore
^a Other is any MMSI that is not a parent or child ^b Only check when Message 6 is used			

5 Requirements for AIS AtoN stations

5.1 Physical layer

5.1.1 Transmitter requirements

5.1.1.1 Channel

The AIS AtoN station shall operate on dual channels, channel 1 and channel 2, in the VHF maritime mobile service band, using 25 kHz bandwidth, according to the ITU Radio Regulations, Appendix 18.

5.1.1.2 Channel alternatives

The type 1, type 2 and type 3 AIS AtoN stations may transmit on a single channel only, either channel 1 or channel 2.

5.1.1.3 Parameter settings

Table 6 and Table 8 are derived from Recommendation ITU-R M.1371 and give the parameters required for an AIS AtoN station. For the meaning of the symbols and additional information (footnotes), refer to the appropriate section of Recommendation ITU-R M.1371.

Table 6 – Required parameter settings for an AIS AtoN Station

Symbol	Parameter name	Setting (FATDMA, RATDMA)	Setting (CSTDMA)
PH.RFR	Regional frequencies	Two channels between 156,025 MHz and 162,025 MHz	
PH.AIS1	Channel 1 (default channel 1)	161,975 MHz	
PH.AIS2	Channel 2 (default channel 2)	162,025 MHz	
PH.BR	Bit rate	9600 bps	
PH.TS	Training sequence	24 bits	
PH.TST	Transmitter settling time (transmit power within 20 % of final value. Frequency stable to within $\pm 1,0$ kHz of final value). Tested at manufacturers declared transmit power	$\leq 1,0$ ms	≤ 313 μ s
	Ramp down time	≤ 832 μ s	≤ 313 μ s
	Transmission duration	≤ 80 ms	$\leq 23\,333$ μ s
	Transmission delay	No delay	2083 μ s
	Transmitter output power	12,5 W or as defined by manufacturer	

In addition, the constants of the physical layer of the AIS AtoN station shall comply with the values given in Table 7 and Table 8.

Table 7 – Required settings of physical layer constants

Symbol	Parameter name	Value
PH.DE	Data encoding	NRZI
PH.FEC	Forward error correction	Not used
PH.IL	Interleaving	Not used
PH.BS	Bit scrambling	Not used
PH.MOD	Modulation	Bandwidth adapted GMSK

Table 8 – Modulation parameters of the physical layer of the AIS AtoN station

Symbol	Name	Value
PH.TXBT	Transmit BT-product	0,4
PH.RXBT	Receive BT-product	0,5
PH.MI	Modulation index	0,5

5.1.1.4 Transmitter shutdown

An automatic transmitter shutdown shall be provided to ensure that transmission does not continue for more than 2 s. This shutdown shall be independent of any software.

5.1.1.5 Transmitter characteristics

The technical characteristics as specified in Table 9 should apply to the TDMA transmitter.

Table 9 – Minimum required TDMA transmitter characteristics

Transmitter parameters	Requirements
Carrier power error	$\pm 1,5$ dB (normal), ± 3 dB (extreme)
Carrier frequency error	± 500 Hz (normal), $\pm 1\,000$ Hz (extreme)
Slotted modulation mask	-25 dBc $\Delta f_c < \pm 10$ kHz -60 dBc ± 25 kHz $< \Delta f_c < \pm 62,5$ kHz
Transmitter test sequence and modulation accuracy	$< 3\,400$ Hz for bit 0, 1 (normal and extreme) $2\,400$ Hz ± 480 Hz for bits 2, 3 (normal and extreme) $2\,400$ Hz ± 240 Hz for bits 4... 31 (normal, $2\,400$ Hz ± 480 Hz extreme) For bits 32 ... 199 $1\,740$ Hz ± 175 Hz (normal, $1\,740$ Hz ± 350 Hz extreme) for a bit pattern of 0101 $2\,400$ Hz ± 240 Hz (normal, $2\,400$ Hz ± 350 Hz extreme) for a bit pattern of 00001111
Transmitter output power versus time	Power within mask shown in Figure 5 and timings given in Table 12
Spurious emissions	-36 dBm 9 kHz... 1 GHz -30 dBm 1 GHz... 4 GHz

5.1.2 Receiver requirements

The technical characteristics as specified in Table 10 should apply to the TDMA receivers.

Table 10 – Required receiver characteristics

Receiver parameters	Required result (Max PER or absolute level in dBm)	Type 3 (TDMA receiver)		Type 2 (control receiver)	
		Wanted signal	Unwanted signals	Wanted signals	Unwanted signals
Sensitivity	20%	-107 dBm normal -104 dBm normal at ± 500 Hz offset -101 dBm extreme	-	-97 dBm normal -94 dBm normal at ± 500 Hz offset -91 dBm extreme	-
Error at high input levels	2% 10%	-77 dBm -7 dBm	- -	-77 dBm -7 dBm	- -
Co-channel rejection	20%	-101 dBm	-111 dBm -111 dBm at ± 1000 Hz offset	-91 dBm	-107 dBm -107 dBm at ± 1000 Hz offset
Adjacent channel selectivity	20%	-101 dBm	-31 dBm	-91 dBm	-31 dBm
Spurious response rejection	20%	-101 dBm	-31 dBm	-91 dBm	-31 dBm
Intermodulation response rejection	20%	-101 dBm	-36 dBm	-91 dBm	-36 dBm
Blocking and desensitisation	20%	-101 dBm	-23 dBm (< 5 MHz) -15 dBm (> 5 MHz)	-91 dBm	-33 dBm (< 5 MHz) -25 dBm (> 5 MHz)
Spurious emissions	-57 dBm or less (9 kHz-1 GHz) -47 dBm or less (1 GHz-4 GHz)	-	-	-	-

5.1.3 Power consumption

The manufacturer shall state the average power consumed by the AIS AtoN station under defined test conditions.

5.1.4 Environmental requirements

The manufacturer shall declare the category for durability and resistance to environmental conditions (e.g. durability and resistance to environment, electromagnetic emissions, and immunity to electromagnetic environment) for the EUT as specified in IEC 60945.

5.2 Link layer

5.2.1 General

The link layer specifies how data shall be formatted and transmitted on the VDL.

The link layer requirements are referenced to Recommendation ITU-R M.1371.

5.2.2 AIS Messages

5.2.2.1 Message 21 format and content

5.2.2.1.1 AtoN status bits

The AIS AtoN station shall broadcast Message 21, as defined in Recommendation ITU-R M.1371. In Message 21, the status bits (7 6 5 4 3 2 1 0) are numbered so that bit 7 is the most significant bit, and bit 0 is the least significant bit. The first three bits (i.e. 7, 6 and 5) shall be used to define a page ID. The page ID can range from 0 to 7, allowing 8 pages. Page ID 0 shall not be used for the regional/international application.

Annex B defines AtoN status bit pages.

5.2.2.1.2 Virtual and Synthetic AIS AtoN message

An AIS AtoN station, when broadcasting Message 21 for virtual and synthetic AtoN, shall use the MMSIs allocated to the virtual and synthetic AtoN as issued under the same series for real AIS AtoN stations. For synthetic AIS AtoN messages, the repeat indicator field shall be set to 1 to signify that the message is transmitted from a position other than that provided in the message. All parameters of all virtual and synthetic AIS AtoN messages shall be configurable.

5.2.2.2 Additional messages

In addition to Message 21, the AIS AtoN station may transmit other messages, in accordance with Recommendation ITU-R M.1371. These are summarised in Table 2.

5.2.3 Synchronisation

5.2.3.1 General

Synchronisation is used to determine the TDMA frames and individual slots so that the transmission of the AIS message is performed within the desired slot. The synchronisation for the AtoN AIS station shall be UTC direct.

If UTC direct synchronisation is lost, the AIS AtoN station shall cease transmitting or optionally behave as declared by the manufacturer.

5.2.3.2 Optional indirect synchronisation

When UTC synchronisation has failed, the type 3 AIS AtoN station may use indirect synchronisation or synchronise to a station acting as a semaphore.

5.2.3.3 Synchronisation accuracy

The transmission timing error, including jitter, of the AtoN AIS shall be within the limits as defined in Table 11, referring to an ideal transmission as defined by Recommendation ITU-R M.1371.

Table 11 – Maximum allowed time error

Synchronisation mode	Maximum allowed time error
UTC direct synchronisation	± 1 bit ($\pm 104 \mu\text{s}$)
UTC indirect synchronisation	± 3 bits ($\pm 312 \mu\text{s}$)
Semaphore synchronisation	± 3 bits ($\pm 312 \mu\text{s}$)

5.2.4 VDL access schemes

5.2.4.1 General

The AIS AtoN station shall use FATDMA (or RATDMA only for Type 3) for the transmission of Message 21.

The AIS AtoN station may optionally transmit Messages 6, 7, 8, 12, 13, 14, 25 and 26. The maximum length of Messages 6, 8, 12, and 14 is three slots per message when using FATDMA or RATDMA (if implemented). CSTDMA may be used for one-slot messages only.

To ensure a consistent slot range, the message transmission slot interval valid range is 375 to 3240000 slots. The interval shall evenly divide a minute, hour, or day, and shall be an integer number of slots. This results in the following valid intervals:

- seconds: 10, 12, 20, 30;
- minutes: 1, 2, 3, 4, 5, 6, 10, 12, 15, 20, 30;
- hours: 1, 2, 3, 4, 6, 8, 12, 24.

5.2.4.2 Type 3 AIS AtoN station

The type 3 AIS AtoN station shall use FATDMA and may use RATDMA (if implemented) for Message 21. The type 3 AIS AtoN station shall use the VDL access scheme defined by its configuration.

Single slot binary and safety-related messages may be transmitted using FATDMA, RATDMA or CSTDMA, if implemented. When enabled, acknowledgement Messages 7 and 13 shall be transmitted within 4 s of receiving Messages 6 and 12 using FATDMA, CSTDMA or RATDMA. When acknowledgement is enabled, transmission of Messages 6 and 12 shall be repeated if no acknowledgment is received within 4 s of each transmission (up to 3 times).

5.2.4.3 FATDMA VDL access

Slot reservations made by Message 20 shall be ignored when scheduling an FATDMA transmission, since the base station may be reserving them for use by the AIS AtoN station.

5.2.4.4 RATDMA VDL Access

RATDMA shall use slots according to Recommendation ITU-R M.1371.

The AtoN shall monitor the VDL for a minimum of 1 min before RATDMA transmission.

When receivers are not operating continuously, slots reserved by a received Message 20 shall be observed with an extended time out of between 12 h and 24 h. Additionally receivers shall be turned on for 7 consecutive minutes at power on and at least once per 12 h period to allow latest FATDMA reservations to be captured.

The start slot defines the first slot of the RATDMA selection interval. If the start slot is not defined, then it is randomly selected, which is the default behaviour when scheduling transmissions using RATDMA.

5.2.4.5 **FATDMA and RATDMA VDL access**

5.2.4.5.1 **Transmission timing**

The transmitter shall begin transmission by turning on the RF power after slot start (T_0). The unit shall and reach -3 dB before T_{B1} (see Figure 5).

The transmitter shall be turned off after the last bit of the transmission packet has left the transmitting unit; nominal transmission end is T_e .

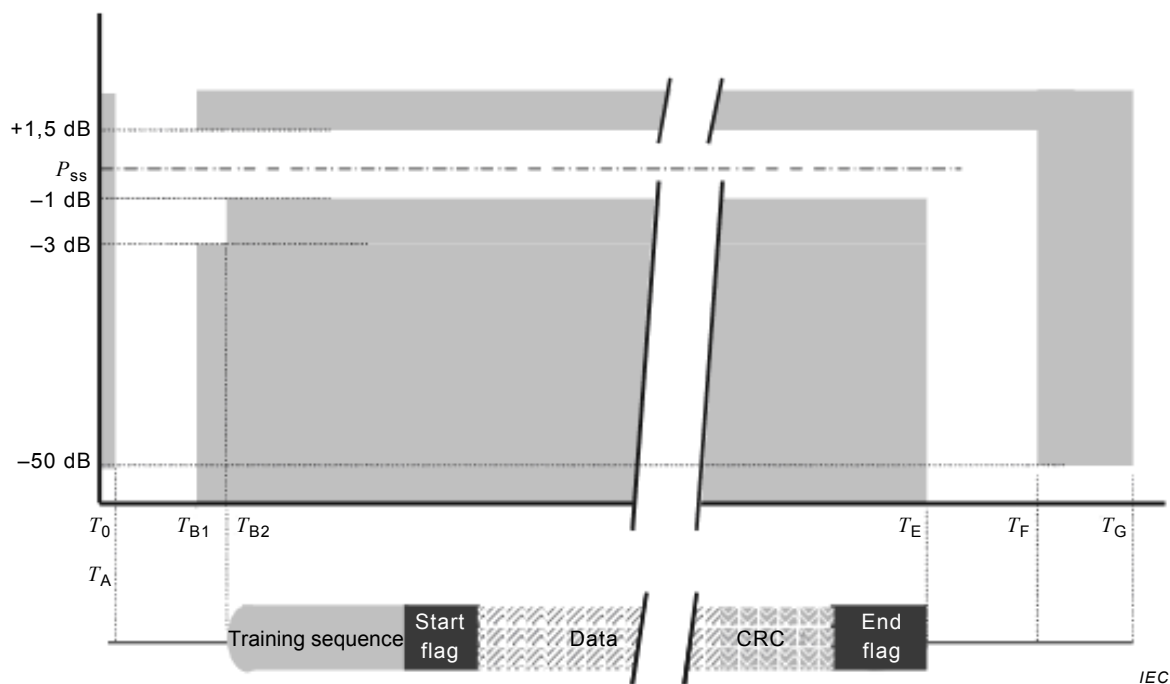


Figure 5 – Power versus time mask

The access to the medium is performed as shown in Figure 5 and Table 12.

Table 12 – Definitions of timing for Figure 5

Reference	Bits	Time in ms	Definition
T_0	0	0	Start of transmission slot. Power shall not exceed -50 dB of P_{ss} before T_0
T_A	0-6	0 – 0,624	Power exceeds -50 dB of P_{ss}
T_B	T_{B1}	6	Power shall be within +1,5 dB or -3 dB of P_{ss}
	T_{B2}	8	Power shall be within +1,5 dB or -1 dB of P_{ss}
T_E	104 – 748	10,833 – 77,917	Power shall remain within +1,5 dB or -1 dB of P_{ss} during the period T_{B2} to T_E The T_E can vary depending on message type, data content and bit stuffing bits from minimum 104 bits for the shortest possible message (Message 14 and no text content) to maximum length of 740 bits for a three-slot message. T_E shall not exceed; • 236 bits for a one-slot message • 492 bits for a two-slot message • 748 bits for a three-slot message A station may occupy at maximum three consecutive slots for one continuous transmission. Only a single application of the overhead (ramp up, training sequence, flags, FCS, buffering) is required for a long transmission packet. The length of a long transmission packet should not be longer than necessary to transfer the data; i.e. the AIS should not add filler.
T_F	112 – 756	11,667 – 78,787	Power shall be -50 dB of P_{ss} and stay below this
T_G	256, 512 or 768	26,667 one slot TX 53,333 two slot TX 80,000 three slot TX	Start of next transmission time period

5.2.4.5.2 Link sub-layer 1: medium access control (MAC)

Refer to Recommendation ITU-R M.1371 and 5.2.3 for synchronisation.

5.2.4.5.3 Link sub-layer 2: data link service (DLS)

Refer to Recommendation ITU-R M.1371.

5.2.4.5.4 Link sub-layer 3: link management entity (LME)

Refer to Recommendation ITU-R M.1371.

5.2.4.6 CSTDMA VDL access mode

The operation of CSTDMA in the AIS AtoN station shall be in accordance with Recommendation ITU-R M.1371 and tested according to IEC 62287-1, however the AIS AtoN station is allowed to use the same transmit power setting for CSTDMA as for RATDMA and FATDMA.

All CSTDMA transmissions shall be limited to one slot.

5.2.5 Autonomous mode

5.2.5.1 General

The AIS AtoN station shall always operate autonomously and determine its own schedule for transmission of its messages based on its configuration. The station shall automatically resolve scheduling conflicts with other stations when using CSTDMA and RATDMA.

5.2.5.2 Message 21 reporting intervals

In accordance with ITU-R M.1371 the default reporting interval for Message 21 shall be 3 min. This shall be configurable to other reporting intervals.

The AIS AtoN station shall be configurable to decrease the reporting interval for Message 21 when the AtoN is off-position.

5.2.5.3 Channel operation

5.2.5.3.1 Reporting modes for Message 21

The AIS AtoN station shall transmit Message 21 at the configured reporting interval. As indicated in Figure 6, transmissions shall be:

- Mode A operation: Message 21 transmission alternates between channel 1 and channel 2 in a subsequent frame that is nominally one reporting interval later. Message 21 content is updated for each message, or
- Mode B operation: the same Message 21 transmitted on channel 1 and channel 2 in quick (nominally 4 s) succession. The first transmission of each Message 21 may be on either channel 1 or channel 2. The second transmission shall be on the other channel, or
- Mode C operation: Message 21 transmitted on a single channel, either channel 1 or channel 2. Message 21 content updated at each reporting interval.

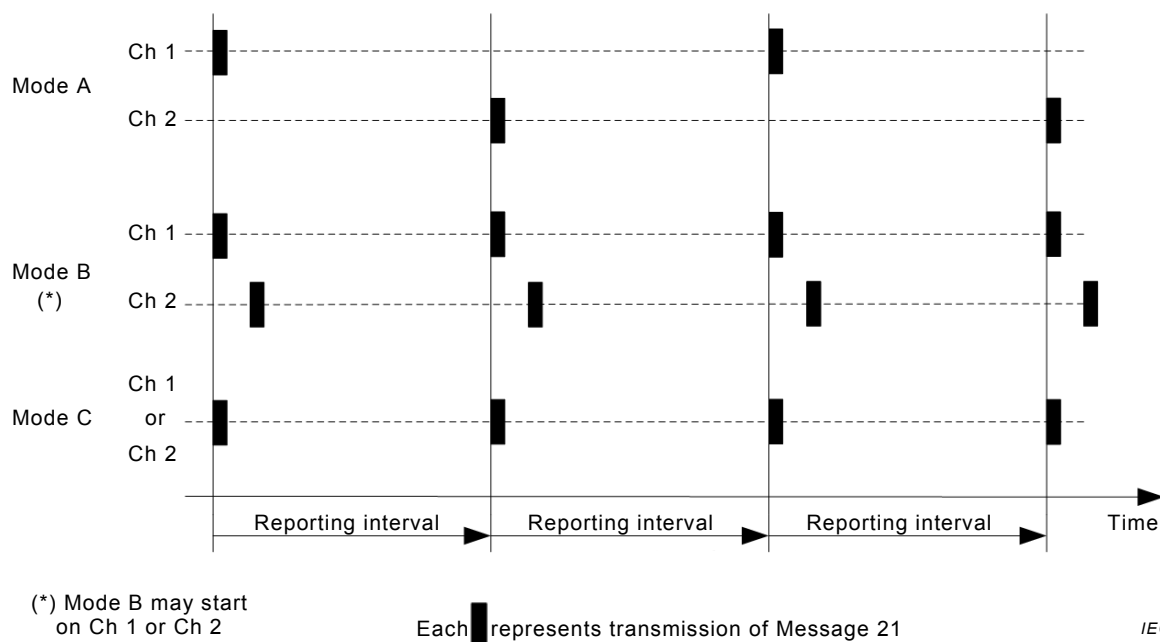


Figure 6 – Reporting modes for Message 21

5.2.5.3.2 Single channel operation for Message 21

The type 1 and type 2 AIS AtoN stations shall transmit on the designated channel using FATDMA slots of the selected frames in the UTC hour (as per mode C, Figure 6).

5.2.6 Electronic position fix system

5.2.6.1 Position source

An EPFS shall be used as the source for AtoN position reporting unless a surveyed position is used.

If the internal EPFS is a GNSS receiver, it shall meet the following requirements of the IEC 61108 series: position accuracy, acquisition, re-acquisition, receiver sensitivity, RF dynamic range, interference susceptibility, position update, failure warnings, status indications and integrity flag, provide a resolution of one ten-thousandth of a minute of arc and use WGS 84 datum.

If another type of EPFS is used, then it shall meet the requirements of the applicable standard and use WGS 84 datum.

5.2.6.2 Augmentation systems

The EPFS may be capable of being corrected using any suitable augmentation system (for example, SBAS, radio beacon DGNSS, evaluation of Message 17, etc.). The manufacturer shall declare which augmentation systems can be used, and that the augmentation system does not adversely affect Message 21 transmissions.

The manufacturer shall declare if the EPFS is not capable of being corrected.

5.2.6.3 Invalid position

If the EPFS device is unable to provide a valid position fix, then the reported position shall be longitude = 181° = not available = default and latitude = 91° = not available = default and the time stamp field shall be set to a value of 63.

5.2.6.4 Off-position monitoring

If the floating AtoN is within its on-position limits, the off-position indicator shall be set to "0" in the transmitted Message 21.

If a floating AtoN is off-position, the AIS AtoN station shall identify this condition and the off-position indicator shall be set to "1" in the transmitted Message 21. The reporting interval when the AIS AtoN station is off-position shall be determined by its configuration (see 5.2.5.2).

5.2.6.5 Position source alternatives for types 1, 2 and 3

If a surveyed position is used, an EPFS is not required.

When a surveyed position is used, the latitude and longitude fields of the transmitted Message 21 shall contain the surveyed position, the "type of electronic position fixing device" is set to "7" (surveyed), the "RAIM-Flag" field is set to "0", the off-position indicator field is set to "0" and the "position accuracy" field is set in accordance with the accuracy of the surveyed position (i.e. "1" if better than 10 m, otherwise "0").

5.2.7 Built-in integrity test

The AIS AtoN station shall have a built-in integrity test (BIIT) process which tests for conditions as described in Table 13. If standard configuration sentences are used, the warning/notification conditions shall be sent via sentence ADS. The manufacturer may optionally output an ALR sentence using the alarm ID defined in Table 13.

The health flag in the AtoN status bits defined in Annex A shall be set if any of the BIIT conditions in Table 13 are detected.

Table 13 – AIS AtoN Station reaction to BIIT conditions

Alarm ID	Condition	Reaction of the AIS AtoN station
001	AIS: Tx malfunction	Stop transmission
002	AIS: antenna VSWR exceeds limit	Continue operation
003	AIS: Rx Channel 1 malfunction	Stop RATDMA and CSTDMA transmissions on affected channel
004	AIS: Rx Channel 2 malfunction	Stop RATDMA and CSTDMA transmissions on affected channel
006	AIS: general failure	Stop transmission
007	AIS: direct synchronisation failure	As defined by manufacturer
026	AIS: EPFS failure	Continue operation
037	AIS: synchronisation lost	As defined by manufacturer
038	AIS: DGNSS input failed	Continue operation

5.3 Configuration method

5.3.1 General

The configuration method shall be as defined by the manufacturer and held in non-volatile memory.

Configuration may use standard configuration sentences either directly or via the VDL. Query for the encryption key is not allowed. The configuration method shall:

- configure the content for Message 21;
- configure transmission parameters for Message 21 and any other messages supported by the manufacturer;
- configure the behaviour of the AIS AtoN station when synchronisation is lost;
- configure the behaviour of the AIS AtoN station when off position.

The manufacturer shall provide a means to verify configuration and version information of the AIS AtoN station.

5.3.2 Alternative for types 1, 2 and 3

5.3.2.1 General

Standard PI sentences Table 14 provides an overview of the sentences that may be used for configuration of AIS AtoN applications. It includes sentences from IEC 61162-1 and AIS AtoN specific sentences given in NMEA 0183:June 2012.

These standard sentences shall be implemented to provide at least one standard method for configuration. Sentences which support an optional, not implemented, function are not required.

It is possible to implement these sentences using a separate interface unit that communicates with the AtoN unit with a proprietary communication method.