

**Maritime navigation and radiocommunication
equipment and systems –
Digital interfaces –**

**Part 100:
Single talker and multiple listeners –
Extra requirements to IEC 61162-1
for the UAIS**

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

**MARITIME NAVIGATION AND RADIOCOMMUNICATION EQUIPMENT
AND SYSTEMS – DIGITAL INTERFACES –****Part 100: Single talker and multiple listeners –
Extra requirements to IEC 61162-1 for the UAIS**

FOREWORD

A PAS is a technical specification not fulfilling the requirements for a standard, but made available to the public.

IEC-PAS 61162-100 has been processed by IEC technical committee 80: Maritime navigation and radiocommunication equipment and systems.

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

This PAS was approved for publication by the P-members of the committee concerned as indicated in the following document:

Draft PAS	Report on voting
80/330/PAS	80/338/RVD

Following publication of this PAS, the technical committee or subcommittee concerned will investigate the possibility of transforming the PAS into an International Standard.

This PAS document relates to International Standard IEC 61162-1. The document has been coordinated with the TC 80 Working Group preparing the AIS Standard IEC 61993 Part 2, and the NMEA Standards Committee.

- 1) The IEC (International Electrotechnical Commission) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of the IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, the IEC publishes International Standards. Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. The IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
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- 5) The IEC provides no marking procedure to indicate its approval and cannot be rendered responsible for any equipment declared to be in conformity with one of its standards.
- 6) Attention is drawn to the possibility that some of the elements of this International Standard may be the subject of patent rights. The IEC shall not be held responsible for identifying any or all such patent rights.

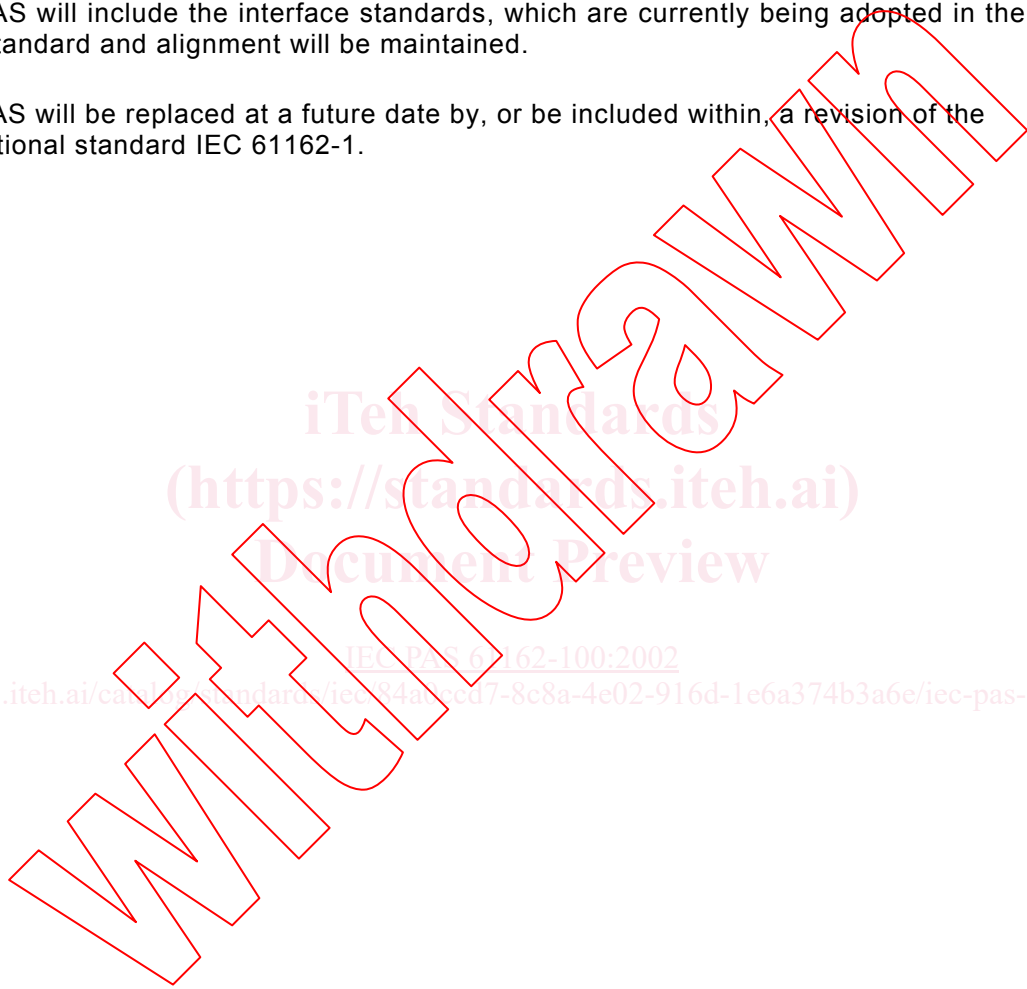
INTRODUCTION

This document is issued as a IEC Publicly Available Specification according to the IEC/PAS approval process. This agreed process allows the new information needed for the development of UAIS to be placed in the public domain in a shorter timescale than revising the appropriate International standards.

This document provides information on the necessary interface standards for use with the UAIS, which are not available in the current issue of IEC 61162-1 Ed 2. The information in this PAS supersedes that in annex B (informative) of IEC 61993-2, the Standard for UAIS.

This PAS will include the interface standards, which are currently being adopted in the NMEA 0183 standard and alignment will be maintained.

This PAS will be replaced at a future date by, or be included within, a revision of the international standard IEC 61162-1.



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<https://standards.iteh.ai/can/view/standard/iec/84ad3cd7-8c8a-4e02-916d-1e6a374b3a6e/iec-pas-61162-100-2002>

MARITIME NAVIGATION AND RADIOCOMMUNICATION EQUIPMENT AND SYSTEMS – DIGITAL INTERFACES –

Part 100: Single talker and multiple listeners – Extra requirements to IEC 61162-1 for the UAIS

1 Scope

All the requirements to effectively transmit the data of the mobile TDMA based AIS station are included in this PAS.

Whilst the established Standard IEC 61162-1 sentences are available for certain functions a number of new sentences are now required to permit all specified AIS data to be transmitted. The total requirements for the AIS are included in this PAS document but the current Standard IEC 61162-1 should be referred to for the reference data applicable to the existing format.

The reader should be aware that certain of the new sentences may include new features not currently included in IEC 61162-1. For this reason the PAS has been divided into three sections, namely: -

- Existing IEC 61162-1 sentences to be employed in the AIS (and elsewhere) – see clause 5
- Additional IEC 61162-1 sentences to cover new AIS requirements, but maintaining the standard format – see clause 6
- Proposed new sentence structures to meet specific AIS requirements and which cannot be accommodated in the standard IEC 61162-1 format. These new sentence standards are essentially designed to meet the AIS requirements and are not for general use – see clause 7 and annex A.

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.

The references contained in IEC 61162-1 apply to this PAS. In addition the following apply:

IEC Standard 61993 Part 2: *Universal Shipborne Automatic Identification System (AIS); Operational and Performance Requirements, Methods of Test and required Test Results.*

ITU-R M.1371-1:2001 *Technical characteristics for a Universal Shipborne Automatic Identification System (AIS) using TDMA in the VHF maritime mobile band.*

IMO Recommendation on Performance Standards for a Universal Automatic Identification System (AIS) MSC.74(69)

IMO SOLAS Convention, Chapter V (2002)

IMO HSC Code, Chapter 13

ISO/IEC 10646-1 (1993-05). *Unicode Standard*

3 Definitions

3.1 Parametric sentences

(See IEC 61162-1 clause 5 Data format protocol)

These sentences start with the “\$” (HEX 24) delimiter and represent the majority of approved sentences defined by IEC 61162-1 and this PAS. This is the preferred method for conveying information. Refer to clauses 5 and 6 for details.

The maximum number of characters in a sentence shall be 82, consisting of a maximum of 79 characters between the starting delimiter “\$” and the terminating delimiter <CR><LF>.

The minimum number of fields in a sentence is one (1). The first field shall be an address field containing the identity of the talker and the sentence formatter, which specifies the number of data fields in the sentence, the type of data they contain and the order in which the data fields are transmitted. The remaining portion of the sentence may contain zero or multiple data fields.

The maximum number of fields allowed in a single sentence is limited only by the maximum sentence length and shall always be used even if data for that field is unavailable.

The basic rules for parametric sentence structures are:

- The sentence begins with the “\$” delimiter.
- Only approved sentence formatters are allowed. Formatters used by special-purpose encapsulation sentences cannot be re-used. (See IEC 61162-1, clause 6.2 (table 5).)
- Only valid characters are allowed. (See IEC 61162-1, clause 6.1 (tables 1 and 2).)
- Only approved field types are allowed. (See IEC 61162-1, clause 6.2 (table 6).)
- Data fields (parameters) are individually delimited, and their content is identified and often described in detail by this standard.
- Encapsulated non-delimited data fields are NOT ALLOWED.

3.2 Encapsulation sentences

(New definition not currently in IEC 61162-1)

These sentences start with the “!” (HEX 21) delimiter. The function of this special-purpose sentence structure is to provide a means to convey information, when the specific data content is unknown or greater information bandwidth is needed. This is similar to a modem that transfers information without knowing how the information is to be decoded or interpreted.

The basic rules for encapsulation sentence structures are:

- The sentence begins with the “!” delimiter.
- Only approved sentence formatters are allowed. Formatters used by conventional parametric sentences can not be re-used. (See clauses 5 and 6, and IEC 61162-1, clause 6.2 (table 5)).
- Only valid characters are allowed. (See IEC 61162-1, clause 6.1 (tables 1 and 2).)
- Only approved field types are allowed. (See annex B.5 and IEC 61162-1, clause 6.2 (table 6).)
- Only Six bit coding may be used to create encapsulated data fields. (See annex B.5.)
- Encapsulated data fields may consist of any number of parameters, and their content is not identified or described by this standard.
- The sentence must be defined with one encapsulated data field and any number of parametric data fields separated by the “,” data field delimiter. The encapsulated data

field shall always be the second to last data field in the sentence, not counting the checksum field. (See IEC 61162-1, clause 5.2.2.)

- The sentence contains a "Total Number Of Sentences" field. (See annex A.)
- The sentence contains a "Sentence Number" field. (See annex A.)
- The sentence contains a "Sequential Message Identifier" field. (See annex A.)
- The sentence contains a "Fill Bits" field immediately following the encapsulated data field. The Fill Bits field shall always be the last data field in the sentence, not counting the checksum field. (See annex A.)

NOTE : This method of conveying information is to be used only when absolutely necessary, and will only be considered when one or both of two conditions are true, and when there is no alternative.

Condition 1: The data parameters are unknown by devices having to convey the information. For example, the ABM and BBM sentences meet this condition, because the content is not known to the Automatic Identification System (AIS) transponder.

Condition 2: When information requires a significantly higher data rate than can be achieved by the IEC61162-1 (4,800baud) and IEC61162-2 (38,400baud) standards utilising parametric sentences.

By encapsulating a large amount of information, the number of overhead characters such as " " field delimiters can be reduced, resulting in higher data transfer rates. It is very unusual for this second condition to be fulfilled. As an example, an AIS transponder has a data rate capability of 4,500 messages per minute, and satisfies this condition, resulting in the VDM and VDO sentences.

4 Data requirements of the AIS

A portion of the information broadcast by an AIS unit is obtained from sensors using existing IEC 61162-1 sentence formatters. The sensor data and the existing sentence formatters recognised by the AIS unit are listed in IEC 61993-2 (See IEC 61993-2 clauses : 6.10.1.1; 7.6.2.3, table 9 – preferred IEC 61162-1 sensor sentences; and 7.6.3.3.)

Expanded data requirements, not satisfied by the present IEC 61162-1 sentence formatters, are satisfied by the new sentence formatters described in clauses 6 and 7. The new sensor input sentence formatters include : ABM, ACA, AIR, BBM, LRF, LRI, SSD AND VSD.

5 Existing IEC 61162-1 sentences for the AIS

Listing of approved sentences as given in IEC 61162-1 that apply. Only the sentence header and description to be given here. Refer to IEC 61162-1 clause 6.3

Formatter	Meaning
ACK	Acknowledgement alarm
ALR	Set alarm state
DSI	DSC transponder initialise
DSR	DSC transponder response
DTM	Datum reference
GBS	GNSS satellite fault detection
GLL	Geographic position, latitude/longitude
GNS	GNSS fix data
HDT	Heading true
OSD	Own ship data
RMC	Recommended minimum specific GNSS data
ROT	Rate of turn
RTE	Routes
TXT	Text transmission
VBW	Dual ground/water speed
VTG	Course over ground and ground speed
WPL	Waypoint location

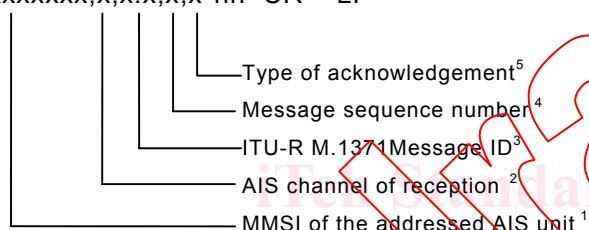
6 Additional IEC 61162-1 parametric sentences for the AIS

Listing of the new approved sentences, including structure and notes

ABK - AIS addressed and binary broadcast acknowledgement

The ABK-sentence is generated when a transaction, initiated by reception of an ABM, AIR, or BBM sentence, is completed or terminated. This sentence provides information about the success or failure of a requested ABM broadcast of either ITU-R M.1371 messages 6 or 12. The ABK process utilises the information received in ITU-R M.1371 messages 7 and 13. Upon reception of either a VHF Data-link message 7 or 13, or the failure of messages 6 or 12, the AIS unit delivers the ABK sentence to the external application. This sentence is also used to report to the external application the AIS unit's handling of the AIR (ITU-R M.1371 message 15) and BBM (ITU-R M.1371 messages 8, 14, 19, and 21) sentences. The external application initiates an interrogation through the use of the AIR-sentence, or a broadcast through the use of the BBM sentence. The AIS unit generates an ABK sentence to report the outcome of the AIR, or BBM broadcast process.

\$--ABK,xxxxxxxx,x,x.x,x,x*hh<CR><LF>



NOTE 1 Identifies the distant addressed AIS unit involved with the acknowledgement. If more than one MMSI are being addressed (ITU-R M.1371 messages 15 and 16), the MMSI of the first distant AIS unit, identified in the message, is the MMSI reported here. This is a null field when the ITU-R M.1371 message type is 8 or 14.

NOTE 2 Indication of the VHF Data Link channel upon which a message type 7 or 13 acknowledgement was received. An "A" indicates reception on channel A. A "B" indicates reception on channel B.

NOTE 3 This indicates to the external application the type of ITU-R M.1371 message that this ABK sentence is addressing. Also see the Message IDs listed in Note 4.

NOTE 4 The Message sequence number, together with the Message ID and MMSI of the addressed AIS unit, uniquely identifies a previously received ABM, AIR, or BBM sentence. Generation of an ABK sentence makes a sequence message identifier available for re-use. The Message ID determines the source of the Message sequence number. The following table lists the source by message ID:

ITU-R M.1371 Message ID	Message Sequence Number source
6	sequential message identifier from ABM-sentence, (See clause 5, ABM sentence)
7	addressed AIS unit's message 7, sequence number, ITU-R M.1371-1
8	sequential message identifier from BBM-sentence, (See clause 5, BBM sentence)
12	sequential message identifier from ABM-sentence, (See clause 5, ABM sentence)
13	addressed AIS unit's message 13, sequence number, ITU-R M.1371-1
14	sequential message identifier from BBM-sentence, (See clause 5, BBM sentence)
15	no source, the Message sequence number shall be null

NOTE 5 Acknowledgements provided are:

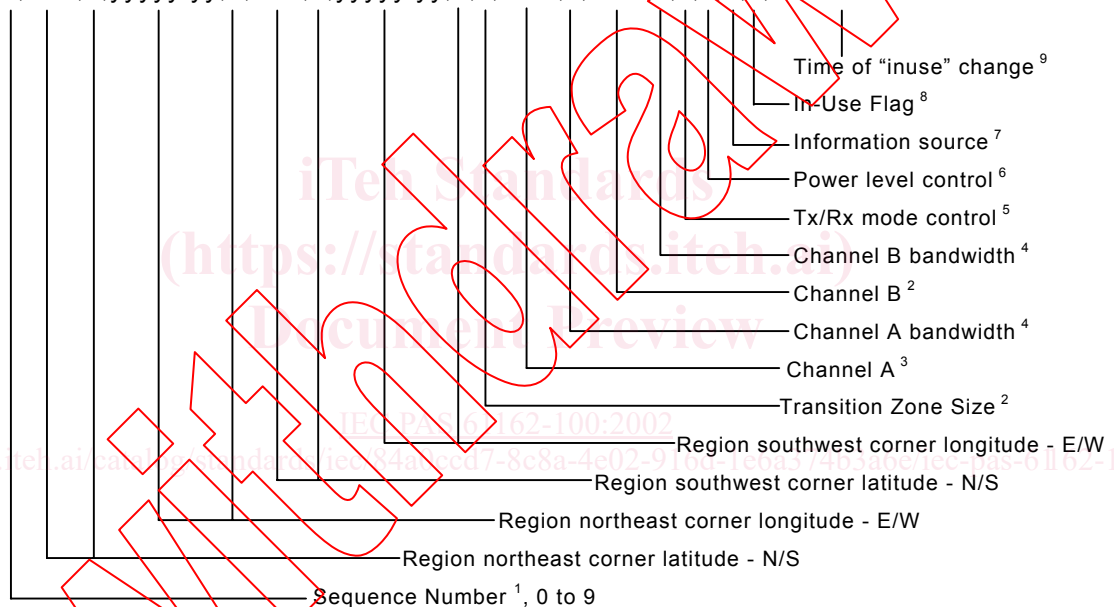
- 0 = message (6 or 12) successfully received by the addressed AIS unit,
- 1 =message (6 or 12) was broadcast, but no acknowledgement by the addressed AIS unit,
- 2 =message could not be broadcast (i.e. quantity of encapsulated data exceeds five slots)
- 3 =requested broadcast of message (8, 14 or 15) has been successfully completed,
- 4 =late reception of a message 7 or 13 acknowledgement that was addressed to this AIS unit (own-ship) and referenced as a valid transaction

ACA – AIS Channel assignment message

An AIS device can receive regional channel management information in four ways: ITU-R M.1371-1 message 22, DSC telecommand received on channel 70, manual operator input, and an ACA sentence. The AIS unit may store channel management information for future use. Channel management information is applied based upon the actual location of the AIS device. An AIS unit is “using” channel management information when the information is being used to manage the operation of the VHF receiver and/or transmitter inside the AIS unit.

This sentence is used both to enter and obtain channel management information. When sent to an AIS unit, the ACA sentence provides regional information that the unit stores and uses to manage the internal VHF radio. When sent from an AIS unit, the ACA sentence provides the current channel management information retained by the AIS unit. The information contained in this sentence is similar to the information contained in an ITU-R M.1371-1 message 22. The information contained in this sentence directly relates to the Initialisation Phase and Dual Channel Operation and Channel Management functions of the AIS unit as described in ITU-R M. 1371.

\$--ACA,x,IIII.II,a,yyyy.yy,a,IIII.II,a,yyyy.yy,a,x,xxxx,x,xxxx,x,x,x,a,x,hmmss.ss*hh<CR><LF>



NOTE 1 This is used to bind the contents of the ACA and ACS sentences together. The ACS sentence, when provided by the AIS unit, shall immediately follow the related ACA sentence, containing the same sequence number. The AIS unit generating the ACA and ACS sentences, shall increment the sequence number each time an ACA/ACS pair is created. After 9 is used the process shall begin again from 0. Information contained in the ACS sentence is not related to the information the ACA sentence if the sequence numbers are different. When an AIS unit is queried for an ACA sentence, the AIS unit should respond with the ACA/ACS sentence pair. When an external device is sending an ACA sentence to the AIS unit, the sequence number may be null if no ACS sentence is being sent.

NOTE 2 Range of 1 to 8 nautical miles.

NOTE 3 VHF channel number, see ITU-R M.1084, Annex 4

NOTE 4 Value of 0, bandwidth is specified by channel number, see ITU-R M.1084, Annex 4
Value of 1, bandwidth is 12.5 kHz.

NOTE 5 Value of 0, transmit on channels A and B, receive on channels A and B
Value of 1, transmit on channel A, receive on channels A and B
Value of 2, transmit on channel B, receive on channels A and B
Value of 3, do not transmit, receive on channels A and B
Value of 4, do not transmit, receive on channel A
Value of 5, do not transmit, receive on channel B

NOTE 6 Value of 0, high power
Value of 1, low power

NOTE 7 Source identifiers:

A = ITU-R M.1371 message 22: Channel Management addressed message,

B = ITU-R M.1371 message 22: Channel Management broadcast geographical area message,

C = IEC 61162-1 AIS Channel Assignment sentence,

D = DSC Channel 70 telecommand, and

M = operator manual input.

This field should be null when the sentence is sent to an AIS device.

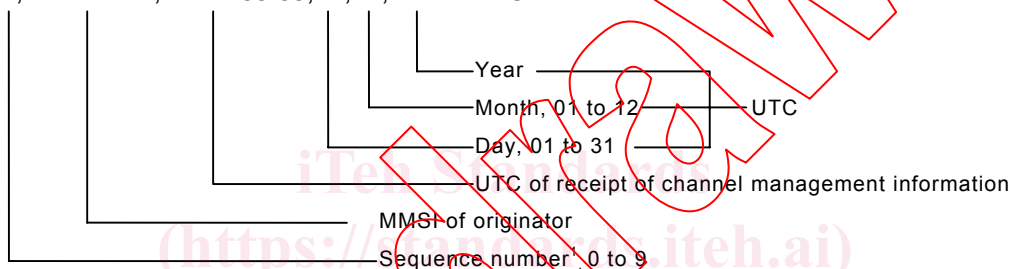
NOTE 8 This value is set to indicate that the other parameters in the sentence are "in-use" by an AIS unit at the time that the AIS unit sends this sentence. A value of "0" indicates that the parameters are not "in-use," and a value of "1" indicates that the parameters are "in-use." This field should be null when the sentence is sent to an AIS unit.

NOTE 9 This is the UTC time that the "In-Use Flag" field changed to the indicated state. This field should be null when the sentence is sent to an AIS unit

ACS - AIS Channel management information Source

This sentence is used in conjunction with the ACA sentence. This sentence identifies the originator of the information contained in the ACA sentence and the date and time the AIS unit received that information.

\$--ACS,x,xxxxxxxx,hhmmss.ss,xx,xx,xxx*hh<CR><LF>



NOTE 1 This is used to bind the contents of the ACA and ACS sentences together. The ACS sentence, when provided by the AIS unit, shall immediately follow the related ACA sentence, containing the same sequence number. The AIS unit generating the ACA and ACS sentences, shall increment the sequence number each time an ACA/ACS pair is created. After 9 is used the process shall begin again from 0. Information contained in the ACS sentence is not related to the information the ACA sentence if the sequence numbers are different. When an external device is sending an ACA sentence to the AIS unit, the sequence number may be null if no ACS sentence is being sent.