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Working Party on Inland Water Transport

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Item 10 (a) of the provisional agenda
Promotion of River Information Services and other Information and Communication Technologies in inland navigation: International Standard for Tracking and Tracing on Inland Waterways (annex to resolution No. 63, revised)

Revised annex to resolution No. 63, International Standard for Tracking and Tracing on Inland Waterways

Note by the secretariat

The annex to the present document contains the consolidated text of the revised annex to resolution No. 63, International Standard for Tracking and Tracing on Inland Waterways, preliminarily approved by the Working Party on the Standardization of Technical and Safety Requirements in Inland Navigation at its fifty-sixth session and the virtual informal meeting held on 29 and 30 June 2020 (see ECE/TRANS/SC.3/WP.3/2020/7, ECE/TRANS/SC.3/WP.3/2020/8, ECE/TRANS/SC.3/WP.3/2020/21/Rev.1 and ECE/TRANS/SC.3/WP.3/2020/22).

Some editorial changes have been introduced to the text by the secretariat in cooperation with the Chair of the CESNI Temporary Working Group for Vessel Tracking and Tracing and the Russian Federation.

Annex

Technical Specifications for Vessel Tracking and Tracing Systems in Inland Navigation

Contents

1. General provisions

1.1 Introduction

The technical specifications for Vessel Tracking and Tracing (VTT) systems is based on the work carried out in this field by relevant international organizations, namely already existing standards and technical specifications in inland navigation, maritime or other relevant areas.

Due to the application of VTT systems in mixed traffic areas including both inland and maritime navigation environments, like sea ports and coastal areas, VTT systems shall be compatible with the AIS Class A mobile stations as referred to in Chapter V of the SOLAS convention.

1.2 References

The following international agreements, recommendations, standards and guidelines are referred to in this annex:

Document title	*Organization*	*Publication date*
Directive 2005/44/EC of the European Parliament and of the Council of 7 September 2005 on harmonised river information services (RIS) on inland waterways in the community	European Union	07.09.2005
Commission Implementing Regulation (EU) 2019/838 of 20 February 2019 on technical specifications for vessel tracking and tracing systems and repealing Regulation (EC) No. 415/2007	European Union	24.05.2019
The World Association for Waterborne Transport Infrastructure (PIANC) Guidelines and Recommendations for River Information Services	PIANC	2019
Recommendation on Electronic Chart Display and Information System for Inland Navigation (Inland ECDIS), edition 2.4, annex to resolution No. 48, revision-4	UNECE	08.11.2019
Guidelines and Recommendations for River Information Services, edition 3.0, annex to resolution No. 57, revised	UNECE	14.10.2011

Document title	*Organization*	*Publication date*
Guidelines and Criteria for Vessel Traffic Services on Inland Waterways, annex to resolution No. 58	UNECE	21.10.2004
International Standard for Electronic Ship Reporting in Inland Navigation, annex to resolution No.79	UNECE	15.10.2010
International Standard for Notices to Skippers, annex to resolution No. 80, revised	UNECE	08.11.2019
Recommendation No 28 “Codes for Types of Means of Transport”, revision 3	UNECE	2010
International Convention of Safety of Life at Sea (SOLAS), Chapter V — Safety of navigation, as amended	IMO	1974
MSC.74(69) Annex 3, “Recommendation on Performance Standards for a Shipborne Automatic Identification System (AIS)”	IMO	12.05.1998
IMO Resolution A.915(22), “Revised Maritime Policy and Requirements for a future Global Navigation Satellite System (GNSS)”	IMO	29.11.2001
IMO Resolution A.1106(29), “Revised Guidelines for the Onboard Operational Use of Shipborne Automatic Identification System (AIS)”	IMO	02.12.2015
ITU Radio Regulations	ITU	2016
Recommendation ITU-R M.585 “Assignment and use of identities in the maritime mobile service”	ITU	2019
Recommendation ITU-R M.1371–5, “Technical characteristics for a universal shipborne automatic identification system using time-division multiple access in the VHF maritime mobile band”	ITU	18.02.2014
International Standard IEC 61993-2, edition 2.0:2018 “Maritime navigation and radiocommunication equipment and systems — Automatic Identification Systems (AIS) — Part 2: Class A shipborne equipment of the universal automatic identification system (AIS) — Operational and performance requirements, methods of test and required test results”	IEC	19.07.2018
International Standard IEC 61162-Serie, “Maritime navigation and radiocommunication equipment and systems — Digital interfaces”:	IEC	
Part 1: Single talker and multiple listeners		01.08.2016
Part 2: Single talker and multiple listeners, high speed transmission		09.1998
International Standard IEC 62287-Series, “Maritime navigation and radiocommunication equipment and systems — Class B shipborne equipment of the automatic identification system (AIS)”	IEC	
Part 1: Carrier-sense time division multiple access (CSTDMA) techniques		04.05.2017
Part 2: Self-organising time division multiple access (SOTDMA) techniques		02.2017
Radio Technical Commission's for Maritime Services (RTCM) Recommended Standards for Differential GNSS (Global Navigation Satellite Systems) Service	RTCM	2010

1.3 Definitions

(a) Automatic Identification System

Automatic Identification System (AIS)

"Automatic Identification System (AIS)" means an automatic communication and identification system intended to improve the safety of navigation by assisting in the efficient operation of vessel traffic services (VTS), ship reporting, ship-to-ship and ship-to-shore operations.

Inland AIS

"Inland AIS" means AIS for the use in inland navigation and interoperable with (maritime) AIS-technically enabled by amendments and extensions to the (maritime) AIS.

Track and Trace

"Track and Trace" means the process of monitoring and recording the past and present whereabouts of a ship shipment, as it passes through different handlers on its way to its destination, through a network. Tracing refers to where the product has been, while tracking refers to where it is going next.

Track

"Track" means the path followed or to be followed between one position and another.

(b) Services

River Information Services (RIS)

"River Information Services (RIS)" means services provided in accordance with paragraph 2.1 of the Guidelines and Recommendations for River Information Services (annex to resolution No. 57, revised).

Vessel Traffic Management (VTM)

"Vessel Traffic Management (VTM)" means the functional framework of harmonised measures and services to enhance the safety, security, efficiency of shipping and the protection of the marine environment in all navigable waters.

Inland Vessel Traffic Services (VTS)

"Inland Vessel Traffic Services (VTS)" means services within the meaning of paragraph 2.1.1 of the Guidelines and criteria for Vessel Traffic Services on Inland Waterways (annex to resolution No. 58).

Navigational information

"Navigational information" means information provided to the skipper on board to support in onboard decision-making.

Tactical Traffic Information (TTI)

"Tactical Traffic Information" means the information affecting immediate navigation decisions–in the actual traffic situation and the close geographic surroundings. Tactical Traffic Information is used to generate a Tactical Traffic Image.

Strategic Traffic Information (STI)

"Strategic Traffic Information" means the information affecting the medium and long-term decisions of RIS users. Strategic Traffic Information is used to generate a Strategic Traffic Image.

Vessel Tracking and Tracing-(VTT)

"Vessel Tracking and Tracing" means a function within the meaning of paragraph 2.15 of the Guidelines and Recommendations for River Information Services (annex to resolution No. 57, revised).

Maritime Mobile Service Identity (MMSI)

"Maritime Mobile Service Identity (MMSI)" means series of nine digits which are transmitted over the radio path in order to uniquely identify ship, stations, coast stations and group calls.

Electronic Reporting International (ERI)

"Electronic Reporting International (ERI)" means the Technical guidelines and specifications established in accordance with section 4.4 of the Guidelines and Recommendations for River Information Services (annex to resolution No. 57, revised).

Inland Electronic Chart Display and Information System (Inland ECDIS)

"Inland Electronic Chart Display and Information System (Inland ECDIS)" means the Technical guidelines and specifications established in accordance with section 4.2 of the Guidelines and Recommendations for River Information Services (annex to resolution No. 57, revised).

(c) Players

Shipmaster

"Shipmaster" means the person on board of the ship being in command and having the authority to take all decisions pertaining to navigation and ship management. The terms "shipmaster", "boatmaster" and "skipper" shall be deemed to be equivalent.

Conning skipper

"Conning skipper (Navigating skipper)" means the person who navigates the vessel according to the voyage plan instructions of the shipmaster.

Competent authority for RIS

"The Competent Authority for RIS" means the competent authority designated by the Member State in accordance with section 2.8 of the Guidelines and Recommendations for River Information Services (annex to resolution No. 57, revised).

RIS operator

"RIS operator" means a person performing one or more tasks related to the provision of RIS services.

1.4 Vessel Tracking and Tracing services and minimum requirements of Vessel Tracking and Tracing systems

VTT systems shall be able to support the following services:

- Navigation,
- Traffic Information,
- Traffic Management,
- Calamity Abatement,
- Transport Management,
- Enforcement,
- Waterway dues and port infrastructure charges,

- Fairway Information Services,
- Statistics.

The most important information of VTT relates to vessel identity and its position. VTT shall be capable of providing — at minimum — the following information on an automatic and periodical basis to other vessels and shore stations, provided these vessels or shore stations are appropriately equipped:

- User identifier (Maritime Mobile Service Identity, MMSI);
- Unique vessel ID: unique European vessel identification number (ENI)/International Maritime Organisation number (IMO number);
- Name of vessel;
- Vessel call sign (if available);[1]
- Navigational status;
- Type of vessel or convoy and cargo type;
- Overall dimensions of vessel or convoy/reference for position;
- Maximum present static draught;
- Dangerous cargo indication (number of blue cones in compliance with ADN);[1]
- Loading status (loaded/unloaded);[1, 2]
- Destination;
- Estimated Time of Arrival (ETA) at destination;
- Number of persons on board;[1, 2]
- Position (WGS-84) (+ quality indication[1, 3]);
- Speed Over Ground (SOG) (+ quality indication[1, 3]);
- Course Over Ground (COG) (+ quality indication[1, 3]);
- Heading (HDG) (+ quality indication[1, 3]);
- Rate Of Turn (ROT);
- Blue sign information;[1]
- Timestamp.

Note: Instead of "quality indication" for position, SOG, COG and HDG, "position accuracy" can be used.

These minimum requirements indicate the user needs and the necessary data for VTT systems in inland navigation.

A VTT system is designed to offer sufficient flexibility to accommodate future additional requirements.

[1] Mandatory according to Commission Implementing Regulation (EU) 2019/838 of 20 February 2019 on technical specifications for vessel tracking and tracing systems and repealing Regulation (EC) No. 415/2007.

[2] Not applicable for maritime AIS.

[3] Quality indication is not applicable for maritime AIS.

2. Inland vessel tracking and tracing functions

2.1 Introduction

This section sets out the requirements relating to VTT information for different RIS service categories. Requirements for each service category are listed describing the user groups and usage of the VTT information.

The overview of VTT information needs is provided in Table 2.1 at the end of this section.

2.2 Navigation

Vessel tracking and tracing can be used to support the active navigation on board. Main user group are conning skippers.

The process navigation can be divided into three phases:

- Navigation, medium-term ahead;
- Navigation, short-term ahead;
- Navigation, very short-term ahead.

For each phase, the user requirements are different.

2.2.1 Navigation, medium-term ahead

Navigation, a medium-term ahead, is the navigation phase in which the skipper observes and analyses the traffic situation looking some minutes up to an hour ahead and considers the possibilities of where to meet, pass or overtake other vessels.

The traffic image needed is the typical “looking around the corner” feature and is mainly outside the scope of the onboard radar range.

The update rate depends on the task and differs from the situation in which the vessel is involved.

2.2.2 Navigation, short-term ahead

Navigation, short-term ahead, is the decision phase in the navigation process. In this phase, traffic information has relevance for the process of navigation, including collision avoidance measures, if necessary. This function deals with the observation of other vessels in the close surroundings of the own vessel.

The actual traffic information shall be exchanged continuously at least every 10 seconds; in any case, the interval must not exceed the value indicated in table 3.1. For some routes, the authorities will set a predefined update rate (maximum 2 seconds).

2.2.3 Navigation, very short term-ahead

Navigation, very short term-ahead, is the operational navigation process. It consists of execution of the decisions that were made beforehand, on the spot and monitoring their effects. The traffic information needed from other vessels, especially in this situation, is related to its own vessel conditions, such as relative position, relative speed. It is necessary to follow highly accurate information in this phase.

Therefore, Tracking and Tracing information cannot be used for very short-term navigation.

2.3 Vessel Traffic Management

Vessel Traffic Management (VTM) comprises at least of the following elements:

- Vessel Traffic Services;
- Lock planning and operation;
- Bridge planning and operation.

2.3.1 Vessel Traffic Services

Vessel Traffic Services (VTS) consist of the following services:

- Information service;
- Navigational assistance service;
- Traffic organization service.

The user groups of Vessel Traffic Services are VTS operators and conning skippers. The user needs related to traffic information are indicated in paragraphs 2.3.1.1 to 2.3.1.3.

2.3.1.1 Information service

The information service is provided by broadcasting information at fixed times and intervals or when deemed necessary by VTS or at the request of a vessel, and may include reports on the position, identity and intentions of other vessels, waterway conditions, weather conditions, hazardous situations or any other factors that may influence the vessel's transit.

For the information services, an overview of traffic in a network or on a fairway stretch is required.

The competent authority may set a predefined update rate, if needed for safe and reliable passage through the area.

2.3.1.2 Navigational assistance service

Navigational assistance service informs the conning skipper about difficult navigational or meteorological circumstances or assists the conning skipper in case of defects or deficiencies. This service is normally rendered at the request of a vessel or by VTS when deemed necessary.

To provide individual information to a conning skipper, the VTS operator needs an actual detailed traffic image.

The actual traffic information has to be exchanged continuously (every three seconds, almost real time or another predefined update rate set by the competent authority); in any case, the interval must not exceed the value indicated in table 3.1.

All other information shall be made available on demand of the VTS operator or in special occasions.

2.3.1.3 Traffic organization service

The traffic organization service concerns the operational management of traffic and the forward planning of vessel movements to prevent congestion and dangerous situations, and is particularly relevant in times of high traffic density or when the movement of special transports may affect the flow of other traffic. The service may also include establishing and operating a system of traffic clearances, or VTS sailing plans, or both in relation to priority of movements, allocation of space (such as berthing places, lock space, sailing routes), mandatory reporting of movements in the VTS area, routes to be followed, speed limits to be observed or other appropriate measures which are considered necessary by the VTS authority.

2.3.2 Lock planning and operation

The lock planning processes — long- and medium-term — and lock operation process are described in paragraphs 2.3.2.1 to 2.3.2.3. Main user groups are lock operators, conning skippers, shipmasters and fleet managers.

2.3.2.1 Lock planning, long-term

Long-term lock planning deals with the planning of a lock some hours up to a day ahead.

In this case, the traffic information is used to improve the information on waiting and passing times at locks, and are originally based on statistical information.

Estimated Time of Arrival (ETA) should be available on demand or should be exchanged, if a deviation from the original ETA exceeds the deviation allowed by the competent authority. Requested time of arrival (RTA) is the response to an ETA report or may be sent from a lock to propose a locking time.

2.3.2.2 Lock planning, medium-term

Medium-term lock planning deals with the planning of a lock up to two or four lock cycles ahead.

In this case, the traffic information is used to map the arriving vessels to the available lock cycles and based on the planning to inform the conning skippers about RTA.

ETA should be available on demand or should be exchanged, if a deviation from the original ETA exceeds the deviation allowed by the competent authority. All other information should be available once at the first contact or on demand. RTA is the response to an ETA report or may be sent from a lock to propose a locking time.

2.3.2.3 Lock operation

In lock operation phase, the actual locking process takes place.

The actual traffic information must be exchanged either continuously or at an update rate predefined by the competent authority.

The accuracy of VTT information does not allow for high-precision applications like closing of lock gates.

2.3.3 Bridge planning and operation

The bridge planning processes — medium- and short-term — and bridge operation process are described in paragraphs 2.3.3.1 to 2.3.3.3. Main user groups are bridge operators, conning skippers, shipmasters and fleet managers.

2.3.3.1 Bridge planning, medium-term

The bridge planning process in the medium term deals with the optimization of the traffic flow in such a way that the bridges are opened in time for passing of vessels (green wave). The planning horizon varies between fifteen minutes and two hours. The time frame depends on the local situation.

ETA and position information should be available on demand or such information should be exchanged as soon as the deviation between the updated ETA and the original ETA exceeds a predefined value set by the competent authority. All other information should be available once at the first contact or on demand. RTA is the response to an ETA report or may be sent from a bridge to propose a passage time.

2.3.3.2 Bridge planning, short-term

In the case of bridge planning in the short-term, decisions are made on the basis of the strategy for opening of the bridge.

Actual traffic information on the position, speed and direction, should be available on demand or exchanged in accordance with predefined update rate, for example, every five minutes, set by the competent authority. ETA and position information should be available on demand or such information should be exchanged as soon as the deviation between the updated ETA and the original ETA exceeds a predefined value set by the competent authority. All other information should be available once at the first contact or on demand. RTA is the response to an ETA report or may be sent from a bridge to propose a passage time.

2.3.3.3 Bridge operation

In bridge operation phase, the actual opening and passing of the vessel through the bridge takes place.

The actual traffic information shall be exchanged either continuously or at another update rate set by the competent authority.

The accuracy of VTT information does not allow for high-precision applications like opening or closing of the bridge.

2.4 Calamity Abatement

Calamity abatement in this context focuses on repressive measures: dealing with real accidents and providing assistance during emergencies. Main user groups are operators in calamity centre, VTS operators, conning skippers, shipmasters and the competent authorities.

In the case of an accident, the traffic information can be provided automatically or the responsible organization shall ask for the respective information.

2.5 Transport Management

Transport management (TS) is divided into the following four activities:

- Voyage planning;
- Transport logistics;
- Port and terminal management;
- Cargo and fleet management.

Main user groups are shipmasters, freight brokers, fleet managers, consignors, consignees, supply forwarders, port authorities, terminal operators, lock operators and bridge operators.

2.5.1 Voyage planning

Voyage planning in this context focuses on the planning on-trip. During the voyage, the shipmaster shall check his original planned voyage.

2.5.2 Transport Logistics

Transport logistics consist of the organization, planning, execution and control of transport.

All traffic information is needed on demand of the vessel owner or logistics stakeholders.

2.5.3 Intermodal port and terminal management

Intermodal port and terminal management considers the planning of resources in ports and at terminals.

The terminal and port manager shall request for the traffic information or shall agree that in predefined situations the traffic information will be sent automatically.

2.5.4 Cargo and fleet management

Cargo and fleet management considers the planning and optimizing the use of vessels, arranging cargo and transportation.

The shipper or vessel owner shall request for the traffic information or the traffic information shall be sent in predefined situations.

2.6 Enforcement

The scope of the enforcement task is limited to the services on dangerous goods, immigration control and customs. Main user groups are customs, competent authorities and shipmasters.

Traffic information shall be exchanged with the appropriate authorities. The traffic information exchange will take place on demand or at fixed predefined points or in case of special circumstances defined by the responsible authority.

2.7 Waterway dues and port infrastructure charges

At various locations in Europe, usage of the waterway and ports is may be subject to the payment of fees. Main user groups are competent authorities, shipmasters, fleet managers, waterway authorities and port authorities.

The traffic information shall be exchanged on demand or at fixed points, defined by the competent waterway or port authority.

2.8 Information needs

Table 2.1 provides an overview of the information needs of the different services.

Table 2.1
Overview of information needs

	Identification	*Name*	*Call sign*	*Navigational status*	*Type*	*Dimensions*	*Draught*	*Dangerous cargo*	*Loading status*	*Destination*	*ETA at destination*	*Number of persons*	*Position and time*	*Speed*	*Course=direction*	*Heading*	*Rate of turn*	*Blue sign*	*Other information*
Navigation — medium-term	X	X		X	X	X		X	X	X			X	X	X			X	
Navigation — short-term	X	X		X	X	X		X	X	X			X	X	X	X		X	
Navigation — very short-term	Requirements are currently not met by VTT																		
VTM — VTS services	X	X		X	X	X	X	X	X	X		X	X	X	X			X	
VTM — lock operation	X	X		X	X		X	X					X		X				Air draught
VTM — lock planning	X	X		X	X	X	X	X					X	X	X				Number of assisting tugboats, air draught, ETA/RTA
VTM — bridge operation	X	X			X	X							X	X	X				Air draught
VTM — bridge planning	X	X		X	X	X							X	X	X				Air draught, ETA/RTA
Calamity abatement	X	X			X			X	X	X		X	X		X				
TM — voyage planning	X	X				X	X		X	X			X	X					Air draught, ETA/RTA
TM — transport logistics	X	X									X		X		X				
TM — port and terminal management	X	X		X	X	X		X	X				X		X				ETA/RTA
TM — cargo and fleet management	X	X		X			X		X	X			X		X				ETA/RTA
Enforcement	X	X		X	X			X		X	X	X	X		X				
Waterway and port infrastructure charges	X	X			X	X	X			X			X						

3. Inland AIS Technical Specification

3.1 Introduction

In maritime navigation, IMO has introduced the carriage of Automatic Identification System (AIS): all sea-going ships on international voyage falling under Chapter V of SOLAS "Safety of Navigation", must be equipped with AIS Class A mobile stations since the end of 2004.

Directive 2002/59/EC of the European Parliament and of the Council establishes a Community vessel traffic monitoring and information system for sea-going vessels carrying dangerous or polluting goods using AIS for Ship Reporting and Monitoring.

AIS is considered as a suitable solution for automatic identification and vessel tracking and tracing in inland navigation. Especially, the real time performance of AIS and the availability of worldwide standards and guidelines are beneficial for safety-related applications.

To serve the specific requirements of inland navigation, AIS had to be further developed to the so-called Inland AIS technical specification while preserving full compatibility with the maritime AIS and already existing standards and technical specifications in inland navigation.

Because Inland AIS is compatible with the maritime AIS, it enables a direct data exchange between sea-going and inland vessels navigating in mixed traffic areas.

Using AIS for automatic identification and vessel tracking and tracing in inland navigation presents the following features.

AIS is:

- Introduced by IMO to support the maritime safety of navigation; mandatory carriage requirement for all vessels in accordance with Chapter V of SOLAS
- Operating in direct ship-to-ship mode as well as in ship-to-shore and shore-to-ship mode
- A safety system with high requirements regarding availability, continuity and reliability
- A real-time system due to the direct ship-to-ship data exchange
- An autonomously operating system, in a self-organized manner, without a master station. There is no need for a central controlling intelligence
- Based on international standards and procedures in accordance with Chapter V of SOLAS
- A type-approved system to enhance safety of navigation following a certification procedure.
- Globally interoperable.

The purpose of this chapter is to define all necessary functional requirements, amendments and extensions to the existing AIS Class A mobile stations in order to create an Inland AIS mobile station for use in inland navigation.

3.2 Scope

AIS is a shipborne radio data system exchanging static, dynamic and voyage-related vessel data between equipped vessels and between equipped vessels and shore stations. Shipborne AIS stations broadcast the vessel's identity, position and other data at regular intervals. By receiving these transmissions, shipborne or shore-based AIS stations within the radio range can automatically locate, identify and track AIS-equipped vessels on an appropriate display, such as a radar or electronic chart display systems such as the Inland Electronic Chart Display and Information System (Inland ECDIS) as defined in the Recommendation on electronic chart display and information system for inland navigation (Inland ECDIS) (annex to resolution No. 48, revision 4). AIS is intended to enhance safety of navigation in ship-to-ship use, surveillance (VTS), Vessel Tracking and Tracing, and calamity abatement support.

AIS mobile stations are divided into the following types:

(a) Class A mobile stations to be used by all sea-going vessels falling under the carriage requirements of Chapter V of SOLAS;

(b) Inland AIS mobile station, having full Class A functionality on Very High Frequency (VHF) Data Link level, deviating in supplementary functions designed for the use by inland vessels);

(c) Class B SO/CS mobile stations with limited functionality which may be used by vessels not falling under carriage requirements for Class A or Inland AIS mobile stations;

(d) AIS shore stations, including AIS base stations and AIS repeater stations.

The following modes of operation can be distinguished:

(a) Ship-to-ship operation: all AIS-equipped vessels are able to receive static and dynamic information from all other AIS-equipped vessels within the radio range;

(b) Ship-to-shore operation: data from AIS-equipped vessels can also be received by AIS shore stations connected to the RIS centre where a traffic image (Tactical Traffic Image and/or Strategic Traffic Image) can be generated;

(c) Shore-to-ship operation: voyage and safety-related data from shore to vessel can be transmitted.

A characteristic of AIS is the autonomous mode, using Self-Organized Time Division Multiple Access (SOTDMA) without any need for an organizing master station. The radio protocol is designed in a way that vessel stations operate autonomously in a self-organized manner by exchanging link access parameters. Time is divided into one minute frames with 2 250 time slots per radio channel which are synchronized by GNSS UTC time. Each participant organizes its access to the radio channel by choosing free time slots considering the future use of time slots by other stations. There is no need for a central intelligence controlling the slot assignment.

An Inland AIS mobile station consists in general of the following components:

(a) VHF transceiver (one transmitter, two receivers);

(b) GNSS receiver;

(c) Data processor.

Universal shipborne AIS, as defined by IMO, ITU and IEC, and recommended for use in inland navigation, uses SOTDMA in the VHF maritime mobile band. AIS operates on the internationally designated VHF frequencies AIS 1 (161.975 MHz) and AIS 2 (162.025 MHz), and can be switched to other frequencies in the VHF maritime mobile band.

To serve the specific requirements of inland navigation, AIS has to be further developed to the so-called Inland AIS while preserving compatibility with the maritime AIS and already existing standards in inland navigation.

Vessel Tracking and Tracing systems in inland navigation shall be compatible with AIS Class A mobile stations, as defined by IMO. Therefore, AIS messages shall be able to provide the following types of information:

(a) Static information, such as official vessel number (ENI or IMO number), User identifier (MMSI), call sign of vessel, name of vessel, type of vessel;

(b) Dynamic information, such as vessel’s position, COG and SOG with accuracy indication and integrity status;

(c) Voyage-related information, such as length and beam of convoy, port of arrival, ETA, cargo type and dangerous cargo on board;

(d) Inland navigation specific information, such as number of blue cones/lights according to ADN or ETA at lock/bridge/terminal/border.

For moving vessels, the update rate for dynamic information on tactical level shall be between 2 and 10 seconds. For vessels at anchor, it is recommended to have an update rate of several minutes, or an update triggered when information is amended.

Inland AIS mobile station does not replace, but supports navigational services such as radar target tracking and VTS. Inland AIS mobile station provides is an additional input for navigational information: its value added is to provide means of surveillance and tracking of vessels equipped with Inland AIS. The position accuracy derived from Inland AIS mobile station using the internal (uncorrected) GNSS is typically above 10 metres. When the position is corrected using DGNSS from either maritime beacon differential correction service or AIS Message 17 the accuracy is typically below 10 metres. Due to their different characteristics, Inland AIS mobile station and radar complement each other.

3.3 Requirements

3.3.1 General requirements

Inland AIS mobile station is based on the AIS Class A mobile station in accordance with SOLAS.

Inland AIS mobile station should cover the main functionality of AIS Class A mobile stations while considering the specific requirements for inland navigation.

Inland AIS should be compatible to the maritime AIS and should enable a direct data exchange between sea-going and inland vessels navigating in a mixed traffic area.

The requirements set out in paragraphs 3.3 to 3.5 are complementary or additional requirements for Inland AIS, which differs from the AIS Class A mobile stations.

The default setting of the transmission power shall be high power and shall only been set to low power if directed so by the competent authority.

3.3.2 Information content

Only Tracking and Tracing and safety-related information shall be transmitted via Inland AIS mobile station.

The information content set out in paragraphs 3.3.2.1 to 3.3.2.5 shall be implemented in a way that it can be sent from an Inland AIS mobile station without the need for an external application.

The Inland AIS messages should contain the following information (items marked with "*" have to be handled differently as for seagoing ships):

3.3.2.1 Static vessel information

The static vessel information for inland vessels should have the same parameters and the same structure as in the AIS Class A mobile stations as far as it is applicable. Any conversions from inland to maritime parameters shall be done automatically where feasible. Unused parameter fields should be set to "not available".

Inland specific static vessel information should be added.

Static vessel information is broadcast autonomously from the vessel or on demand.

User identifier (MMSI)	In all messages
Name of vessel	AIS Message 5
Call sign of the vessel	AIS Message 5
IMO number	AIS Message 5 (not available for inland vessels)
Type of vessel/convoy and cargo*	AIS Message 5 + Inland FI 10
Overall length (decimetre accuracy)*	AIS Message 5 + Inland FI 10
Overall beam (decimetre accuracy)*	AIS Message 5 + Inland FI 10
Unique European vessel identification number (ENI)	Inland FI 10
Reference point of reported position on the vessel (location of antenna)*	AIS Message 5

3.3.2.2 Dynamic vessel information

The dynamic vessel information for inland vessels should have the same parameters and the same structure as in AIS Class A mobile stations as far as it is applicable. Unused parameter fields should be set to “not available”.

Inland specific dynamic vessel information should be added.

Dynamic vessel information is broadcasted autonomously from the vessel or on demand.

Position according to World Geodetic System from 1984 (WGS 84)	AIS Message 1, 2 and 3
Speed Over Ground (SOG)	AIS Message 1, 2 and 3
Course COG	AIS Message 1, 2 and 3
Heading HDG	AIS Message 1, 2 and 3
Rate of turn ROT	AIS Message 1, 2 and 3
Position accuracy (GNSS/DGNSS)	AIS Message 1, 2 and 3
Time of electronic position fixing device	AIS Message 1, 2 and 3
Navigational status	AIS Message 1, 2 and 3
Status of Blue sign*	AIS Message 1, 2 and 3
Quality of speed information	Inland FI 10
Quality of course information	Inland FI 10
Quality of heading information	Inland FI 10

3.3.2.3 Voyage-related vessel information

The voyage-related vessel information for inland vessels should have the same parameters and the same structure as in AIS Class A mobile stations as far as it is applicable. Unused parameter fields should be set to “not available”.

Inland specific voyage-related vessel information should be added.

Voyage-related vessel information is broadcasted autonomously from the vessel or on demand.

Destination (ISRS location code)	AIS Message 5
Category of dangerous cargo	AIS Message 5
ETA	AIS Message 5

Maximum present static draught*	AIS Message 5 + Inland FI 10
Dangerous cargo indication	Inland FI 10
Loaded/unloaded vessel	Inland FI 10

3.3.2.4 Number of persons on board

The number of persons on board is transmitted either as a broadcast message or as an addressed message from vessel to shore on demand or on event.

Number of crew members on board	Inland FI 55
Number of passengers on board	Inland FI 55
Number of shipboard personnel on board	Inland FI 55

3.3.2.5 Safety-related messages

Safety-related messages (i.e. text messages) are transmitted when required as broadcast or as addressed messages.

Addressed Safety related message	AIS Message 12
Broadcasted Safety related message	AIS Message 14

3.3.3 Reporting interval of information transmission

The different information types of Inland AIS messages should be transmitted with different reporting rates.

For moving vessels on inland waterways, the reporting rate for dynamic information can be switched between autonomous mode and assigned mode. The reporting behaviour shall be switchable from an AIS base station (via AIS Message 23 for group assignment or Message 16 for individual assignment) and by commands from external shipborne systems, via IEC 61162 interface as defined in Appendix B.

For static and voyage-related information, the reporting rate shall be 6 minutes on demand, or if information is amended.

The following reporting rates shall be applicable:

Static vessel information	Every 6 minutes, on demand or when data has been changed
Dynamic vessel information	Depends on navigational status and vessel operating mode, either autonomous (default) or assigned mode, see table 3.1
Voyage-related vessel information	Every 6 minutes, on demand or when data has been changed
Number of persons on board	As required or on request
Safety-related messages	As required
Application Specific Messages	As required (to be defined by the competent authority)

Table 3.1
Update rate of dynamic ship information

Ship dynamic conditions	*Nominal reporting interval*
Vessel status "at anchor" and not moving faster than 3 knots	3 minutes[4]
Vessel status "at anchor" and moving faster than 3 knots	10 seconds[4]
Vessel operating in autonomous mode, moving 0–14 knots	10 seconds[4]
Vessel operating in autonomous mode, moving 0–14 knots and changing course	3 1/3 seconds[4]
Vessel operating in autonomous mode, moving 14–23 knots	6 seconds[4]
Vessel operating in autonomous mode, moving 14–23 knots and changing course	2 seconds
Vessel operating in autonomous mode, moving faster than 23 knots	2 seconds
Vessel operating in autonomous mode, moving faster than 23 knots and changing course	2 seconds
Vessel operating in assigned mode[5]	assigned between 2 seconds and 10 seconds

3.3.4 Technology platform

The platform for Inland AIS mobile station is the AIS Class A mobile station.

The technical solution of Inland AIS mobile station is based on the same technical standards as AIS Class A mobile stations (Recommendation ITU-R M.1371 and International standard IEC 61993–2).

3.3.5 Compatibility with Class A transponders

Inland AIS mobile stations shall be compliant with AIS Class A mobile stations and shall be capable of receiving and processing all AIS messages (according to Recommendation ITU-R M.1371 and IALA Technical clarifications on Recommendation ITU-R M.1371) and, in addition, the messages defined in paragraph 3.4.

3.3.6 Unique identifier

In order to guarantee the compatibility with maritime vessels, the Maritime Mobile Service Identifier (MMSI) number must be used as a unique station identifier (radio equipment identifier) for Inland AIS mobile stations.

3.3.7 Application requirements

Information referred to paragraph 3.3.2 shall be input, stored and displayed directly within the Inland AIS mobile station.

The Inland AIS mobile station shall be capable of storing also the inland specific static data in the internal memory, in order to keep the information when the unit is without power supply.

[4] When a mobile station determines that it is the semaphore (refer to Recommendation ITU-R M.1371, annex 2, § 3.1.1.4), the reporting rate should increase to once per 2 seconds (refer to Recommendation ITU-R M.1371, annex 2, § 3.1.3.3.2).

[5] Shall be switched by the competent authority, when necessary.

Necessary data conversions for the Minimum Keyboard Display (MKD) of the Inland AIS information content (e.g. knots into km/h) or MKD input and display of information concerning inland vessel types shall be handled within the Inland AIS mobile station.

Application Specific Messages (ASM) should be entered/displayed by an external application with the exemption of Inland AIS ASM DAC = 200 FI = 10 (Inland Ship static and voyage related data) and DAC = 200 FI = 55 (inland number of persons on board) which are implemented directly in the Inland AIS mobile station.

In order to program the inland specific data into the AIS transponder the digital interface sentences are defined in Appendix B.

The Inland AIS mobile station shall provide — as a minimum — an external interface for the input of DGNSS correction and integrity information according to the provisions of the Radio Technical Commission for Maritime Services Special Committee 104 on DGNSS.[6]

3.3.8 Type approval

Inland AIS mobile station shall be type-approved for compliance with these technical specifications.

3.4 Protocol amendments for Inland AIS mobile station

Due to evolution of the Recommendation ITU-R M.1371, several parameters allow for the use of new status codes. This does not harm the functioning of the AIS but may result in display of unrecognized status codes in equipment based on previous revisions of the standard.

3.4.1 Position reports (Message 1, 2, 3)

Table 3.2
Position Report

Parameter	*Number of bits*	*Description*
Message ID	6	Identifier for this message 1, 2 or 3
Repeat indicator	2	Used by the repeater to indicate how many times a message has been repeated. 0–3; 0 = default; 3 = do not repeat any more
User ID (MMSI)	30	MMSI number
Navigational status	4	0 = under way using engine; 1 = at anchor; 2 = not under command; 3 = restricted manoeuvrability; 4 = constrained by her draught; 5 = moored; 6 = aground; 7 = engaged in fishing; 8 = under way sailing; 9 = reserved for future amendment of Navigational Status for a high-speed craft; 10 = reserved for future amendment of Navigational Status for Wing In Ground (WIG); 11 = power-driven vessel towing astern (regional use);[7] 12 = power-driven vessel pushing ahead or towing alongside (regional use);[7] 13 = reserved for future use; 14 = AIS-SART (active); 15 = not defined = default (also used by AIS)

[6] This requirement is not mandatory for AIS ship stations of Class A and Class B.

[7] Not applicable within the European Union for the purpose of Commission Implementing Regulation (EU) 2019/838 of 20 February 2019 on technical specifications for vessel tracking and tracing systems and repealing Regulation (EC) No. 415/2007.

Parameter	*Number of bits*	*Description*
Rate of Turn ROT_{AIS}	8	0 to +126 = turning right at up to 708° per min or higher 0 to –126 = turning left at up to 708° per min or higher Values between 0 and 708° per min coded by $ROT_{AIS} = 4.733\ SQRT(ROT_{sensor})$ degrees per min where ROT_{sensor} is the Rate of Turn as input by an external Rate of Turn Indicator (TI). ROT_{AIS} is rounded to the nearest integer value. +127 = turning right at more than 5º per 30 s (No TI available) –127 = turning left at more than 5º per 30 s (No TI available) –128 (80 hexadecimal) indicates no turn information available (default). ROT data should not be derived from COG information.
Speed over ground	10	Speed over Ground in 1/10 knot steps (0–102.2 knots) 1 023 = not available; 1 022 = 102.2 knots or higher[8]
Position accuracy	1	The position accuracy (PA) flag should be determined in accordance with ITU-R M.1371 1 = high (≤ 10 m) 0 = low (>10 m) 0 = default
Longitude	28	Longitude in 1/10 000 min (±180° , East = positive (as per 2's complement), West = negative (as per 2's complement). 181° (6791AC0 hexadecimal) = not available = default)
Latitude	27	Latitude in 1/10 000 min (±90°, North = positive (as per 2's complement), South = negative (as per 2's complement). 91° (3412140 hexadecimal) = not available = default)
Course over ground	12	Course over ground in 1/10° (0–3 599) 3 600 (E10 hexadecimal) = not available = default 3 601–4 095 shall not be used
True heading	9	Degrees (0–359) (511 indicates not available = default)
Timestamp	6	UTC second when the report was generated by the Electronic Position Fixing System (EPFS) (0–59, or 60 if Timestamp is not available, which should also be the default value, or 61 if positioning system is in manual input mode, or 62 if Electronic Position Fixing System operates in estimated (dead reckoning) mode, or 63 if the positioning system is inoperative)
Special manoeuvre indicator: blue sign	2	Indication if blue sign is set[9] 0 = not available = default 1 = not engaged in special manoeuvre = blue sign not set 2 = engaged in special manoeuvre = blue sign is set 3 = not used
Spare	3	Not used. Should be set to zero. Reserved for future use.
RAIM-flag	1	Receiver Autonomous Integrity Monitoring (RAIM) flag of Electronic Position Fixing Device; 0 = RAIM not in use = default; 1 = RAIM in use. RAIM-flag should be determined in accordance with ITU-R M. 1371
Communication state	19	Communication state should be determined in accordance with ITU-R M.1371
Total	**168**	**Occupies one slot**

[8] Knots should be calculated in km/h by external onboard equipment.

[9] Shall only be evaluated if the report is coming from an Inland AIS mobile station and if the information is derived by automatic means (direct connection to switch).

3.4.2 Ship static and voyage-related data (Message 5)

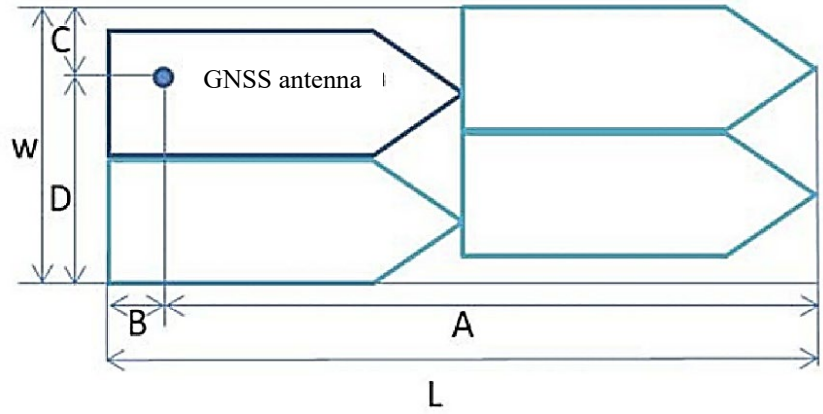
Table 3.3
Ship static and dynamic data report

Parameter	*Number of bits*	*Description*
Message ID	6	Identifier for this Message 5
Repeat indicator	2	Sent by the repeater to indicate how many times a message has been repeated. 0–3; 0 = default; 3 = do not repeat any more
User ID (MMSI)	30	MMSI number
AIS version indicator	2	0 = Station compliant with Recommendation ITU-R M.1371–1 1 = Station compliant with Recommendation ITU-R M.1371–3 (or later) 2 = Station compliant with Recommendation ITU-R M.1371–5 (or later) 3 = Station compliant with future editions
IMO number	30	0 = not available = default – Not applicable to Search and Rescue (SAR) aircraft 0000000001–0000999999 not used 0001000000–0009999999 = valid IMO number 0010000000–1073741823 = official flag state number[10]
Call sign	42	7 × 6 bit ASCII characters, "@@@@@@@" = not available = default Craft associated with a parent vessel, should use "A" followed by the last six digits of the MMSI of the parent vessel. Examples of these craft include towed vessels, rescue boats, tenders, lifeboats and liferafts
Name	120	Maximum 20 characters 6 bit ASCII, see ITU-R M.1371; @@@@@@@@@@@@@@@@@@@@ = not available = default. For SAR aircraft, it shall be set to "SAR AIRCRAFT NNNNNNN" where NNNNNNN equals the aircraft registration number
Type of vessel and cargo	8	0 = not available or no vessel = default; 1–99 = as defined in ITU-R M.1371;[11] 100–199 = reserved, for regional use; 200–255 = reserved, for future use Not applicable to SAR aircraft
Overall dimensions of vessel/convoy and reference for position	30	Reference point for reported position; also indicates the dimension of vessel in metres (see ITU-R M.1371). For SAR aircraft, the use of this field may be decided by the responsible administration. If used, it shall indicate the maximum dimensions of the craft. As default should A = B = C = D be set to "0"[12, 13, 14]
Type of Electronic Positioning Fixing Device	4	0 = undefined (default) 1 = GPS 2 = GLONASS 3 = Combined GPS/GLONASS 4 = Loran-C 5 = Chayka 6 = Integrated Navigation System

[10] Shall be set to 0 for inland vessels.
[11] Best applicable vessel type shall be used for inland navigation (see appendix C).
[12] The dimensions shall be set to the maximum rectangle size of the convoy.
[13] The decimetre accuracy of the inland information shall be rounded upwards.
[14] The reference point information has to be taken out of the SSD interface sentence by distinguishing the field "source identifier". Position reference point information with source identifier AI, has to be stored as internal one. Other source identifiers shall lead to reference point information for the external reference point.

Parameter	*Number of bits*	*Description*
		7 = surveyed 8 = Galileo 9–14 = not used 15 = internal GNSS
ETA	20	ETA; MMDDHHMM UTC Bits 19–16: month; 1–12; 0 = not available = default Bits 15–11: day; 1–31; 0 = not available = default Bits 10–6: hour; 0–23; 24 = not available = default Bits 5–0: minute; 0–59; 60 = not available = default For SAR aircraft, the use of this field may be decided by the responsible administration
Maximum present static draught	8	In 1/10 m, 255 = draught 25.5 m or greater, 0 = not available = default[15]
Destination	120	Maximum 20 characters using 6-bit ASCII; @@@@@@@@@@@@@@@@@@@@ = not available[16]
Data Terminal Equipment (DTE)	1	Data terminal ready (0 = available, 1 = not available = default)
Spare	1	Spare. Not used. Shall be set to zero. Reserved for future use
Total	**424**	**Occupies two slots**

Figure 3.1
Reference point for reported position and overall dimension of the vessel/convoy



[15] The centimetre accuracy on the inland information shall be rounded upwards.
[16] The ISRS Location Codes as part of the RIS Index shall be used derived from the European Reference Data Management System (ERDMS) kept by the European Commission.

	Number of bits	*Bit fields*	*Distance (m)*	
A	9	Bit 21 – Bit 29	0 – 511 = 511 m or greater	Reference Point for reported position
B	9	Bit 12 – Bit 20	0 –511 = 511 m or greater	
C	6	Bit 6 – Bit 11	0 – 63 = 63 m or greater	
D	6	Bit 0 – Bit 5	0 – 63 = 63 m or greater	
L = A + B W = C + D	Defined in Inland FI 10			Overall dimension used in Inland AIS mobile station

The dimension should be in the direction of the transmitted heading information (bow).
Reference point of reported position not available, but dimensions of vessel/convoy are available:
A = C = 0 and B ≠ 0 and D ≠ 0.
Neither reference point of reported position nor dimensions of vessel/convoy are available:
A = B = C = D = 0 (= default). For use of the message table, A = most significant field. D = least significant field.

3.4.3 Group Assignment Command (Message 23)

Inland AIS mobile stations shall be addressed for group assignment by Message 23 using station type "6 = inland waterways".

3.5 Inland AIS messages

3.5.1 Additional Inland AIS messages

To comply with the information needs, specific Inland AIS messages are defined. In addition to the information content which shall be implemented directly in the Inland AIS station, the Inland AIS mobile station may transmit additional information through Application Specific Messages (ASM). This information content is normally handled by an external application, such as Inland ECDIS.

The use of Inland AIS ASM is in the responsibility of the river commission or the competent authorities.

3.5.2 Application identifier for Inland AIS Application Specific Messages

The application specific messages consist of the AIS Class A mobile stations framework according Recommendation ITU-R M.1371 (message ID, repeat indicator, source ID, destination ID), the Application Identifier (AI = DAC + FI) and the data content (variable length up to a given maximum).

The 16-bit application identifier (AI = DAC + FI) consists of the following elements:

(a) 10-bit designated area code (DAC): international (DAC = 1) or regional (DAC > 1);

(b) 6-bit function identifier (FI) – allows for 64 unique application specific messages.

For the European harmonized Inland AIS Application Specific Messages, the DAC "200" is used.

In addition, national (regional) DAC may be used in local ASM, e.g. test pilots. Nevertheless, it is strongly recommended to avoid the usage of regional ASM.

3.5.3 Information content through Application Specific Messages

Inland AIS ASM DAC = 200 FI = 10 (Inland Ship static and voyage related data) and DAC = 200 FI = 55 (inland number of persons on board) are implemented directly in the Inland AIS mobile station (see paragraphs 3.5.3.1 and 3.5.3.2).

3.5.3.1 Inland vessel static and voyage-related data (Inland specific Message FI 10)

This message should be used by inland vessels only, to broadcast vessel static and voyage-related data in addition to Message 5. The message should be sent with binary Message 8 as soon as possible (from the AIS point of view) after Message 5.

Table 3.4
Inland vessel data report

Parameter		*Number of bits*	*Description*
Message ID		6	Identifier for Message 8; always 8
Repeat indicator		2	Used by the repeater to indicate how many times a message has been repeated. 0–3; 0 = default ; 3 = do not repeat any more
Source ID		30	MMSI number
Spare		2	Not used, shall be set to zero. Reserved for future use.
Binary data	Application Identifier	16	DAC = 200; FI = 10
	Unique European Vessel Identification Number (ENI)	48	8∗6 bit ASCII characters 00000000 = ENI not assigned = default
	Length of vessel/convoy	13	1–8 000 (rest not to be used) length of vessel/convoy in 1/10m; 0 = default
	Beam of vessel/convoy	10	1–1 000 (rest not to be used) beam of vessel/convoy in 1/10m; 0 = default
	Vessel and convoy type	14	Numeric vessel and convoy type as described in appendix C 0 = not available = default
	Dangerous cargo indication	3	Number of blue cones/lights 0–3; 4 = B-flag; 5 = default = unknown
	Maximum present static draught	11	1–2 000 (rest not to be used) draught in 1/100 m, 0 = default = unknown
	Loaded/unloaded	2	1 = loaded; 2 = unloaded; 0 = not available/default; 3 should not be used
	Quality of speed information	1	1 = high; 0 = low/GNSS = default[17]
	Quality of course information	1	1 = high, 0 = low/GNSS = default[17]
	Quality of heading information	1	1 = high, 0 = low = default[17]
	Spare	8	Not used, shall be set to zero. Reserved for future use.
Total		**168**	**Occupies one slot**

3.5.3.2 Number of persons on board (Inland specific Message FI 55)

This message should be sent by inland vessels only, to inform about the number of persons (passengers, crew, shipboard personnel) on board. The message should be sent with binary Message 6**,** preferably on event or on demand**,** using International Application Identifier binary functional Message 2.

[17] Shall be set to 0 if no type approved sensor (e.g. gyro) is connected to the transponder.

Table 3.5
Number of persons on board report

Parameter		*Number of bits*	*Description*
Message ID		6	Identifier for Message 6; always 6
Repeat indicator		2	Used by the repeater to indicate how many times a message has been repeated. 0–3; 0 = default; 3 = do not repeat any more
Source ID		30	MMSI number of source station
Sequence number		2	0–3
Destination ID		30	MMSI number of destination station
Retransmit flag		1	Retransmit flag should be set upon retransmission: 0 = no retransmission = default; 1 = retransmitted.
Spare		1	Not used, shall be set to zero. Reserved for future use.
Binary data	Application Identifier	16	DAC = 200; FI = 55
	Number of crew members on board	8	0–254 crew members, 255 = unknown = default
	Number of passengers on board	13	0–8 190 passengers, 8 191 = unknown = default
	Number of shipboard personnel on board	8	0–254 shipboard personnel, 255 = unknown = default
	Spare	51	Not used, shall be set to zero. Reserved for future use.
	Total number of bits	**168**	**Occupies one slot**

4. Other AIS mobile stations on inland waterways

4.1 Introduction

Vessels not obliged to operate Inland AIS mobile stations may use other AIS mobile stations. The following mobile stations can be used:

(a) AIS Class A mobile station in accordance with Regulation 19 of SOLAS Chapter V and Recommendation ITU-R M.1371;

(b) AIS Class B mobile station in accordance with paragraph 4.2.

The use of such stations in inland waterways is up to the decision of the Competent Authority responsible for the navigation in that area.

If such stations are used on a voluntary basis, the shipmaster shall keep the manually entered AIS data constantly up to date. No incorrect data shall be transmitted over AIS.

4.2 General requirements for AIS Class B mobile stations on inland waterways

AIS Class B has restricted functionalities compared to Inland AIS mobile stations. The messages sent out by an AIS Class B mobile station are transmitted with a lower priority in comparison to Inland AIS mobile stations.

AIS Class B mobile stations installed on vessels navigating on inland waterways shall meet the requirements set out in:[18]

[18] AIS Class B mobile stations installed on vessels navigating on inland waterways of the European Union, must also meet the requirements stated in the annex to Commission Implementing Regulation

(a) Recommendation ITU-R M. 1371;

(b) IEC International Standard 62287 (including DSC channel management[19]).

Note: It is the responsibility of the Competent Authority responsible for the navigation in that area to ascertain the conformity of AIS Class B mobile stations to the standards and requirements listed in the second subparagraph prior to issuing a ship station license, assigning a Maritime Mobile Service Identifier (MMSI) number, for example by type approval of the relevant AIS Class B mobile stations.

5. AIS Aids to Navigation in inland navigation

5.1 Introduction

A navigational aid (also known as Aids to Navigation, or AtoN) is a marker which provides support during navigation. Such aids include markings for lighthouses, buoys, fog signals, and day beacons. A list of types of AtoNs is included in Table 5.2.

The AIS technology provides the possibility to dynamically transfer information about AtoNs.

For the use in inland navigation the maritime AIS AtoN report (Message 21) needs to be extended to reflect the specifics of the inland buoyage system.

The maritime AIS AtoN report is based on the IALA buoyage system. For inland navigation the AIS AtoN report needs to reflect the European Inland AtoN system described in chapter 5.

The AIS AtoN report transfers the position and the meaning of the AtoN as well as information if a buoy is on the required position (on position) or not (off position).

5.2 Use of Message 21: Aids to Navigation report

For the use on inland waterways, the AIS AtoN report (Message 21) as defined in Recommendation ITU-R M.1371 is being used. The additional European Inland types of AtoN are coded using the "AtoN status" bits.

Table 5.1
AIS AtoN Report

Parameter	*Number of bits*	*Description*
Message ID	6	Identifier for this message 21
Repeat indicator	2	Used by the repeater to indicate how many times a message has been repeated 0–3; Default = 0; 3 = do not repeat any more
ID	30	MMSI number (see Article 19 of the ITU Radio Regulations and Recommendation ITU-R M.585)
Type of Aids to Navigation	5	0 = not available = default; refer to appropriate definition set up by IALA; see figure 5.1[20]
Name of Aids to Navigation	120	Maximum 20 characters 6-bit ASCII, as defined in Table 47 of Recommendation ITU-R M. 1371 "@@@@@@@@@@@@@@@@@@@@" = not available = default.

(EU) 2019/838 of 20 February 2019 on technical specifications for vessel tracking and tracing systems and repealing Regulation (EC) No. 415/2007, in particular, the requirements resulting from Directive 1999/5/EC of the European Parliament and of the Council and Commission Decision 2005/53/EC.

[19] Mandatory according to Commission Implementing Regulation (EU) 2019/838 of 20 February 2019 on technical specifications for vessel tracking and tracing systems and repealing Regulation (EC) No. 415/2007.

[20] In case an inland AtoN type code is being transmitted, this field (type of AtoN) shall be set to 0 = undefined.

Parameter	*Number of bits*	*Description*
		The name of the AtoN may be extended by the parameter "Name of Aids to Navigation Extension" below
Position accuracy (PA)	1	1 = high (≤ 10 m) 0 = low (> 10 m) 0 = default The PA flag should be determined in accordance with Recommendation ITU-R M.1371, table "Determination of position accuracy information"
Longitude	28	Longitude in 1/10 000 min of position of an AtoN (± 180°, East = positive, West = negative 181 = (6791AC0h) = not available = default)
Latitude	27	Latitude in 1/10 000 min of an AtoN (± 90°, North = positive, South = negative 91 = (3412140h) = not available = default)
Dimension/ reference for position	30	Reference point for reported position; also indicates the dimension of an AtoN (m) (see figure 5.1), if relevant[21]
Type of electronic position fixing device	4	0 = Undefined (default) 1 = GPS 2 = GLONASS 3 = Combined GPS/GLONASS 4 = Loran-C 5 = Chayka 6 = Integrated Navigation System 7 = surveyed. For fixed AtoN and virtual AtoN, the charted position should be used. The accurate position enhances its function as a radar reference target 8 = Galileo 9–14 = not used 15 = internal GNSS
Time stamp	6	UTC second when the report was generated by the EPFS (0–59 or 60) if time stamp is not available, which should also be the default value, or 61, if positioning system is in manual input mode, or 62, if electronic position fixing system operates in estimated (dead reckoning) mode, or 63, if the positioning system is inoperative)
Off-position indicator	1	For floating AtoN, only: 0 = on position; 1 = off position. *Note 1*: This flag should only be considered valid by receiving station, if the AtoN is a floating aid, and if time stamp is equal to or below 59. For floating AtoN, the guard zone parameters should be set on installation
AtoN status	8	Reserved for the indication of the AtoN status 00000000 = default[22]

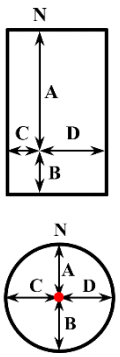
[21] When using figure 5.1 for AtoN the following shall be observed:

- For fixed AtoN, virtual AtoN, and for offshore structures, the orientation established by the dimension A shall point to true north
- For floating aids larger than 2 × 2 m, the dimensions of the AtoN shall always be given approximated to a circle, i.e. the dimensions shall always be as follows A = B = C = D ≠ 0. (This is due to the fact that the orientation of the floating AtoN is not transmitted. The reference point for reported position is in the centre of the circle.)
- A = B = C = D = 1 shall indicate objects (fixed or floating) smaller than or equal to 2 × 2 m. (The reference point for reported position is in the centre of the circle.)
- Floating offshore structures that are not fixed, such as rigs, shall be considered as Code 31 type from table 5.2. These structures shall have their "Dimension/reference for position" parameter as determined above in Note 1. For fixed offshore structures, Code 3 type from Table 5.2, shall have their "Dimension/reference for position" parameter as determined above in Note 1. Hence, all offshore AtoN and structures have the dimension determined in the same manner and the actual dimensions are contained in Message 21.

[22] For Inland AIS AtoN report, this field shall be used to indicate the Inland AtoN type using page 001.

Parameter	*Number of bits*	*Description*
RAIM-flag	1	RAIM (Receiver autonomous integrity monitoring) flag of electronic position fixing device; 0 = RAIM not in use = default; 1 = RAIM in use; see Recommendation ITU-R M.1371 table "Determination of position accuracy information"
Virtual AtoN flag	1	0 = default = real AtoN at indicated position; 1 = virtual AtoN, does not physically exist[23]
Assigned mode flag	1	0 = Station operating in autonomous and continuous mode = default 1= Station operating in assigned mode
Spare	1	Spare. Not used, shall be set to zero. Reserved for future use
Name of Aids to Navigation Extension	0, 6, 12, 18, 24, 30, 36, … 84	This parameter of up to 14 additional 6-bit-ASCII characters for a 2-slot message may be combined with the parameter "Name of Aids-to-Navigation" at the end of that parameter, when more than 20 characters are needed for the name of the AtoN. This parameter should be omitted when no more than 20 characters for the name of the AtoN are needed in total. Only the required number of characters should be transmitted, i.e. no @-character should be used
Spare	0, 2, 4 or 6	Spare. Used only when parameter "Name of Aids to Navigation Extension" is used. Shall be set to zero. The number of spare bits should be adjusted in order to observe byte boundaries
Total	**272–360**	**Occupies two slots**

Figure 5.1
Reference point for reported position of a maritime AtoN, or the dimension of an AtoN



	Number of bits	*Bit Fields*	*Distance (m)*
A	9	Bit 21–Bit 29	0–511 511 – 511 m or greater
B	9	Bit 12–Bit 20	0–511 511 – 511 m or greater
C	6	Bit 6–Bit 11	0–63 63 – 63 m or greater
D	6	Bit 0–Bit 5	0-63 63 - 63 m or greater

If the type of AtoN to be transmitted is covered within the existing IALA types of AtoN (according to table 5.2), no changes need to be applied.

Table 5.2
Types of Aids to Navigation

Code	*Definition Maritime*
0	Default, Type of AtoN not specified
1	Reference point
2	RACON

[23] When transmitting virtual AtoN information, i.e. the virtual/pseudo AtoN Target Flag is set to one (1), the dimensions shall be set to A = B=C = D = 0 (default). This shall also be the case, when transmitting the "reference point" information.

	Code	*Definition Maritime*
	3	Fixed structures offshore, such as oil platforms, wind farms. (*Note 1*: This code should identify an obstruction that is fitted with an AtoN AIS station)
	4	Emergency Wreck Marking Buoy
Fixed AtoN	5	Light, without sectors
	6	Light, with sectors
	7	Leading Light Front
	8	Leading Light Rear
	9	Beacon, Cardinal N
	10	Beacon, Cardinal E
	11	Beacon, Cardinal S
	12	Beacon, Cardinal W
	13	Beacon, Port hand
	14	Beacon, Starboard hand
	15	Beacon, Preferred Channel port hand
	16	Beacon, Preferred Channel starboard hand
	17	Beacon, Isolated danger
	18	Beacon, Safe water
	19	Beacon, Special mark
Floating AtoN	20	Cardinal Mark N
	21	Cardinal Mark E
	22	Cardinal Mark S
	23	Cardinal Mark W
	24	Port hand Mark
	25	Starboard hand Mark
	26	Preferred Channel Port hand
	27	Preferred Channel Starboard hand
	28	Isolated danger
	29	Safe Water
	30	Special Mark
	31	Light Vessel/LANBY/Rigs

Note 1: The types of AtoN listed above are based on the IALA Maritime Buoyage System, where applicable.

Note 2: There is potential for confusion when deciding whether an aid is lighted or unlighted. Competent authorities may wish to use the regional/local section of the message to indicate this.

5.3 Extension of Message 21 with inland-specific type of AtoN

The parameter field “AtoN status” is used for the extension of Message 21 with inland-specific type of AtoN.

The parameter field “AtoN status” is organized in eight pages, of which page ID 0 is 0 = default, page ID 1 to 3 is for regional use and page ID 4 to 7 is for international use. The first three bits of the AtoN status filed defines the page ID, the remaining 5 bits contains the information of the page.

The region, in which page ID 1 to 3 is applicable is defined by the Maritime Identification Digits within the MMSI of the transmitting AIS AtoN station. Thus, the bit coding of the 5 information bits in the AtoN status field is only applicable in this specific region.

For the European Union inland waterways, page ID 1 of the AtoN status field contains the list of inland-specific type of AtoN used.

To set an inland-specific type of AtoN in Message 21, two steps have to be made. First, the parameter “Type of aids to navigation” in Message 21 needs to be set to “0 = Default, type of AtoN not specified”. Second, the parameter “AIS status” needs to be set to page ID 1 and the appropriate code of the Inland-specific type of AtoN, as follows:

Msg 21 — AtoN status:

Appendix A

Abbreviations

Abbreviation	*Meaning*
AI	Application Identifier
AIS	Automatic Identification System
ADN	European Agreement concerning the International Carriage of Dangerous Goods by Inland Waterways
ASCII	American Standard Code for Information Interchange
ASM	Application Specific Message
AtoN	Aids to Navigation
DAC	Designated Area Code
DGNSS	Differential GNSS
FI	Functional Identifier
GLONASS	(Russian) GLObal NAvigation Satellite System
GNSS	Global Navigation Satellite System
GPS	Global Positioning System
HDG	Heading
IAI	International Application Identifier
IALA	International Association of Marine Aids to Navigation and Lighthouse Authorities
ID	Identifier
ITU	International Telecommunication Union
MMSI	Maritime Mobile Service Identifier as referred to in Recommendation ITU-R M585
ROT	Rate Of Turn
Class B SO/CS	Class B mobile stations using either carrier-sense time division multiple access (CSTDMA) technique (“CO”), or Self-organising time division multiple access (SOTDMA) technique (“SO”)
SOLAS	Safety of Life at Sea
SQRT	Square root
UTC	Universal Time Coordinated
VHF	Very High Frequency
VTS	Vessel Traffic Services

Appendix B

DIGITAL INTERFACE SENTENCES FOR INLAND AIS

B.1 Input sentences

The serial digital interface of the AIS is supported by existing IEC 61162 sentences. The detailed descriptions for the digital interface sentences are found in IEC 61162.

In addition, the following digital interface sentences are defined for Inland AIS mobile station.

B.2 Inland waterway static ship data

This sentence is used to change settings, which are not covered by SSD and VSD.

$PIWWSSD,cccccccc,xxxx,x.x,x.x,x,x,x,x.x,x.x,x.x,x.x*hh<CR><LF>

field 1 2 3 4 5 6 7 8 9 10 11

Field	*Format*	*Description*
1	cccccccc	ENI number
2	xxxx	inland vessel type according to appendix C
3	x.x	length of vessel 0 to 800,0 metre
4	x.x	beam of vessel 0 to 100,0 metre
5	x	quality of speed information 1 = high or 0 = low
6	x	quality of course information 1 = high or 0 = low
7	x	quality of heading information 1 = high or 0 = low
8	x.x	B value for internal reference position (distance reference point to stern)
9	x.x	C value for internal reference position (distance reference point to port side)
10	x.x	B value for external reference position (distance reference point to stern)
11	x.x	C value for external reference position (distance reference point to port side)

B.3 Inland waterway voyage- data

This sentence is used to enter inland navigation voyage vessel data into an Inland AIS mobile station. For setting the inland voyage related data, the sentence $PIWWIVD with the following content is used:

$PIWWIVD,x,x,x,x.x,x.x,x,xxx,xxxx,xxx,x.x,x.x,x.x,x.x*hh<CR><LF>

field 1 2 3 4 5 6 7 8 9 10 11 12 13

Field	*Format*	*Description*
1	x	See Recommendation ITU-R M.1371 Msg 23 reporting interval settings, default set- ting: 0
2	x	number of blue cones: 0-3, 4 = B-Flag, 5 = default = unknown
3	x	0 = not available = default, 1 = loaded, 2 = unloaded, rest not used

Field	*Format*	*Description*
4	x.x	static draught of vessel 0 to 20.00 metres, 0 = unknown = default, rest not used
5	x.x	air draught of vessel 0 to 40.00 metres, 0 = unknown = default, rest not used
6	x	number of assisting tugboats 0–6, 7 = default = unknown, rest not used
7	xxx	number of crew members on board 0 to 254, 255 = unknown = default, rest not
8	xxxx	number of passengers on board 0 to 8 190, 8 191 = unknown = default, rest not used
9	xxx	number of shipboard personnel on board 0 to 254, 255 = unknown = default, rest not used
10	x.x	Convoy extension to bow in (metre.decimetre = resolution in dm)
11	x.x	Convoy extension to stern in (metre.decimetre = resolution in dm)
12	x.x	Convoy extension to port side in (metre.decimetre = resolution in dm)
13	x.x	Convoy extension to starboard side in (metre.decimetre = resolution in dm)

In case of null fields, the corresponding configuration setting shall not be changed.

Appendix C

INLAND VESSEL AND CONVOY TYPES

This correspondence table is based on an excerpt of the "Codes for Types of Means of Transport" according to UNECE Recommendation 28 and the maritime ship types as defined in Recommendation ITU-R M.1371 "Technical characteristics for a universal shipborne automatic identification system using time division multiple access in the VHF maritime mobile band".

Vessel and convoy type		*Maritime ship type*	
Code	*Vessel name*	*First digit*	*Second digit*
8000	Vessel, type unknown	9	9
8010	Motor freighter	7	9
8020	Motor tanker	8	9
8021	Motor tanker, liquid cargo, type N	8	0
8022	Motor tanker, liquid cargo, type C	8	0
8023	Motor tanker, dry cargo as if liquid (e.g. cement)	8	9
8030	Container vessel	7	9
8040	Gas tanker	8	0
8050	Motor freighter, tug	7	9
8060	Motor tanker, tug	8	9
8070	Motor freighter with one or more ships alongside	7	9
8080	Motor freighter with tanker	8	9
8090	Motor freighter pushing one or more freighters	7	9
8100	Motor freighter pushing at least one tank-ship	8	9
8110	Tug, freighter	7	9
8120	Tug, tanker	8	9
8130	Tug, freighter, coupled	3	1
8140	Tug, freighter/tanker, coupled	3	1
8150	Freightbarge	9	9
8160	Tankbarge	9	9
8161	Tankbarge, liquid cargo, type N	9	0
8162	Tankbarge, liquid cargo, type C	9	0
8163	Tankbarge, dry cargo as if liquid (e.g. cement)	9	9
8170	Freightbarge with containers	8	9
8180	Tankbarge, gas	9	0
8210	Pushtow, one cargo barge	7	9
8220	Pushtow, two cargo barges	7	9

Vessel and convoy type		*Maritime ship type*	
Code	*Vessel name*	*First digit*	*Second digit*
8230	Pushtow, three cargo barges	7	9
8240	Pushtow, four cargo barges	7	9
8250	Pushtow, five cargo barges	7	9
8260	Pushtow, six cargo barges	7	9
8270	Pushtow, seven cargo barges	7	9
8280	Pushtow, eight cargo barges	7	9
8290	Pushtow, nine or more barges	7	9
8310	Pushtow, one tank/gas barge	8	0
8320	Pushtow, two barges at least one tanker or gas barge	8	0
8330	Pushtow, three barges at least one tanker or gas barge	8	0
8340	Pushtow, four barges at least one tanker or gas barge	8	0
8350	Pushtow, five barges at least one tanker or gas barge	8	0
8360	Pushtow, six barges at least one tanker or gas barge	8	0
8370	Pushtow, seven barges at least one tanker or gas barge	8	0
8380	Pushtow, eight barges at least one tanker or gas barge	8	0
8390	Pushtow, nine or more barges at least one tanker or gas barge	8	0
8400	Tug, single	5	2
8410	Tug, one or more tows	3	1
8420	Tug, assisting a vessel or linked combination	3	1
8430	Pushboat, single	9	9
8440	Passenger ship, ferry, red cross ship, cruise ship	6	9
8441	Ferry	6	9
8442	Red cross ship	5	8
8443	Cruise ship	6	9
8444	Passenger ship without accommodation	6	9
8445	Day-trip high speed vessel	6	9
8446	Day-trip hydrofoil vessel	6	9
8447	Sailing cruise ship	6	9
8448	Sailing passenger ship without accommodation	6	9
8450	Service vessel, police patrol, port service	9	9
8451	Service vessel	9	9
8452	Police patrol vessel	5	5

Vessel and convoy type		*Maritime ship type*	
Code	*Vessel name*	*First digit*	*Second digit*
8453	Port service vessel	9	9
8454	Navigation surveillance vessel	9	9
8460	Vessel, work maintenance craft, floating derrick, cable-ship, buoy-ship, dredge	3	3
8470	Object, towed, not otherwise specified	9	9
8480	Fishing boat	3	0
8490	Bunkership	9	9
8500	Barge, tanker, chemical	8	0
8510	Object, not otherwise specified	9	9
1500	General cargo vessel maritime	7	9
1510	Unit carrier maritime	7	9
1520	Bulk carrier maritime	7	9
1530	Tanker	8	0
1540	Liquefied gas tanker	8	0
1850	Pleasure craft, longer than 20 metres	3	7
1900	Fast ship	4	9
1910	Hydrofoil	4	9
1920	Catamaran fast	4	9