

Name of contracting authority: Estonian Transport Administration
Name of public procurement: Procurement of AIS/VDES base stations
Type of procurement procedure: Open procedure
Reference number: 249678

RA Annex 1

The technical specifications

1 General

- 1.1 Any reference by the purchaser in this document to the source, process, standard, trademark, patent, type, origin or method of manufacture shall be construed as supplemented by the words "or equivalent".
- 1.2 The vessel traffic management (VTM) system of the Traffic Management Department (TMD) of the Transport Administration (TRAM) uses a network of AIS base stations. They transmit AIS messages from ships to the VTM system for vessel traffic monitoring and the Gulf of Finland Reporting (GoFREP) system developed by Saab AB and Cybernetica AS, as well as to various stakeholders, including the HELCOM regional server, EMSA SSN, the Police and Border Guard (PPA), Estonian Navy etc.
- 1.3 The network of TRAM AIS base stations consists of eight AIS base stations that provide coverage for the AIS signal in the Gulf of Finland. These base stations are connected to the central servers of the VTM centre via a communication interface. The base station equipment is located in masts approximately 50 meters above the ground. In addition to the above, five (5) AIS base stations have been installed to ensure AIS coverage of Western coastline of Estonia, including Liivi Bay and Väinameri at Ruhnu, Torgu, Tõstamaa, Undva and Orisaare, the antennas are located at a height of about 100 meters. Every base station in location is connected to the server of the VTM center via communication interface.

2 General requirements

- 2.1 AIS/VDES base stations and their components must be designed for continuous operation 24/7.
- 2.2 The tenderer shall submit type approval/statement of conformity documents of the base stations issued by an international competent organization and that applies to the clauses applicable to the AIS base stations in the following standards:

Domain	Standards	Document of conformity
AIS	IEC 62320-1:2015	Type approval document/statement of conformity
AIS	ITU-R M.1084-5 / ITU-R M. 1371-5:2014	Type approval document/statement of conformity

2.3 The tenderer shall provide documentation in accordance with the table below regarding the international standards, requirements and recommendations applicable to VDES base stations.

Domain	Standard	Document of conformity
AIS/VDES:	IEC 62320-2:2016 (where relevant to base stations) / IEC62320-3:2015 (where relevant to base stations)	Statement of conformity
VDES/ASM	IEC PAS 63343_2021 (where relevant for base stations) / ITU-R M.2092-1 (02/2022)	Type approval or Statement of Conformity by manufacturer
AIS/VDES	RED Directive 2014/53/EU	EU-Type Examination (Module B) Certificate
AIS/VDES	REACH and RoHS / EU regulation	Statement of Conformity by manufacturer

2.4 The manufacturer must present a EU Declaration of Conformity for the base stations. The EU declaration of conformity (DoC) is a mandatory document that manufacturer or his authorized representative need to sign to declare that his products comply with the EU requirements. By signing the DoC the manufacturer or his authorized representative take full responsibility for product compliance with the applicable EU law.

3 Electrical requirements

3.1 Power supplies

3.1.1 All power supplies must be protected against overload and overvoltage in the event of a fault, such as a short in the supply circuit or components.

3.1.2 The base station shall support the mains power remote controlling.

3.2 Self-diagnostics

3.2.1 The base station must detect and warn when overheating occurs.

3.3 Safety requirements

- 3.3.1 The base station must comply with the safety requirements set out in the relevant publications of the International Electrotechnical Commission (IEC).
- 3.3.2 All metal parts that do not have electrical functions must be earthed.

4 Mechanical requirements

4.1 General

- 4.1.1 Base stations must be designed and constructed in such a way as to allow easy access to the components in need of the maintenance.

4.2 Labels

- 4.2.1 Labels used for identification, warnings, etc. must be in English and in accordance with the instructions and drawings.
- 4.2.2 Warning labels must be clearly distinguishable, in black on a yellow background and designed in accordance with European standards.
- 4.2.3 Each base station component e.g. power supply, modules, etc. must have labels.
- 4.2.4 Each label must contain at least the following information:
name of the system component, type- and serial-number and modification information.
- 4.2.5 All cables and cable entries and outlets must have labels in accordance with instructions and drawings.

4.3 Finishing

- 4.3.1 All equipment must be properly finished in accordance with good commercial practice.

5 Software Requirements

- 5.1 All software that is controlled by the base station control software under normal operating conditions shall have the following characteristics:
 - control of the data exchange and its inputs and outputs;
 - Incorrect data must never confuse the system. Such data must be discarded immediately;

6 Environmental requirements

- 6.1 The AIS/VDES base station shall be capable of operating at least in the following conditions without loss of reliability or equipment damage:
 - a temperature range of at least -20°C to $+55^{\circ}\text{C}$ (at least -55°C to $+85^{\circ}\text{C}$ during transport and storage);
 - relative humidity of at least 95%.
- 6.2 AIS/VDES base stations antennas installations must have lightning protection.

7 Presets

- 7.1 Base station shall automatically return to preset normal operation state after a power or other failure.

8 Functional requirements:

- sending and receiving all AIS and ASM messages
- simultaneous support for AIS1 (87B), AIS2 (88B), ASM1 (2027), ASM2 (2028) channels and use of AIS secure communication mode

- support for all VDE.ter channels: lower leg VDE1-A (1024-1026, 1084-1086) and upper leg VDE1-B (2024-2026, 2084-2086)
- built-in Software Defined Radio (SDR)
- VDL Signal Information Message (VSI) message support, VDL analysis support
- Frame summary of AIS reception (FSR) support
- AMRD support (Autonomous Maritime Radio Device)
- FATDMA and RATDMA time slot allocation support
- AIS secure communication mode (AIS), which allows encrypted communication
- embedded WEB server
- built-in Base Station Controller (BSC)
- internal storage device for storing data
- built-in NTP server functionality
- simultaneous support for multiple GNSS systems
- self-surveyed position
- remote software upgrade support
- user display on front
- AIS AtoN support

9 Technical requirements:

- supply voltage inputs: AC 100-240V, 50 / 60Hz
- the frequency band 156-163 MHz
- channel bandwidth: 25 kHz (AIS, ASM), 50 kHz and 100 kHz (VDE)
- output power: AIS low 1W, AIS high 12.5W, ASM and VDE variable (fixed values) between 1 and 12.5W
- bit rate (Tx / Rx): 9.6 kbps (AIS), 19.2 kbps (ASM), 307.2 kbps (VDE max. bit rate)
- Receiver sensitivity equal to or better than –118 dBm (AIS), 115 dBm (ASM) (20% PER)
- at least two (2) Ethernet ports of 1000 Mbit / s, one Supervisor Ethernet port
- TCP protocol support
- one (1) Rx/Tx N-Female socket for connecting VHF antenna (both Rx and Tx signals must use one socket and one antenna)
- GNSS receiver with at least 50 channels
- GNSS support for at least GPS, BeiDou, Glonass and Galileo systems
- TNC-Female GNSS antenna socket with, 5V @ 40mA supply
- GNSS receiver sensitivity better than -167 dBm
- an external GNSS antenna must be included in the base station kit
- meant to be installed in a 19 "wide rack / equipment cabinet and have a maximum height of 2U

10 Built-in Test Equipment (BITE)

10.1 General

10.1.1 AIS/VDES base station shall have a BITE for fault detection and isolation.

10.1.2 BITE must not cause false alarms or system malfunctions. BITE must constantly check the status of its work to ensure the accuracy of the output data.

10.2 Warnings and alarms

10.2.1 BITE must provide warnings and alarms according to the criticality of the problems. It must be possible to change the settings for warnings and alarms.

11 Control and Monitoring System (CMS)

11.1 AIS/VDES base stations shall have a control and monitoring system (CMS).

11.2 The interface of the control and monitoring system must be available on-site and / or over the network.

11.3 The CMS must be able to perform the following tasks:

- monitoring the general condition of the system
- system recovery
- setting parameters
- system reconfiguration
- tabular and graphical display of AIS spatial data (location reports)
- VDL image (busy, reserved) and free timeslot allocation in time frame

11.4 The failure of the CMS shall not cause the AIS/VDES base station to fail completely.

11.5 The CMS shall not generate false control commands or generate false system status messages during events caused by:

- line disturbances
- current fluctuations
- power outages

11.6 The CMS shall be able to manage multiple signals simultaneously and control commands without loss of information.

11.7 Attempts to perform prohibited operations / configurations shall be automatically aborted.

11.8 All data must be available according to the current system configuration.

11.9 Changes to the system parameters are made via the CMS.

12 Reliability

12.1 The average Mean Time Between Failures (MTBF) of a AIS/VDES base station shall be at least 100,000 hours.

12.2 The AIS/VDES base station shall have a availability of at least 99.8%. Up to 0.2% of the operating time can be spent on maintenance work at a AIS/VDES base station.

12.3 The Mean Time To Repair (MTTR, including troubleshooting, unit replacement, and system recovery) must be defined by manufacturer.

13 Abbreviations

AC	Alternating Current
AIS	Automatic Identification System
AMRD	Autonomous Maritime Radio Device
ASM	Application Specific Messages
ASO	Data Communication in Public Administration (State Network)

AtoN	Aids to Navigation
BITE	Built-in Test Equipment
BSC	Base Station Controller
CMS	Control and Monitoring System
DC	Direct Current
DoC	Declaration of Conformity
EMSA	European Maritime Safety Agency
EU	European Union
FAT	Factory Acceptance Test
FATDMA	Fixed Access Time Division Multiple Access
FSR	Frame Summary of AIS reception
GNSS	Global Navigation Satellite System
GoFREP	Gulf of Finland Reporting
GPS	Global Positioning System
HELCOM	Helsinki Commission
IALA	International Association of Marine Aids to Navigation and Lighthouse Authorities
IEC	International Electrotechnical Commission
ITU	International Telecommunication Union
MTBF	Mean Time between Failures
MTTR	Mean Time to Repair
NATO	North Atlantic Treaty Organization
NTP	Network Time Protocol
PAS	Publicly Available Specification
PER	Packet Error Rate
PPA	Estonian Police and Border Guard Board
RATDMA	Random Access Time Division Multiple Access
REACH	Registration, Evaluation, Authorisation and Restriction of Chemicals
RED	Radio Equipment Directive
RIKS	State Infocommunication Foundation
RoHS	Restriction of Hazardous Substances
Rx	Receive
SAT	Site Acceptance Test
SDR	Software Defined Radio
SNMP	Simple Network Management Protocol
SSN	SafeSeaNet
STANAG	NATO Standardization Agreement
TAT	Turnaround Time
TCP	Transmission Control Protocol
TMD	Traffic Management Department
Tx	Transmit
UDP	User Datagram Protocol
TRAM	Estonian Transport Administration
VDES	VHF Data Exchange System
VDL	VHF Data Link
VHF	Very High Frequency

VPN	Virtual Private Network
VSI	VDL Signal Information
VSP	Variable System Parameter
VTM	Vessel Traffic Management
VTS	Vessel Traffic Service