KONGSBERG

Kongsberg AIS 300 Automatic Identification System

Instruction manual

A300-02/2.0
June 2016 - preliminary

Document history

Document number: A300-02 / Revision 2.0		
Rev. 2.0	June 2016	Preliminary second version — awaiting FCC approval.

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Warning

The equipment to which this manual applies must only be used for the purpose for which it was designed. Improper use or maintenance may cause damage to the equipment and/or injury to personnel. The user must be familiar with the contents of the appropriate manuals before attempting to operate or work on the equipment.
Kongsberg Seatex disclaims any responsibility for damage or injury caused by improper installation, use or maintenance of the equipment.

Comments

To assist us in making improvements to the product and to this manual, we welcome comments and constructive criticism.
e-mail: km.seatex@km.kongsberg.com

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Glossary

Abbreviations

AIS	Automatic Identification System
BIIT	Built-in integrity test
CTS	Clear to send
DGPS	Differential GPS
ECDIS	Electronic chart display and information system
ECS	Electronic chart system
EGNOS	European Geostationary Navigation Overlay System
EMC	Electromagnetic compatibility
GPS	Global positioning system
IALA	International Association of Lighthouse Authorities
IEC	International electrotechnical committee
IMO	International Maritime Organization
LED	Light emitting diode
LGND	Logic ground
LNA	Low noise signal amplifier
MIB	Management information base
MKD	Minimum keyboard display
NDS	Not detected serial port
NMEA	National marine electronics association. NMEA 0183 (reference IEC 61162) is a standard for interchange of information between navigation equipment.
PGND	Power ground
PI	Presentation interface
PPS	Pulse per second
PRN	Pseudorandom noise
PSS	Physical shore station
QA	Quality assurance
RTS	Request to send
RTCM	Radio Technical Commission of Maritime Services
SA	Selective availability
SBAS	Satellite Based Augmentation System
SNMP	Simple network management protocol

SNR	Signal/noise ratio
SOTDMA	Self Organised TDMA
SPS	Standard positioning service
SW	Software
TDMA	Time Division Multiple Access
UI	User interface
UTM	Universal transverse mercator
VDL	VHF data link
VHF	Very high frequency
WAAS	Wide area augmentation system
WEEE	Waste Electrical and Electronic Equipment
WGS84	World Geodetic System of 1984

1 Introduction

1.1 About the manual

This instruction manual is intended as a reference manual for the personnel installing, configuring and operating the system and it contains the necessary information in order to install, configure and operate the AIS 300 Mobile Station.

1.2 Notations used in this manual

The following notations are used in this manual:

Bold text is used for all menu names. A series of menu selections is indicated by **File→ New**

Italics is used for manual names and for information that needs your attention.

Note

A note is used to draw attention to special features or behaviour of the equipment.

Caution

Caution is used to make the user aware of procedures and operational practice which, if not followed, may result in degraded performance or damage to the equipment.

1.3 Product restrictions

1.3.1 Restrictions in guarantee

Changes or modifications to the product not explicitly approved by Kongsberg Seatex AS will void the guarantee.

The liability of Kongsberg Seatex AS is limited to repair of this system only under the given terms and conditions stated in the sales documents. Consequential damages such as customer's loss of profit or damage to other systems traceable back to this system's malfunctions, are excluded. The warranty does not cover malfunctions of the system resulting from the following conditions:

- Incorrect power connection.
- Short-circuiting of GNSS antenna cable during operation of the system(s).

1.3.2 Restrictions in use

The AIS is a communication system that relies on VHF and GPS. The antennas shall be connected according to the instructions. Without proper VHF antenna and antenna cable, the sensitivity and hence the range, will be degraded. The GNSS receiver requires free sight from the antenna to the sky, minimum four visible satellites and otherwise normal conditions to operate.

1.4 Radio frequency license

This product contains a radio-transmitting device and a national license for the use of frequencies is required for operation. Use in national waters will require a frequency license issued by the relevant national authorities. The owner and user of the equipment are responsible for obtaining such a license prior to switching the product ON. It may be required to switch the product OFF when the product is brought close to shore (closer than 12 NM).

1.5 FCC statements

The Federal Communications Commission (FCC) is an independent agency of the United States government and regulates interstate and international communications by radio, television, wire, satellite and cable.

1.5.1 FCC general statement

Excerpt from FCC Rules, §15.21.

Changes or modifications to the equipment not expressly approved by the party responsible for compliance could void the user’s authority to operate the equipment.

1.5.2 FCC part 15 statement

Excerpt from FCC Rules.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

1 this device may not cause harmful interference, and

2 this device must accept any interference received, including interference that may cause undesired operations.

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a marine and/or commercial environment. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. The equipment is not intended for operation in a residential area. Operation in such an area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

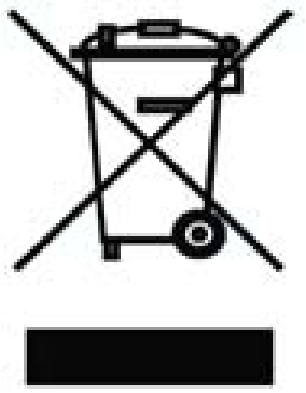
1.6 Note on RF radiation exposure limits and AIS equipment

The international regulations related to radiation exposure are mainly aimed at setting levels for portable devices (and base station sites for mobile networks). Portable devices intended to be used very close to the human body (within 0.5 m or less), can have RF power levels in the range up to 10 W.

The Kongsberg Seatex AS AIS equipment uses VHF transmission (156 to 164 MHz band), and is intended for permanent installation on ships (above a certain size). The antenna is mounted high up in a mast. This is considered a controlled environment. RF power fed to the antenna is maximum 12 W (the transmission is not continuous). Any human will be in the far field (> 10 m) from the AIS VHF antenna and is not likely to be exposed to hazardous RF fields originating from this antenna.

1.7 Disposal

All electrical and electronic components have to be disposed of separately from the municipal waste stream via designated collection facilities appointed by the government or local authorities. The correct disposal and separate collection of your old appliance will help prevent potential negative consequences for the environment and human health. It is a precondition for reuse and recycling of used electrical and electronic equipment. For more detailed information about disposal of your old appliance, please contact your local authorities or waste disposal service.



The equipment may be returned to Kongsberg Seatex AS if there is no local WEEE collection. The equipment is marked with this pictogram.

1.8 Equipment handling

Observe the following when handling the equipment:

- All units must be handled with care.
- The case containing the unit must be kept dry at all times and must be sheltered from the weather.
- It must not be subjected to shocks, excessive vibration or other rough handling.
- The equipment must be preserved and stored in such a way that it does not constitute any danger to health, environment or personal injury.
- The unit must, whenever possible, be stored and transported in its original transportation box.
- The transportation box must not be used for any purpose for which it was not intended.
- The storage area's mean temperature must not be lower than – 20 ºC and not warmer than + 70 ºC.
- Once unpacked, the equipment must be kept in a dry, non-condensing atmosphere, free from corrosive agents and isolated from sources of vibration.

1.9 Support information

- **Company name**: Kongsberg Seatex AS
- **Address**: Havnegata 9, 7010 Trondheim, Norway
- **Switchboard**: +47 73 54 55 00
- **Telefax**: +47 73 51 50 20
- **Duty phone**: +47 33 03 24 07 (24 hours)
- **E-mail address**: km.support.seatex@km.kongsberg.com
- **Website**: http://www.km.kongsberg.com/seatex

2 Product description

This chapter describes the AIS Mobile Station system and gives an overview of AIS and GPS related information.

2.1 Software and hardware versions

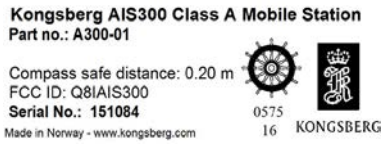
System delivered with	Software version, 1.00.xx	Hardware version, 1

Revision table

Date	Software version	Hardware version

2.2 Wheelmarking

This product is wheelmarked. The wheelmark with serial number is located on the label on the side and the rear of the AIS Unit.



2.3 Purpose and applications

Kongsberg Seatex AS provides, via its AIS 300 mobile station, a technical solution that enables the identification of other vessels, navigations aids fitted with VHF based AIS technology and virtual AIS AtoN. It is designed to be a “black box” for integration towards other navigation equipment such as ECDIS/ECS and radar. AIS 300 has an outstanding receiver sensitivity which gives a larger range compared to units with the required sensitivity of -107 dBm.

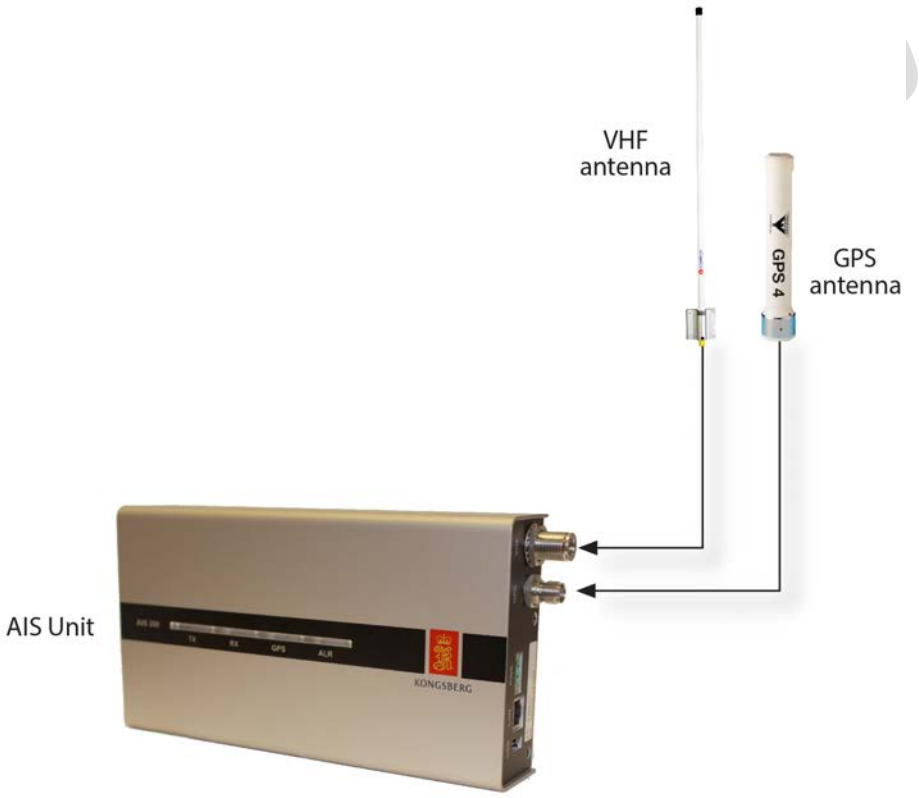
2.4 System components

This system will normally comprise the following main components, which are physically separated:

- AIS Unit
- GNSS antenna
- VHF antenna

In addition, the following items are needed:

- Antenna cable for GNSS antenna and VHF antenna
- Power cable (two cords)
- Serial connection towards external sensors (if any) such as heading device, GNSS receiver etc.

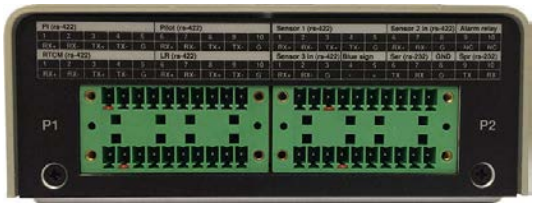


2.5 AIS Unit

The unit is a stand-alone mount and comprises the following main parts:

- AIS module
- GPS receiver
- Power supply
- Interface module

VHF, GPS connectors, LAN, USB and power are located on one side and the serial connections are located on the other side.

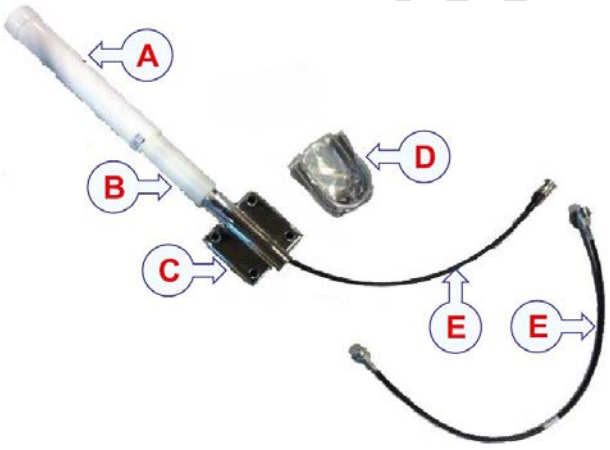


2.6 GNSS antenna description

The GPS 4 antenna is an active receiving antenna for the 1575 MHz NAVSTAR GPS satellite navigation system.

The GNSS antenna has a right-hand circular polarisation (RHCP) and a built-in high gain, low noise amplifier. It has a full hemispherical coverage due to quadrifilar helix antenna element.

It is delivered with an installation kit with U-bolts. The connector is FME-female (pin) (N-female pigtail when delivered by Kongsberg Seatex AS).



A GNSS antenna
B Extension pipe
C Mounting bracket
D U-bolts
E Interconnection cables

2.7 VHF antenna description

AV7 is a high quality dipole antenna designed for the marine VHF radio telephone service. It is a high quality antenna with a durable construction. It has a vertical polarization and omni-directional radiation pattern.

U-bolts in stainless steel are included.

2.8 AIS system

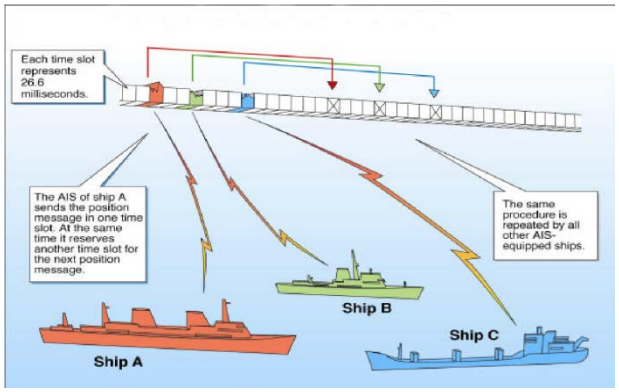
In accordance with IMO requirements all SOLAS ships in international traffic above 300GT shall carry an AIS mobile station. A major task for competent authorities such as coastal and harbour authorities, police, customs, military, search and rescue centres and other, is to monitor ship traffic within their territorial waters. Through an AIS infrastructure system, the governmental organisations will have the full traffic overview of all SOLAS ships, as well as AIS Class B within the AIS base station coverage area. The AIS system provides an efficient tool to increase the situation awareness, the efficiency of operations and safety. Experience shows that the workload for the operators involved in vessel tracking and monitoring, is heavily decreased.

The implementation plan for SOLAS vessels started in 2002 and was finalised in 2004.

A Class A AIS mobile station consists of a GPS receiver and VHF radio modules. The AIS mobile station uses GPS satellites to determine vessel position. The position data should, however, come from the ship's primary navigation system. If this is not available, the position will be provided from the internal GPS receiver. The internal GPS receiver is also used for time-synchronisation of received and transmitted data.

VHF communication is used for broadcast and reception of vessel position data, navigational data, static and voyage related information with other vessels and base stations.

For an AIS Class A mobile station serial line communication and the NMEA data protocol are used to exchange AIS data with other navigation systems. AIS data are displayed on the MKD unit or external systems such as ECDIS/ECS or radar.



The Self-Organised Time Division Multiple Access protocol (SOTDMA) organises access for all users by operating with time-frames divided into single slots. AIS is based on SOTDMA communication on two frequencies (161.975 MHz and 162.025 MHz). Vessels will first listen in order to establish the slot table and then start sending in a vacant slot. When in normal operation, each station sends in a previously announced or randomly chosen slot. Future transmission slots will be allocated and communicated to surrounding AIS mobile stations. Hence a self-organised communication avoids transmission in same slots.

The system is designed to give preference to close targets. Targets far away will drop out first in the event of overload.

The length of a timeslot within the SOTDMA telegram is 26.6 milliseconds. There are maximum 2250 slots per minute on each AIS frequency, in total 4500 slots. One navigation message from a ship occupies one slot.

The transmission rate of a position message (msg 1-3) depends on the speed and turn-rate of a vessel. Static information (msg 5) is sent every 6 minutes.

Ship's dynamic conditions	**Reporting interval**
Ship at anchor or moored and not moving faster than 3 knots	3 minutes
Ship at anchor or moored and moving faster than 3 knots	10 seconds
Ship 0 to 14 knots	10 seconds
Ship 0 to 14 knots and changing course	3.3 seconds
Ship 14 to 23 knots	6 seconds
Ship 14 to 23 knots and changing course	2 seconds
Ship > 23 knots	2 seconds
Ship > 23 knots and changing course	2 seconds

2.9 GNSS systems

GNSS (Global Navigation Satellite System) is a generic term for satellite navigation systems providing autonomous geo-spatial positioning with global coverage. GPS is the only GNSS with full constellation. However, GLONASS is operable but do not have full constellation. Galileo is a third GNSS, which is in the development phase.

2.9.1 GPS - Global Positioning System

The Global Positioning System (GPS) is a satellite-based navigation system made up of a network of satellites placed into orbit by the U.S. Department of Defence. GPS was originally intended for military applications but in the 1980es the government made the system available for civilian use.

GPS provides a highly accurate and continuous navigation service. It provides 24-hour, all weather and global coverage.

The system is divided into the following three segments:

Space segment	This segment consists of at least 24 satellites (21 active plus 3 operating spares) in 12-hour circular orbits. At an altitude of 20200 km, each satellite is transmitting orbital and clock parameters.
Control segment	This segment comprises Ground Control Stations geographically spread for monitoring, up-loading and control of the satellite transmitted characteristics.
User segment	This segment comprises GPS receivers installed on board ships, aircraft etc. to track satellite signals and transform them into position, velocity and time.

Each GPS satellite transmits radio signals at two microwave frequencies in the L band, 1575.43 MHz (L1) and 1227.6 MHz (L2).

The L1 signal is modulated by a precise (P) code for Precise Positioning Service (PPS) and a course/acquisition (C/A) code for Standard Positioning Service (SPS). The P code is for military and authorised personnel only and is encrypted before broadcast to GPS users. The C/A code is for civil users. Until 1 May 2000 the accuracy of the C/A code was degraded to 100 m (2DRMS) horizontal positioning by the use of Selective Availability (SA). However, SA is now switched off and the position accuracy of the system is about 16 metres 95% CEP.

The fundamental technique for GPS is one-way ranging from the satellites. Triangulation, based on ranging from the satellites, is the basis of the system. In order to triangulate, the GPS measures distance using the travel time of a radio message. To measure travel time, timing is crucial. GPS therefore needs very accurate clocks. The transmission is referred to highly accurate atomic frequency standards on board the satellites, which are in synchronisation with the GPS system time base.

The time difference from when the signal leaves the satellites until it is received at the GPS receiver, is measured. The distance is computed by multiplying with the speed of light. Once the distance to a satellite is known, the satellite's position in space must be found. The GPS satellites are launched into very precise orbits and their position is transmitted to the user. Knowing the satellites' position and the distance to the user receiver, the user position can be computed. Three perfect measurements can solve a three-dimensional point in space.

However, the crystal clocks in the GPS receivers are drifting, and the position is therefore inaccurate. To calculate a three dimensional position, four unknowns have to be solved (latitude, longitude, height and receiver clock offset). To solve this equation with four unknowns it is necessary with range measurements from four or more satellites.

The geometry, and hence the accuracy of the position calculation, varies with the number of satellites available and their location.

Using differential corrections from one or more GPS Reference Stations significantly reduces all major error sources. This principle is called differential GPS (DGPS).

2.10 IALA DGPS description

An IALA DGNSS reference station generates differential GNSS corrections. Raw pseudo-range observations and other pertinent data from the inbuilt GNSS receiver are used to calculate corrections. The generated RTCM messages are sent via the MSK modulator to a DGNSS Reference Station Transmitter which amplifies the signal and broadcasts the corrections in the MF frequency range to mariners. On board the vessel these corrections are used in the DGPS receiver where the GPS position is corrected accordingly.

2.11 VHF in AIS systems

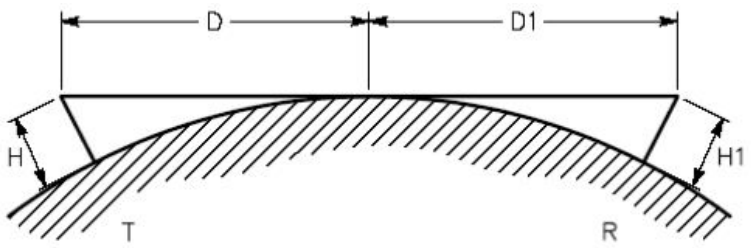
Transmission in the AIS system is based on VHF (Very High Frequency). AIS mobile stations (on board vessels), AIS AtoNs, AIS Base Stations and other AIS devices are transmitting on two standardised AIS channels; Channel A (161.975 MHz) and Channel B (162.025 MHz). Two power levels are used on the vessels; low (1 W) and high (12.5 W).

The range, distance between transmitting unit and receiving unit, is mainly depending on antenna height and the antenna installation. Use of for example combiners will introduce a loss and hence reduce the range. It is important to install the antenna as high as possible. Theoretical range can be estimated based on the following formula, which is a line of sight estimation:

$$D\,(km) = \sqrt{12,75xH\,(m)}$$

D = Distance (range) in kilometers. H = antenna height in metres.

Note that both the transmitter and receiver side (see figure) need to be considered. This is an estimation of line of sight, and is very conservative for VHF range calculations. In order to give a better estimate of VHF range under normal metrological conditions 10 % should be added to the line of sight distance. Special metrological conditions may affect the radio range considerably.



3 Technical specifications

3.1 Performance data

3.1.1 AIS 300 system

AIS module

Sensitivity	Better than -107 dBm

3.2 Physical dimensions

3.2.1 AIS Unit

Height	54.73 mm (including mounting bracket)
Width	132.55 mm
Length	260 mm (including connector)
Weight	1.3 kg (without mounting brackets)
Mounting brackets	Standard: 122.5 mm x 389.5 mm (with strain relief) Optional: 122.5 mm x 272 mm (wall mount) Optional: DIN rail bracket

3.2.2 GNSS antenna

Type	Procom GPS 4
Height	230 mm
Diameter	33 mm
Weight	0.15 kg
Colour	White
Connector type	FME male with pigtail to N-female

The GNSS antenna has a right-hand circular polarisation (RHCP) and a built-in high gain, low noise amplifier. It has a full hemispherical coverage due to quadrifilar helix antenna element. It is delivered with an installation kit with U-bolts.

3.2.3 VHF antenna

Type	Comrod AV7
Height	1250 mm
Diameter	25 mm
Weight	1 kg
Connector type	N-female

AV7 is a high quality dipole antenna designed for the marine VHF radio telephone service. It is a high quality antenna with a durable construction. It has a vertical polarization and omni-directional radiation pattern. U-bolts in stainless steel are included.

3.3 Power

3.3.1 AIS Unit

Input voltage	+24 V DC nominal (operational range 12 to 32 V DC)
Power consumption	Max. 30 W

3.3.2 GNSS antenna

Type	Procom GPS 4
Voltage	5 V DC from main unit

3.4 Environmental specifications

3.4.1 AIS Unit

Enclosure material	Aluminium
Operating temperature range	-15 °C to +55 °C
Recommended operating temperature	Room temperature (+20 °C)
Storage temperature range	-20 °C to +70 °C
Operating humidity	Max. 95 % non-condensing

Storage humidity	Less than 55 %
Ingress protection front	IP 42
Ingress protection rear	IP 21
Electromagnetic compatibility (immunity/emission)	IEC 60945/EN 60945
Vibration	IEC 60945/EN 60945

3.4.2 GNSS antenna

Type	Procom GPS 4
Operating temperature range	-50 °C to +70 °C
Relative humidity	Hermetically sealed (100 %)
Enclosure material	Weather-resistant low-loss plastic

3.4.3 VHF antenna

Type	Comrod AV7
Enclosure material	Fibreglass
Operating temperature range	-55 °C to +71 °C
Wind rating	55 m/s

3.5 External interfaces

3.5.1 AIS Unit

Serial ports	5 RS-422 (I/O), 2 RS-422 (I), 2 RS-232 (service, spare)
Baud rate	Up to 115 200 bytes/sec
LAN	1 Ethernet port
USB	1 in front
ALR	Open/closed (normally closed)
Blue sign	Switch

3.6 Product safety

3.6.1 AIS Unit

Electrical safety (LVD)[1]	IEC 60950-1/EN 60950-1

3.7 Radio frequencies

3.7.1 GNSS antenna

Type	Procom GPS 4
L1	1575 MHz
Gain (in axial direction)	32 dBi

3.7.2 GNSS receiver

Type	u-Blox
GPS L1	1575.42 MHz

3.7.3 VHF antenna

Type	Comrod AV7
Frequency	VSWR < 1.5:1, 156 to 162 MHz
	VSWR < 2:1, 145 to 165 MHz
Gain	2 dBi

3.7.4 VHF receiver

Type	Kongsberg Seatex AIS module
Frequency	156 to 162.0375 MHz

3.8 Data outputs

3.8.1 AIS Unit

Message format	NMEA 0183 v. 3.0, and some proprietary messages

1. This equipment is intended for professional use only.

3.9 Data inputs

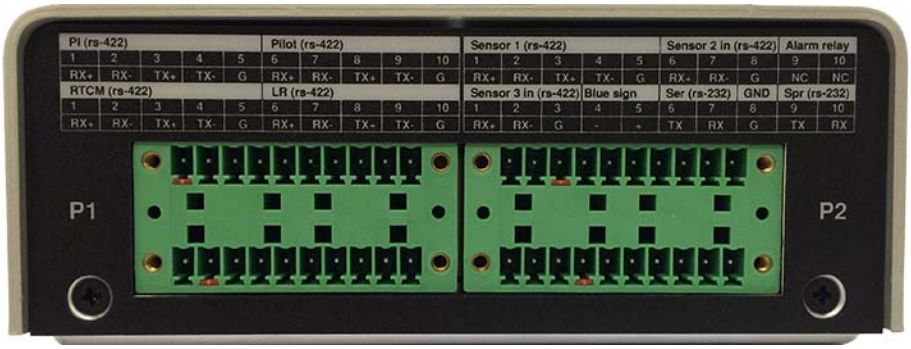
NMEA sentences	PI, Pilot, RTCM, LR, Sensor 1, Sensor 2, Sensor 3 according to IEC 61993–2.

3.10 Interfaces AIS Unit

The antenna connections, power, Ethernet and USB interface is located on one side of the AIS mobile station.

Connector	Type	Connected to
VHF	N-connector female	VHF antenna
GPS	TNC connector 50 Ohm female	GPS antenna
PWR	2–pin Phoenix screw terminals	Power input, 1 = -(N), 2 = +(P)
LAN	RJ-45 10/100 Mbit/s autosense	Switch /router/equipment
USB	USB	USB stick for SW update

The serial, alarm relay and Blue sign interfaces are located on the opposite side. P1 and P2 constitute five 5–pin RS–422 I/O ports, two 3–pin RS–422 I ports, two 3–pin RS–232 ports, one 2–pin Alarm Relay and one 2–pin Blue sign port.



Connector	Type	Connected to
P1	2*10 pin Phoenix screw terminals	PI, Pilot, RTCM, LR
P2	2*10 pin Phoenix screw terminals	Sensor 1, Sensor 2, Alarm, Sensor 3, Blue sign, Service, Spare

3.10.1 Serial ports

The AIS mobile station has seven RS–422 and two RS–232 ports. In addition an alarm relay and a blue sign port for inland water way use.

The below table shows the pinning for the different connections available on P1 and P2 seen from the front. Each of P1 and P2 consists of two 10–pin connectors numbered from left to right. The configuration can be completed in the WEB interface.

P1									
PI (ttyS4 rs-422)					Pilot (ttyS5 rs-422)				
Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9	Pin10
RX +	RX -	TX +	TX -	GND	RX +	RX -	TX +	TX -	GND
RTCM (ttyS6 rs-422)					LR (ttyS7 rs-422)				
Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9	Pin10
RX +	RX -	TX +	TX -	GND	RX +	RX -	TX +	TX -	GND

P2									
Sensor1 (ttyS8 rs-422)					Sensor2 In (ttyS9 rs-422)			Alarm relay	
Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9	Pin10
RX +	RX -	TX +	TX -	GND	RX +	RX -	GND	NC	NC
Sensor 3 In (ttyS10 rs-422)			Blue sign		Service (rs-232)		GND	Spare (ttyS0 rs-232)	
Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9	Pin10
RX +	RX -	GND	-	+	TX	RX	GND	TX	RX

Note

The two RS–232 ports have a common ground through pin 8 on the lower connector on P2.

Note

For RS–422 ports, RX/TX- correspond to signal line RX/TX A and RX/TX+ correspond to RX/TX B.

Baud rates are as follows:

Serial port	Default baud rate	Range
PI	38400	4800 to 115200
Pilot	38400	4800 to 115200

Serial port	Default baud rate	Range
RTCM	9600	4800 to 115200
LR	38400	4800 to 115200
Sensor 1	4800	4800 to 115200
Sensor 2	4800	4800 to 115200
Sensor 3	4800	4800 to 115200
Service	115200	NA
Spare		

3.10.1.1 Termination

The serial interfaces use 1 k Ohm termination. The AIS Unit serial data receiver draws less than 2 mA at 2 V.

3.10.1.2 Output drive capability

Output (talker)

Up to 10 listeners (RX) may be connected to each AIS Unit talker line (TX-RS 422 dataport).

Input (listener)

The AIS Unit listener circuit will not draw more than 2 mA from the line at a 2 V voltage level.

Caution

Do not connect two talker lines together.

3.10.2 Ethernet connection

LAN AIS

This is the LAN port where AIS PI data are received from the AIS Unit and the port to use when configuring the system via WEB interface. Capacity is 100 Mbps.

3.11 LED indicators AIS Unit

At the top of the unit there are four LED indicators which indicate various situations depending on the state of the unit. Seen from right to left: ALR, GPS, RX and TX.

During startup the LEDs have these functions:

- The LED to the left (TX) turns red after power-on.

- The led to the right (ALR) is first unlit and then starts to flash yellow when the AIS Unit software is running.

- The LED to the right (ALR) continues to flash yellow until the AIS Unit is ready to send.

During normal operation the LEDs have these functions.

- The TX LED has these functions:
  - TX transmitting on Channel A, the LED to the left flashes green.

  - TX transmitting on Channel B, the LED to the left flashes yellow.

  - TX transmitting on Channel C, the LED to the left flashes red.

  - TX is off, the LED to the left is constantly red.

- The RX LED has these functions:
  - RX receiving on Channel A, the second LED to the left flashes green.

  - RX receiving on Channel B, the second LED to the left flashes yellow.

  - RX receiving on Channel C, the second LED to the left flashes red.

- The GPS LED has these functions:
  - When the AIS Unit is tracking satellites, the second LED to the right flashes green.

  - When the AIS Unit receives GPS data but no position or time, the second LED to the right flashes yellow.

- The Alarm LED has this function:
  - When there is an alarm situation, the LED to the right is constantly red. Otherwise it is not lit.

3.12 Internal alarm system

3.12.1 BIIT

The AIS module has a built-in alarm functionality. The alarm is generated by the Built In Integrity Test (BIIT).

The software handles generated alarms. The alarm may lead to some kind of actions taken by the system. This depends on what kind of alarm that arises. The alarm generated by the BIIT may lead to stop in transmission of messages. When an alarm arises, this will be identified by a red alarm LED. There will also be generated an alarm message on the PI port.

3.12.2 Alarms

The following alarms can be sent from the AIS Unit on PI. Response to an alarm is listed in the right column.

Alarm	Explanation	Response
Tx malfunction	If the AIS300 detects that it is unable to maintain radio frequencies during transmission or that it fails to shut down TX after ramp down.	Shutdown of transmitter
Antenna VSWR exceeds limit	Antenna/cable error or disconnected. Typically water penetration in antenna or cable.	Continue operation
RX malfunction (Ch A/B/70)	Internal error in AIS; Lost communication with FPGA.	Continue operation
General failure	One or more of the internal SDR processes have stopped responding.	Shutdown of transmitter
UTC clock lost	No internal GPS, due to antenna/cable error/disconnected or GPS receiver error.	Continue operation
MKD connection lost	No MKD connected.	Continue operation
Internal/External GNSS position mismatch	Large position mismatch (100 m), taken GPS antenna positions into account, between internal and external GPS receiver which is present for more than 15 minutes.	Continue operation
NavStatus incorrect	Mismatch between speed and entered nav status.	Continue operation
Heading sensor offset	Sustained difference between COG and heading of 45 degrees or more for at least 5 minutes.	Continue operation

Alarm	Explanation	Response
Active SART	Active SART message has been received.	Continue operation
External EPFS lost	No input from external position source.	Continue operation
No sensor position in use	No valid external nor valid internal position provided.	Continue operation
No valid SOG information	No valid input of, or internal SOG.	Continue operation
No valid COG information	No valid input of, or internal COG.	Continue operation
Heading lost/invalid	No input of heading.	Continue operation
No valid ROT information	No input of Rate Of Turn indicator/sensor.	Continue operation

3.12.3 SNMP

Simple Network Management Protocol (SNMP) is an "Internet-standard protocol for managing devices on IP networks". A SNMP agent is installed on the AIS module in the AIS Unit trapping the BIIT alarms of the system. The Management Information Base (MIB) can be downloaded from FTP server on request.

4 Installation

This chapter covers installation of the AIS Unit, the GNSS antenna and the VHF antenna.

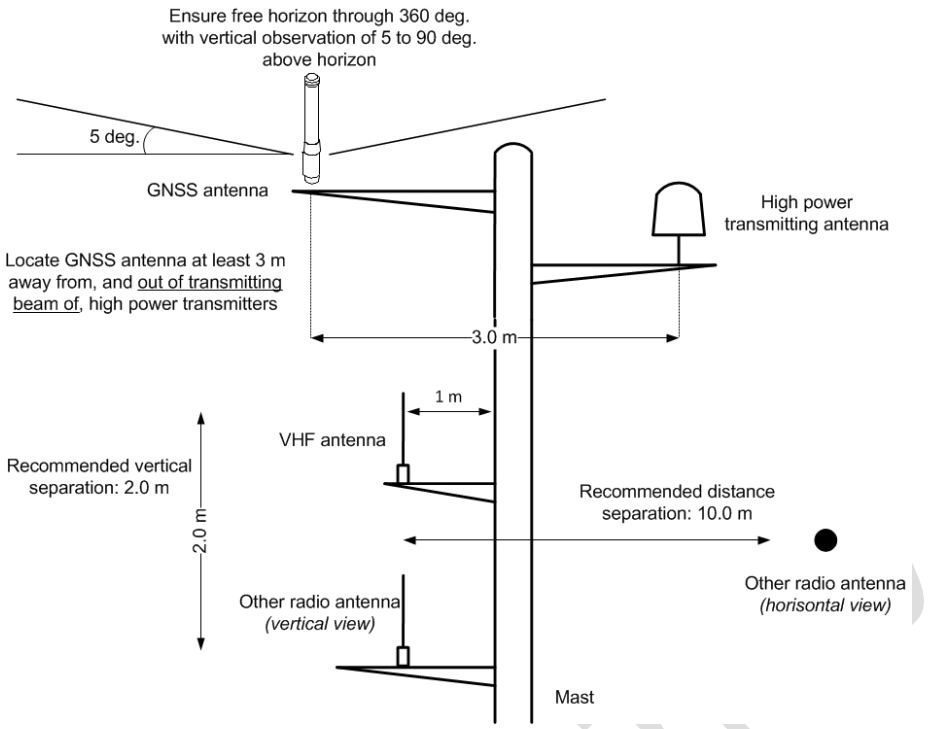
The installation includes:

- Location of the system parts (the AIS Unit, GNSS antenna, VHF antenna)
- Installation of the AIS Unit
- Installation of coax connectors
- Installation of the GNSS antenna and cable
- Installation of the VHF antenna and cable
- Connection of cables between the system and external equipment
- System configuration

4.1 Location of system parts

4.1.1 Antenna location for AIS systems

This system is likely to be co-located with other types of radio equipment at the installation site. Therefore special precautions are required when mounting the antennas for GNSS and VHF. The figure below gives some guidelines for antenna locations.



4.1.2 GNSS antenna

The most critical aspect of the system installation is the location of the GNSS antenna. Incorrect or inadequate installation can lead to poor positioning performance or complete loss of position.

If the antenna is installed in a poor location, it can suffer from masking, multipath or interference from other radio sources which can affect the position performance.

Masking

The GNSS antenna should have an unobstructed line of sight to the sky. The signals from the satellite propagate by line-of-sight, which means that if the antenna cannot see the satellite, the reception will be severely impaired, if it occurs at all.

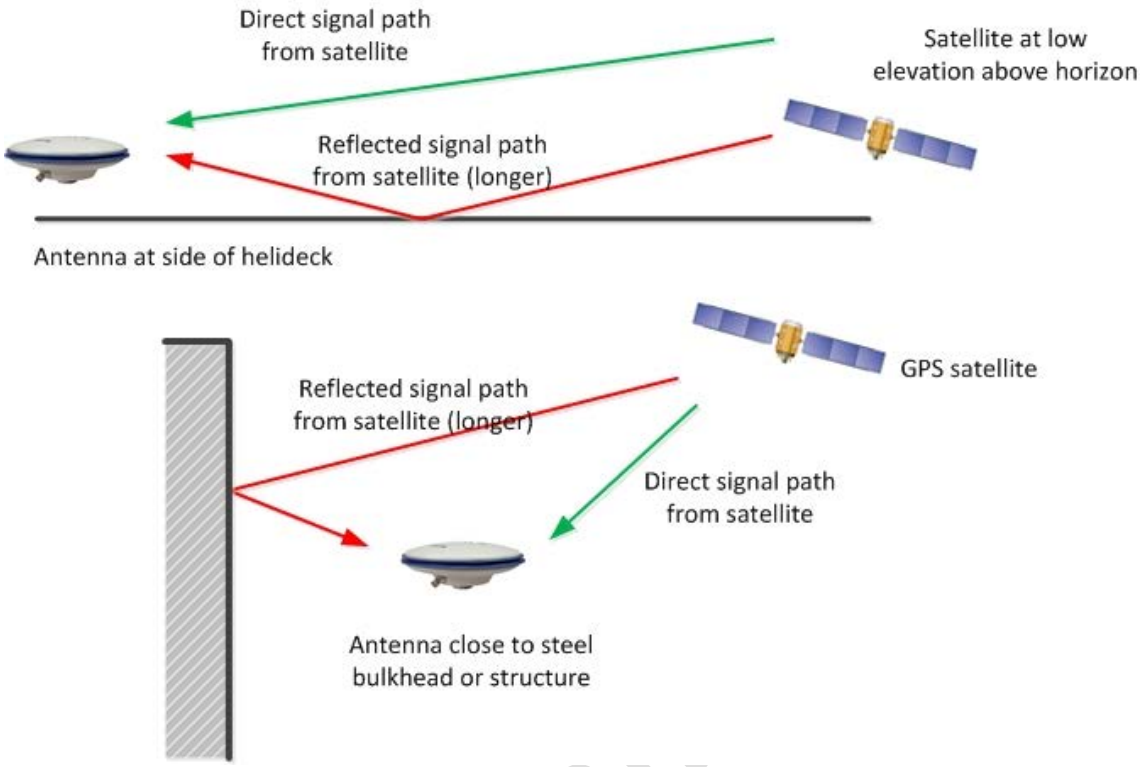
Potential obstructions are other masts and antennas, cranes, rigs and fixed platforms, buildings in ports, high cliffs or hills close to shore. The impact of this can be anything from degraded performance to a complete loss of positioning.

Figure 1 Good antenna location

Figure 2 Bad antenna location, typically masking situation

Multipath

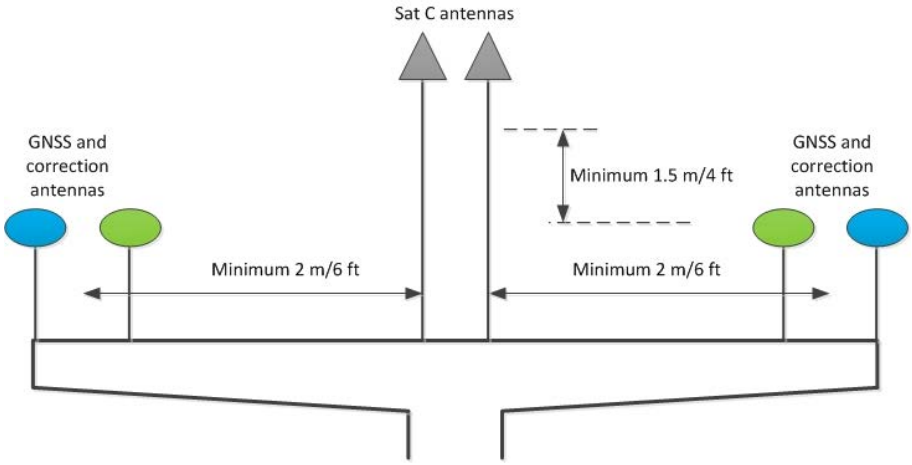
Inappropriate location of the antenna can result in the antenna receiving reflections of the incoming signal as well as the signal itself (multipath). The reflected multipath signal takes a longer path than the direct signal, introducing an error into the position calculation.



Interference from other radiating sources

Interference can be caused by close proximity to other radiating sources. Installing GNSS antennas in close proximity to satellite communication systems operating in or nearby GPS/GLONASS frequency bands (1.2 to 1.6 GHz) should be avoided (i.e. Sat C, Iridium). Ideally the antenna should be situated at a minimum of 3 metres from other radiating sources. As this is not always practically possible, a compromise location must be sought.

Recommended distance to Sat C is minimum 2 metres horizontally and minimum 1.5 metres vertically.



During installation, comprehensive tests should be carried out for potential interference by conducting transmissions from each RF source for extended periods, individually and simultaneously.

4.1.3 VHF antenna

For the VHF antenna, consider the following:

- Mount the antenna in a location where free sight is ensured. Free mounting, and as high as possible is preferable, otherwise the SWR and the radiation diagram will be influenced. The higher the location, the better the coverage.
- Avoid mounting the antenna parallel with, and in the vicinity of, other metal parts such as masts, supporting wires etc.
- The antenna should be protected from direct illumination of radar beams and other transmitting antennas such as Inmarsat antennas.
- Run the cables in a steel pipe in areas where the danger for radiation is high.

4.1.4 AIS Unit

When installing the unit, note the following:

- The unit is designed for indoor installation. Avoid locations with heavy vibrations, strong electronic fields (close to transformers), excessive heat.
- The unit should be resiliently mounted to be in accordance with the environmental standard IEC 60945/EN 60945.
- It is recommended that the area around the unit is kept free from dust and static electricity.
- All connections to the unit are on the short sides of the unit and available space for cable connections and service must be provided.

4.2 Installing the AIS Unit

The AIS Unit is default delivered with a bracket designed with solution for strain relief.

How to install the AIS Unit with strain relief or wall mount bracket

1. Place the bracket where the unit shall be mounted and mark the holes for the screws.
2. Drill the holes.
3. Mount the AIS Unit on the bracket.
4. Mount the bracket with the AIS Unit where the holes were drilled.
5. When cables are connected, fasten the cables with strips to the strain relief.

How to install the AIS Unit with DIN rail bracket (optional equipment)

1. Fasten the bracket to the AIS Unit with four screws at the rear of the unit.
2. Fasten the AIS Unit with the bracket to the DIN rail.

4.2.1 Installing the pilot plug

The AIS Unit is default delivered with a pilot plug, part A300–08, without serial cable. A plug with cable, part A300–07, can be delivered as an option.

Use a paired cable with cords of minimum 0.5 mm^2 to assemble the pilot plug.

Use the pinning in the table to connect the pilot plug to the AIS Unit.

Pilot plug	1	4	5	6	9
AIS Unit port	RX+	RX-	TX+	TX-	GND

Related topics

- *Serial ports* on page 26

4.3 Antenna and cable installation

The maximum length for each of the antenna coaxial cables is 30 metres for RG214 and 100 metres for 1/2" Superflex. If longer cables are needed, a low noise signal amplifier (LNA) should be fitted.

It is recommended to use lightning arrestors. See *Lightning arrestor specifications* on page 88.

4.3.1 GNSS antenna and cable installation

The cable recommended for the GNSS antenna is ½" superflex.

Caution

The GNSS connector is the connector located to the left (TNC). Do not confuse with the VHF connector (N).

Note

The cable running from the GNSS antenna to the main unit should be as straight as possible. Do not crush or crimp the cable with tie-downs, as this will affect the electrical properties of the cable.

Procedure

1 Attach the interconnection pigtail cable to the antenna connector.

2 Wrap the cable connection with waterproof self-vulcanising tape.

3 Thread the interconnection cable through the extension pipe and the mounting bracket and attach the extension pipe with the mounting bracket to the antenna.

4 Attach the antenna mounting bracket to the ship's masthead or pole with the U-bolts.

5 Connect the interconnection cable to the ½" superflex cable.

6 Wrap outdoor cable connections with waterproof self-vulcanising tape. An alternate way of waterproofing is to use heat shrink hose with glue. The hose should cover the whole connector and part of the cable.

7 Dependent on the cable installation, secure the cable to the mast every one to three metres with clamps or bands (non-metal).

8 Check the antenna cable for short-circuiting.

9 Connect the other end of the ½" superflex cable to the interconnection cable. This cable is delivered in order to get secure cable runs to the main unit.

10 Connect the interconnection cable to the receiving device. All GNSS receivers provide necessary power through their antenna RF connectors.

Related topics

- *GNSS antenna mechanical dimensions and installation* on page 84

4.3.2 VHF antenna and cable installation

The construction of the mount enables routing of the cable either along the inside or the outside of the mast tube. An RG-214 cable is used for distances shorter than 30 metres, while a ½" superflex cable is used for distances up to 100 metres.

Caution

If the antenna cable is attached to the AIS Unit, do not attach the antenna cable to the antenna when the unit is running. If the antenna cable is short-circuited with POWER ON, the AIS module can be damaged.

Caution

Do not connect the VHF antenna cable to the GNSS connector as this can damage the GNSS receiver.

How to install the VHF antenna

1 Attach the antenna to a mast tube or pole by using the provided U-bolts.

2 Attach the antenna cable to the antenna.

3 Wrap outdoor cable connections with waterproof self-vulcanising tape. An alternate way of waterproofing is to use heat shrink hose with glue. The hose should cover the whole connector and part of the cable.

4 Make sure the ground strap at the antenna base is connected to a suitable place ensuring good grounding.

5 Seal the terminals of the ground strap from moisture to prevent corrosion. Paint or silicone sealant is recommended for this.

6 Secure the cable to the mast every one to three metres with clamps or bands.

7 Route the connector at the other end of the antenna cable to the AIS Unit and connect the cable to the N-connector named VHF. A short RG-58 or RG-214 cable is often needed in order to secure cable runs to the unit.

Related topics

- *VHF antenna mechanical drawing and installation* on page 86

4.4 Electrical installation

The electrical installation consists of:

- Connecting a cable between the GNSS antenna and the AIS Unit.
- Connecting a cable between the VHF antenna and the AIS Unit.
- Connecting cables with output/input data between the AIS Unit, network and other equipment.
- Supplying 12 to 32 V DC power to the AIS Unit.

Caution

Before powering on the AIS Unit, make sure the antenna cables and antennas are connected. Connecting or disconnecting an antenna or antenna cable when the AIS Unit is already powered, may permanently damage the antenna port on the AIS Unit or the antenna itself, voiding your warranty. If the antenna cable is short-circuited with power on, the receiver within the AIS Unit can be damaged.

How to carry out the electrical installation

Note

The antenna cables must be as straight as possible. Do not crush or crimp the cable with tie-downs as this will affect the electrical properties of the cables.

1 Connect the GNSS antenna cable to the connector marked GPS on the AIS Unit.

2 Connect the VHF cable to the connector marked VHF on the AIS Unit.

3 Connect the network cable for LAN.

4 Connect the power supply to the power connector on the AIS Unit. Minus (-) and plus (+) as indicated on the unit.

5 When all cables are connected, power on the AIS Unit.

6 When the power is connected, all LEDs are unlit for about 30 seconds. Then all LEDs will start to blink in normal operation

Related topics

- *Coax connector installation* on page 75
- *Serial ports* on page 26
- *LED indicators AIS Unit* on page 27

5 Configuration

5.1 Configuration methods

This system is primarily made for configuration with standardised AIS NMEA sentences. Via PI (serial or LAN). These sentences are described in the AIS mobile station test standard IEC 61993–2. The described configuration sentences are normally sent to a mobile station from a user interface (UI) such as ECDIS or RADAR.

In order to make the user independent of a configuration UI and NMEA sentences, a WEB interface has been included in this system.

IP address when delivered from factory is:

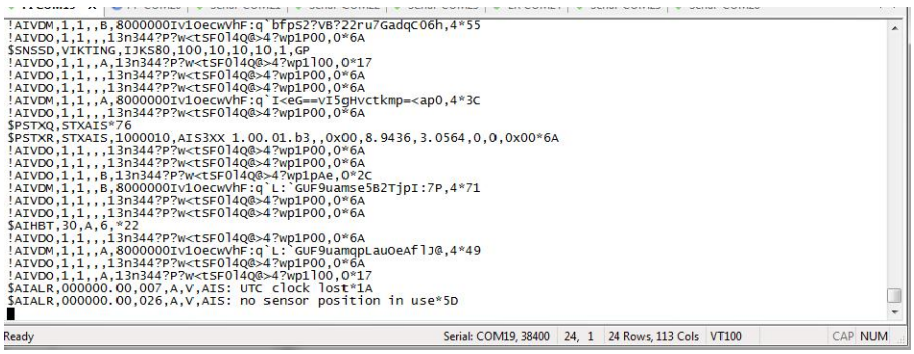
- LAN 10.0.21.60
- Subnet 255.255.255.0
- Gateway 10.0.21.1

5.1.1 Configuration with NMEA sentences

The AIS mobile station test standard IEC 61993–2 defines the AIS NMEA sentences.

New software upgrades will be available after changes in the standard. As the NMEA (PI) sentences are standardised and available in the standard, this manual will not describe the NMEA sentences.

TCP/IP port (multiclient) for configuration of the system is 4712.



Related topics

- *PI sentences* on page 46

5.1.2 Configuration via WEB interface

The user can access the WEB interface if the IP address is known and the address is available for the user. The WEB interface uses the setup files in the system and changes are written to these files.

5.1.2.1 Connecting to WEB interface

How to connect to the WEB interface

1 Open a browser and write: `http://<ip adr>/` in the address bar

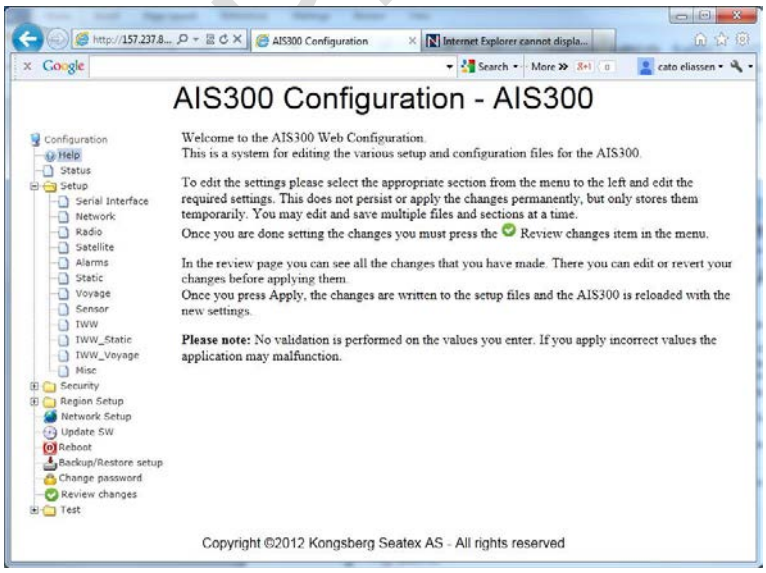
2 Enter the default login credentials for **User:** `ais`

3 Enter the default login credentials for **Password:** `1234`

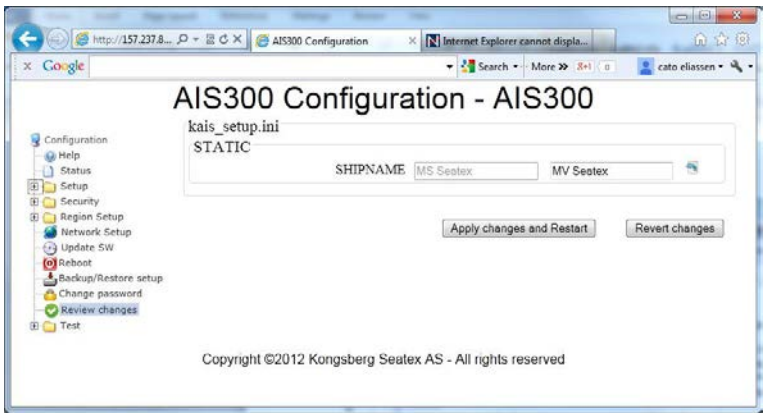
4 Continue with the configuration once you have entered the AIS Unit.

5.1.2.2 Changing parameters via WEB interface

The WEB interface consists of folders for the various settings, which again have sub-folders. When you click a folder, a dialog box with the settings appears. This is where you change the settings.



When you have made the changes, they need to be confirmed before the changes take place. This confirmation is carried out under **Review changes**. Here are all the changes listed and you are asked to confirm.

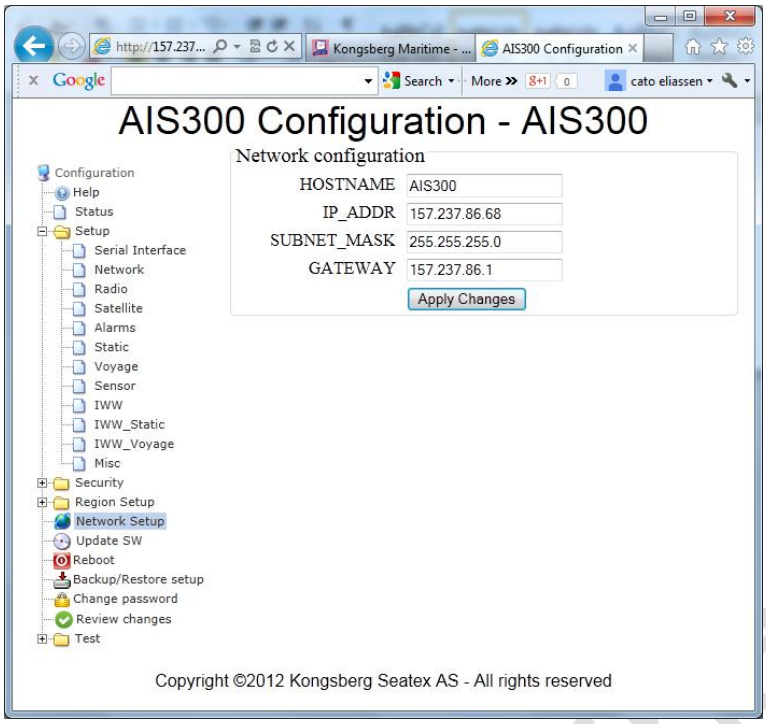


5.1.2.3 WEB interface Help function

A description on how to use the WEB interface is available when connecting to an AIS Unit. In addition there is a short description linked to all parameters that are visible when hovering over the parameter name .

5.1.2.4 Reconfiguration of IP address via WEB interface

Changes to the IP address, subnet mask, gateway and host name are located under **Network Setup**. As a typing error during remote configuration might lead to loss of remote access, special care should be taken during changes of network parameters. The user will be asked to apply changes and a warning will be given. The system will automatically redirect the user to the correct address after the change if the user is on the correct subnet.



5.1.2.5 Voyage related data

Some parameters can be changed in connection with the voyage and these voyage related data can be configured under **Setup →Voyage**.

Destination

Destination should be entered in accordance with the IMO SN/Circ 244 which gives guidance for UN/LOCODE (United nation/Location Code). 20 characters are available for the name.

Draught (static)

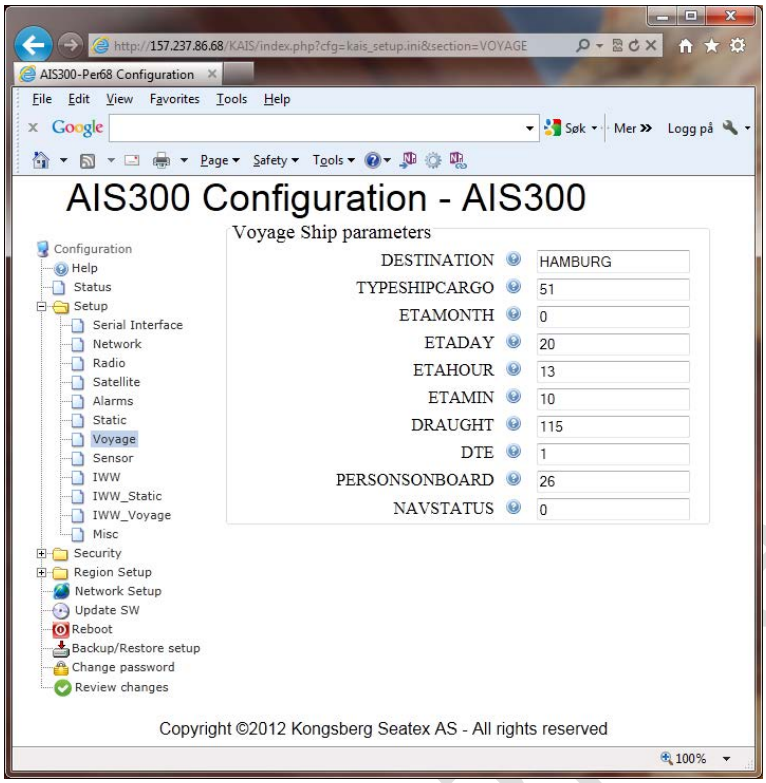
Draught (static) shall be entered in decimeters in the **WEB interface** (115 = 11.5 cm). To be updated if the salinity of the water or the weight of cargo is changed.

Type of ship and cargo

Tables for categorizing of "ship types" are defined in IMO SN/Circ 227 *Guidelines for installation of shipborne AIS*.

- A "ship type" is identified by a first and second digit taken from different tables in the IMO standard:
  - Table A *Commercial vessels not engaged in special activities*, 1 digit #5 says "special craft" — see table C
  - Table C *Special craft engaged in "official" activities*, says 2 digit #5 "Law enforcement vessel"
  - Hence a CG vessels is identified; 1st digit 5, 2nd digit 5

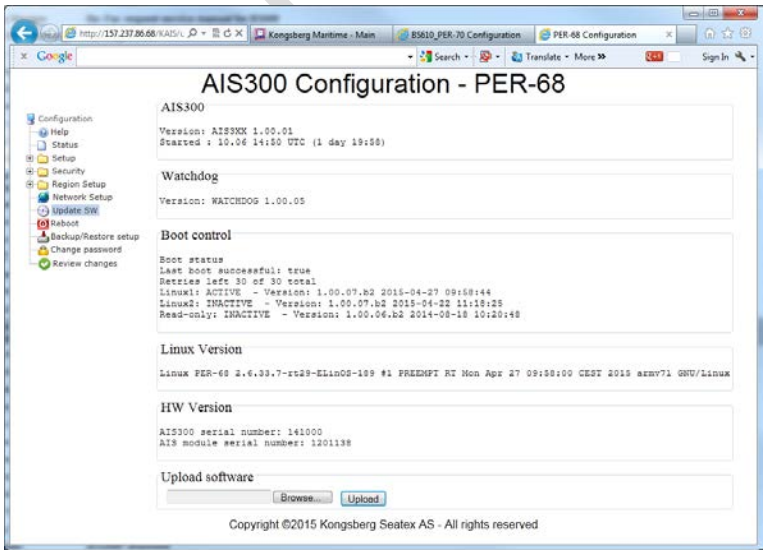
- Typical ship types can be found when hovering over the parameter name .



5.1.2.6 Software update via WEB interface

The software can be updated via the WEB interface. After clicking **Update SW**, you will be asked for a location for the new software. The system will check the validity of the update before the software is restarted and the update takes place.

The software can also be updated locally via an USB stick.

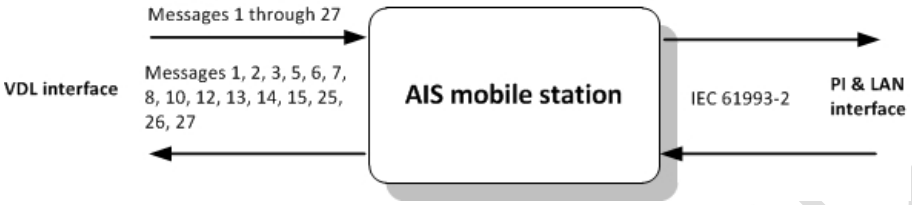


Related topics

- *Software updates* on page 56

5.2 Message types

The AIS mobile station system supports different messages on the VHF data link and on the PI and LAN interfaces. The illustration shows the message flow at VDL and PI on serial and/or LAN.



After start up, that is the first minute after the AIS Unit software has started, the system starts to transmit message 1 to 3 and 5 on a regular basis. The transmit interval is dependent on speed and turn rates for messages 1 to 3.

5.2.1 VDL messages

Via the VDL interface the system can receive or transmit the following messages:

Msg. Id	Message name	RX	TX	Description
1	Position report	•	•	
2	Position report	•	•	
3	Position report	•	•	
4	Base station report	•		Sent between base station and transponder or between base stations. Contains information about position, UTC, date and slot number.
5	Static and voyage related data	•	•	
6	Binary addressed message	•	•	Used as necessary for transmitting messages between base station and addressed transponder and between base stations.
7	Binary acknowledge	•	•	Acknowledge of message 6.
8	Binary broadcast message	•	•	Same as 6, but this one is for broadcast.
9	Standard SAR aircraft position report	•		
10	UTC/data inquiry	•	•	
11	UTC/data response	•		
12	Addressed safety related message	•	•	Used as necessary for transmitting safety related messages between base station and addressed transponder or vice versa.
13	Safety related acknowledge	•	•	Acknowledge of message 13.

Msg. Id	Message name	RX	TX	Description
14	Safety related broadcast message	•	•	Same as 12, but this one is for broadcast.
15	Interrogation	•	•	Request for a specific message type. Used for request for transmission of information from one system to another.
16	Assignment mode command	•		Send from base station to transponder assigning timeslot and MSG type.
17	DGNSS broadcast binary message	•		Used for transmitting correction signals from the base station to transponders.
18	Standard class B equipment position report	•		
19	Extended class B equipment position report	•		
20	Data link management message	•		Gives information to transponder when MSG 4 is coming.
21	Aids-to-navigation report	•		
22	Channel management	•		Channel assignment, information sent from base station to transponder regarding use of channels, output power, bandwidth, etc.
23	Group assignment command	•		Assignment of a specific report behaviour by competent authority using a Base station to a specific group of mobiles.
24	Static data report	•		Additional data assigned to an MMSI. Part A: Name Part B: Static data
25	Single slot binary message	•	•	Short unscheduled binary data transmission (broadcast or addressed).
26	Multiple slot binary message with Communication state	•	•	Scheduled binary data transmission (broadcast or addressed).
27	SAT AIS message		•	Short AIS message sent by a Class A AIS on Ch C and D. Can be received if receiving on Ch C and D.

5.3 NMEA sentences

5.3.1 PI sentences

The system outputs all received VDL messages as VDM sentences via the PI LAN and PI Serial port. Default is UDP/port 4711 and TCP/Port 4712.

PI on TCP can be turned off under **Setup →Misc** in the **WEB interface** by changing the **FULL_PI_TCP** parameter to 0. The TCP port can be changed under **Setup →Network** by changing the **LAN_PITCP_PORT** parameter. Use value above 23.

In addition, all VDL messages transmitted by the system are output as VDO sentences. ALR sentences are periodically output on the same interfaces. Other sentences can be output depending on configuration.

Via the PI interface the system can receive or transmit sentences according to IEC 61993–2.

The table contains input and output messages on the PI interface. All NMEA fields are used.

NMEA Sentence	RX	TX	Description	Transmission interval
ABK		•	AIS addressed and binary broadcast acknowledgement	Upon reception of messages 7 and 13, and when sending message 15
ABM	•		AIS addressed binary and safety related message	
ACA	•	•	AIS channel assignment message	Output when change of status or on query
ACK	•		Alarm acknowledge	
AIQ	•		Query for specified sentence (AIQ,nmea)	
AIR	•		AIS interrogation request	
ALR		•	Set alarm state	30 seconds/1 min.
BBM	•		AIS broadcast binary message	
HBT	•	•	Heartbeat (BIIT)	
LRI	•		Long range interrogation	
LRF	•	•	Long range function	
LR1		•	Long range reply with destination for function request A	
LR2		•	Long range reply with destination for function request B, C, E and F	
LR3		•	Long range reply with destination for function request I, O, P, U and W	
SSD	•	•	Ship static data	
TXT		•	Text transmission	When change of status
VDM		•	AIS VHF data-link message	When receiving message on VDL
VDO		•	AIS VHF data-link own-vessel report	When sending message on VDL
VER	•	•	Version	
VSD	•	•	Voyage static data	
Proprietary:				
PSTXQ,			Query request for:	
BRCADR	•		PI LAN Broadcast parameters	
IMO	•		IMO number	
MMSI	•		MMSI number	
OWNIP	•		Configure IP parameters	

NMEA Sentence	RX	TX	Description	Transmission interval
PORT	•		Serial port configuration	
PSTXR,			Response on query:	
BRCADR		•	PI LAN Broadcast parameters	
IMO		•	IMO number	
MMSI		•	MMSI number	
OWNIP		•	Configure IP parameters	
PIWWSSD		•	Inland waterway static ship data	
PIWWVSD			Inland waterway voyage ship data	
PORT			Serial port configuration	
PSTXS,			Set:	
BRCADR	•		PI LAN Broadcast parameters	
IMO	•		IMO number	
MMSI	•		MMSI number	
OWNIP	•		Configure IP parameters	
PIWWSSD	•		Inland waterway static ship data	
PIWWVSD	•		Inland waterway voyage ship data	
PORT	•		Serial port configuration	

5.3.1.1 STXAIS, proprietary internal information sentence

This sentence is default output at start-up of the AIS Unit. In addition it can be output at a configurable interval but default each 120 seconds. You can request the message with a NMEA sentence. To request the internal AIS information, the following can be sent on the PI.

Format

```
$PSTXQ,STXAIS*<FCS><CR><LF>
```

The AIS BS response message has this format (one message per port):

Format

```
$PSTXR,STXAIS,<type>,<version>,<uptime>,<radio stat><fwp>,
<rfp><thread status>,<system status>,<low
synth>*<FCS><CR><LF>
```

Format description

1 **STXAIS** = Message ID identifying this sentence

2 **type** = Hex value describing the type of AIS Unit

3 **version** = Firmware version

4 **uptime** = Uptime since last reboot dddhhmm

5 **radio stat** = Hex value radio status

6 **fwd** = Forward power

7 **rfp** = Reflected power

8 **thread status** = Hex value of thread status. The thread that caused watchdog to trig

9 **system status** = Hex value of the system status. Reason for last reboot

10 **low synth** = The data read when the lower synth is selected

The following are not used in this AIS product:

- <radio stat>
- <low synth>
- Always <0>

5.3.1.2 VDM sentence structure

The structure for a VDM sentence can be as follows:

- !AIVDM,1,1,,B,13n324wP000gWlhTCDQN4?vD00Sb,0*1B

The **!** sign indicates that the sentence is in 6-bit NMEA binary format, which is not a direct readable format. In this example the AIVDM indicates that this is data received from another unit. The **B** indicates that the message is received on AIS channel B.

5.3.1.3 ALR sentence structure

The structure for an ALR sentence can be as described below:

- $AIALR,150517.00,032,A,V,AIS: heading lost/invalid*27

The **$** sign indicates that this is an ASCII text sentence where it is possible to read some of the information directly. Typical use of this sentence type is for the alarm information.

Typical data output via the PI serial or LAN port can be as follows:

- !AIVDM,1,1,,B,13n324wP000gWlhTCDQN4?vD00Sb,0*1B
- !AIVDO,1,1,,,13n31uOP000gWljTCDQN4?vH0000,0*1E
- $AIHBT,30,A,1,*25
- !AIVDM,1,1,,B,4h2MBmAupFaH<0gWljTCDQO0087K,0*31
- !AIVDO,1,1,,,13n31uOP000gWljTCDQN4?vJ0000,0*1C
- !AIVDM,1,1,,C,8000000Iv1OecwVhF:q`p`8d=b7n8CtegGvCs6i`WP,4*05
- $AIALR,083346.00,030,A,V,AIS: no valid COG information*4A
- $AIALR,150517.00,035,A,V,AIS: no valid ROT information*40
- $AIALR,150517.00,032,A,V,AIS: heading lost/invalid*27
- $AIALR,150517.00,025,A,V,AIS: external EPFS lost*2A
- !AIVDO,1,1,,,13n31uOP000gWljTCDQN4?vT0000,0*02
- !AIVDM,1,1,,A,13n324wP000gWlhTCDQN4?vV059P,0*57
- !AIVDM,1,1,,A,4h2MBoiupFaHCPgCF0TBHl70059P,0*33
- !AIVDO,1,1,,,13n31uOP000gWljTCDQN4?vb0000,0*34
- !AIVDO,1,1,,,13n31uOP000gWljTCDQN4?vd0000,0*32

- !AIVDM,1,1,,A,4h2MBmAupFaHF0gWljTCDQO0059P,0*50
- !AIVDO,1,1,,,13n31uOP000gWljTCDQN4?vf0000,0*30
- !AIVDO,1,1,,,13n31uOP000gWljTCDQN4?vh0000,0*3E
- !AIVDM,1,1,,C,13oChT0001Pg`p6TCDD6GPP`00S2,0*41

Data can be decoded/replayed and verified using an external system that is capable of reading the data.

There are two types of alarm messages which consist of two different sentences. These are the TXT and the ALR sentences. The TXT indicates a change in status of some operational parameters, and the ALR informs of an error situation that might need corrective action.

Note

Heading valid *will occur as TXT (info) when received first time after start-up. If lost again, the alarm will be valid until it occurs or until the unit is restarted.*

5.3.2 Sensor sentences

The main intention of the sensor port is to receive input from an external system. Such systems could be an external GPS source. The input messages on the Sensor interface are according to the table.

NMEA Sentence	Rx	Tx	Description	Transmission interval
DTM	•		Lat offset, Lon offset, altitude offset not used.	
GBS	•		GNSS satellite fault detection	
GGA	•		Global positioning system fix data	
GLL	•		Geographic position – latitude/longitude	
GNS	•		Nav status indicator not used . Mean sea level not used. Antenna altitude not used.	
HDT	•		Heading	
RMC	•		Recommended minimum specific GNSS data. Nav status not used.	
ROT	•		Rate of turn	
THS	•		Heading	
VBW	•		Stern water speed and stern ground speed parameters are not used .	
VTG	•		Course over ground and ground speed	
ZDA	•		Time and data	

5.3.2.1 Priority of position

The system will prioritize the use of NMEA sentences in accordance with the position priority table.

Priority	Sentence
1	RMC
2	GNS
3	GGA
4	GLL

5.3.2.2 Priority between sensors

There is an automatic priority of which position input the AIS mobile station will transmit. The priority list is as follows:

1 External sensor input of differential corrected position.

2 Internal sensor input of differential corrected position.

3 External uncorrected position.

4 Internal uncorrected position.

5.4 Differential corrections

The system can receive RTCM 2.3 DGPS corrections on the RTCM serial port (RS-422). It will automatically enter differential mode when corrections are received, given that the corrections are valid.

6 Getting started

This chapter describes the main operating procedures for getting started and using the AIS Unit.

6.1 How to turn on the AIS Unit

1. Ensure that the serial connection(s), the network and the antennas are connected.
2. Insert the power connector with 12 to 24 V DC.
3. After approximately 30 seconds the LEDs will start to flash. The GPS LED will start to flash after the initialisation. The initialisation period may take up to 15 minutes, depending on the GPS almanac. It will change from yellow to green when the initialisation period is over.

Related topics

- *LED indicators AIS Unit* on page 27

6.2 AIS Unit settings

The following settings must be carried out in order to get a working AIS Unit. We recommend to carry out these settings via the WEB interface. Refer to *Configuration* on page 40 on how to use the WEB interface.

6.2.1 Network settings

How to change the network settings

1. Connect the network port (AIS LAN) of the AIS Unit to a PC, network switch or hub. The unit is delivered with default IP address.
2. Type the address: `http://< ip-address>` to connect to the WEB interface of the AIS module for configuration. Default IP address is: 10.0.21.60.
3. Or you can use NMEA sentences for configuration of the AIS module.

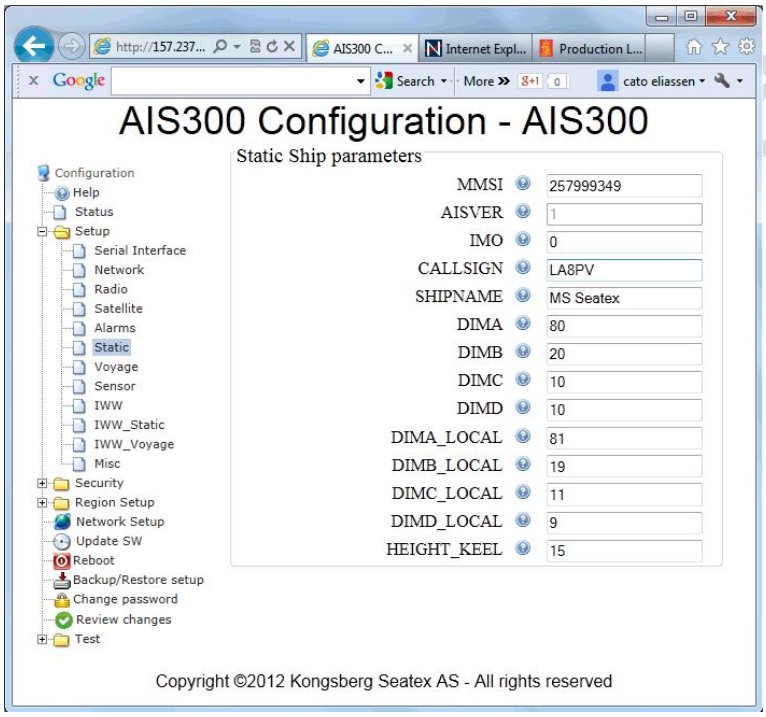
Related topics

- *Reconfiguration of IP address via WEB interface* on page 42
- *Configuration via WEB interface* on page 41

6.2.2 Static parameters

As far as possible the AIS mobile station is pre-configured. There are some parameters that need to be set in connection with the installation. These are collected under **Setup →Static**. Static data should normally not change after installing the AIS Unit.

Remember to control that the entering of the static data is properly completed. The installation personnel should configure the static data as a part of the installation. Ship personnel should be available when configuration is executed in order to provide correct vessel data such as MMSI, IMO number etc.



MMSI

The MMSI number is default set to 0. The unit will not transmit before a valid MMSI number is configured.

DIMA

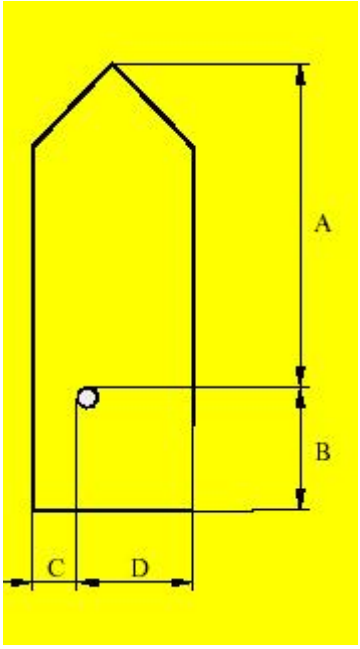
External GPS antenna location. In metres.

DIMA_LOCAL

AIS internal GPS antenna location. In metres.

HEIGHT_KEEL

Vessel height over keel in meters; Total height from keel to top of mast.



6.2.3 Radio — VHF channels and power

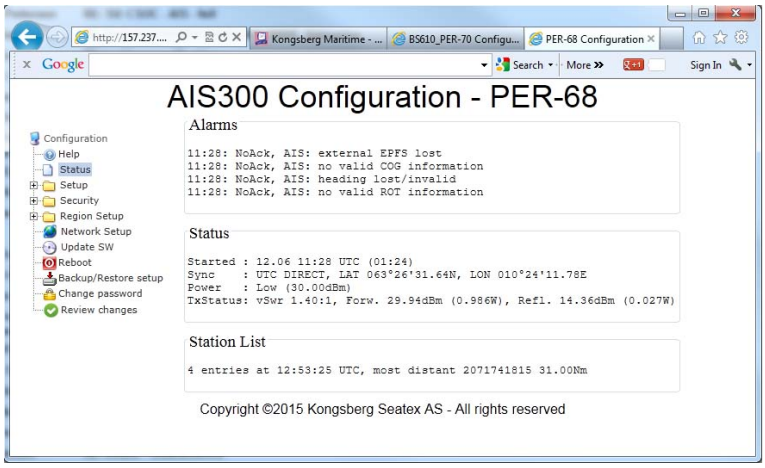
Default VHF RX and TX channels are the standard AIS channels. Ch C is default **off**. Power level is default 12 W. Parameters can be set by sending a BCF sentence to the AIS Unit. These parameters can also be set in the WEB interface under **Setup →Radio**.

6.3 Status information

The **Status** page in the WEB interface holds information on **Alarms** (if any), **Status** and **Station List**.

Alarms, if any, are listed in addition to own position (internal GNSS pos). The **Station List** gives the number of visible AIS vessels and the distance to the most distant unit.

VSWR, Forwarded and Reflected power are displayed in the **Status** box.



7 Maintenance

The AIS system consists of both software and hardware. The software part can be reinstalled or upgraded to the latest version in the field. Service on the hardware in the field can consist of:

- Exchanging damaged GNSS antenna cables.
- Exchanging failed GNSS antenna.
- Exchanging damaged VHF antenna cables.
- Exchanging failed VHF antenna.
- Exchanging failed AIS Unit.

The AIS Unit is not designed for service in the field and opening the housing can result in damage or degradation of the unit and void the warranty.

7.1 Periodic maintenance

Some activities should be carried out on a regular basis to maintain the condition or operational status of the equipment.

7.1.1 Antenna care

The enclosures should be carefully cleaned on a regular basis with a damp cloth and mild soap. Brush off any ice or snow to ensure optimal performance.

Note

Do not use abrasive cleaners or chemicals.

7.2 Software updates

Kongsberg Seatex AS will regularly offer software upgrades for the AIS Unit with improvements and new functionalities. It is up to the user to decide whether he will update his/her unit to the latest version. Contact customer support to receive the new software.

7.2.1 Software update routine

Software on the AIS module within the AIS Unit can be updated either remotely from a PC (via WEB interface) or locally (via USB device).

How to update software via USB

1 Insert the USB device with the unzipped software update in the USB port.

Note

Not all USB devices are supported.

2 When the AIS Unit detects a new firmware on the USB device it will be validated and uploaded.

3 The unit goes through an update procedure and restarts the processes which are affected by the update.

4 When the update is finished the AIS Unit will enter standard operation mode based on the settings it had before the update.

Related topics

- *Software update via WEB interface* on page 44

7.3 Repairs and modifications

Repair of the AIS Unit can consist of:

- exchanging damaged antenna cables
- exchanging failed antennas
- exchanging the AIS Unit

These repairs can be carried out by a skilled electrician.

7.3.1 Exchange of antenna cable

How to change antenna cable

Caution

If the antenna cable is attached to the unit, do not attach the antenna cable to the antenna with the AIS Unit powered on. If the antenna cable is short-circuited with power on, the receiver or AIS module within the unit can be damaged.

1 Turn off the AIS Unit by disconnecting the power connector from the AIS Unit.

2 Dismount the damaged antenna cable. The new antenna cable must be as straight as possible. Do not crush or crimp the cable as this will affect the electrical properties of the cable.

3 Connect the antenna cable to the antenna.

4 The connection between the antenna and the antenna cable should be sealed against water penetration, preferably using waterproof self-vulcanizing tape.

5 Connect the antenna cable to the AIS Unit.

7.3.2 Exchange of antenna

How to change antenna

Caution

If the antenna cable is attached to the unit, do not attach the antenna cable to the antenna with the AIS Unit powered on. If the antenna cable is short-circuited with power on, the receiver or AIS module within the unit can be damaged.

1 Turn off the AIS Unit by disconnecting the power connector from the AIS Unit.

2 Dismount the failed antenna.

3 Mount the new antenna on the mounting rod or similar.

4 Connect the antenna cable to the antenna.

5 The connection between the antenna and the cable should be sealed against water penetration, preferably by using waterproof self-vulcanizing tape.

6 Connect the antenna cable to the AIS Unit.

7.3.3 Repair of AIS Unit

All repairs and modifications of the unit, except from installation of new software versions and setup of the system, should be carried out by qualified personnel. A failed unit should be shipped back to Kongsberg Seatex AS or other agreed service point for repair. Board changes shall only be conducted in agreement with Kongsberg Seatex AS service personnel.

7.3.3.1 Changing the interface board

How to change the interface board

1 Disconnect all cables and place the AIS unit on a table in EMC safe conditions.

2 Remove the three screws on each side of the top cover and lift it off.

3 Dismount the two side plates by removing the two screws on each side.

4 Remove the four screws holding the interface board and lift the board off. It is stacked on top of the AIS module and some wriggling will be necessary.

5 Mount the new interface board on top of the AIS module.

6 Refasten the side plates and the top cover.

7.3.3.2 Changing the GPS board

How to change the GPS board

1 Disconnect all cables and place the AIS unit on a table in EMC safe conditions.

2 Remove the three screws on each side of the top cover and lift it off.

3 Dismount the two side plates by removing the two screws on each side.

4 Remove the four screws holding the interface board and lift the board off. It is stacked on top of the AIS module and some wriggling will be necessary.

5 When the interface board is off, disconnect the GPS antenna connector and remove the spacer holding the GPS board.

6 Lift the GPS board off the connector.

7 Exchange the GPS board with the new board.

8 Fasten the board with the spacer and connect the GPS antenna cable.

9 Place the interface board on top of the AIS module and refasten the screws.

10 Refasten the side plates and the top cover.

7.3.4 Installation of spare AIS Unit

If a spare unit is rented while your unit is in for repair, it is delivered with the latest version of the product software.

How to install a spare AIS Unit

1 Turn off the AIS Unit by disconnecting the power connector from the AIS Unit.

2 Disconnect the unit to be repaired from its cables and replace it with the spare unit.

3 Connect all cables as they were on the original unit.

4 Power up the unit.

7.4 Troubleshooting

This part of the document is written for personnel with operator experience when a situation arises where assistance from service personnel may be required. The aim of this section is to identify the problem so that the appropriate action can be taken.

7.4.1 System status

The error conditions in the system are usually observed by looking at the colour codes of the four LED indicators located on the front panel or in the **Status** page of the **Web interface**.

When contacting Kongsberg Seatex AS support, please refer to the serial number of the unit and the software version. The software version number can be found in the **Web interface →Update SW**.

Related topics

- *LED indicators AIS Unit* on page 27
- *Status information* on page 54

7.4.2 No power

When powering on the unit, the LEDs will start normal operation after approximately 30 seconds.

If the LED indicators are not lit, check the power connection to the unit.

7.4.3 External output problems

During operation situations may occur where the external equipment receives no data from the AIS Unit.

What to check if external equipment receive no data from the AIS Unit

1 Check the network cables/equipment, serial lines (if used), cables, cable connectors and antennas for mechanical damage.

2 Check that the connectors are connected to the correct output ports both on the AIS Unit and on the connected equipment. The pinning is shown in *Interfaces AIS Unit* on page 25.

3 If the cable and connectors are OK, check that the output configuration of the AIS Unit is set up correctly.

Related topics

- *Configuration via WEB interface* on page 41

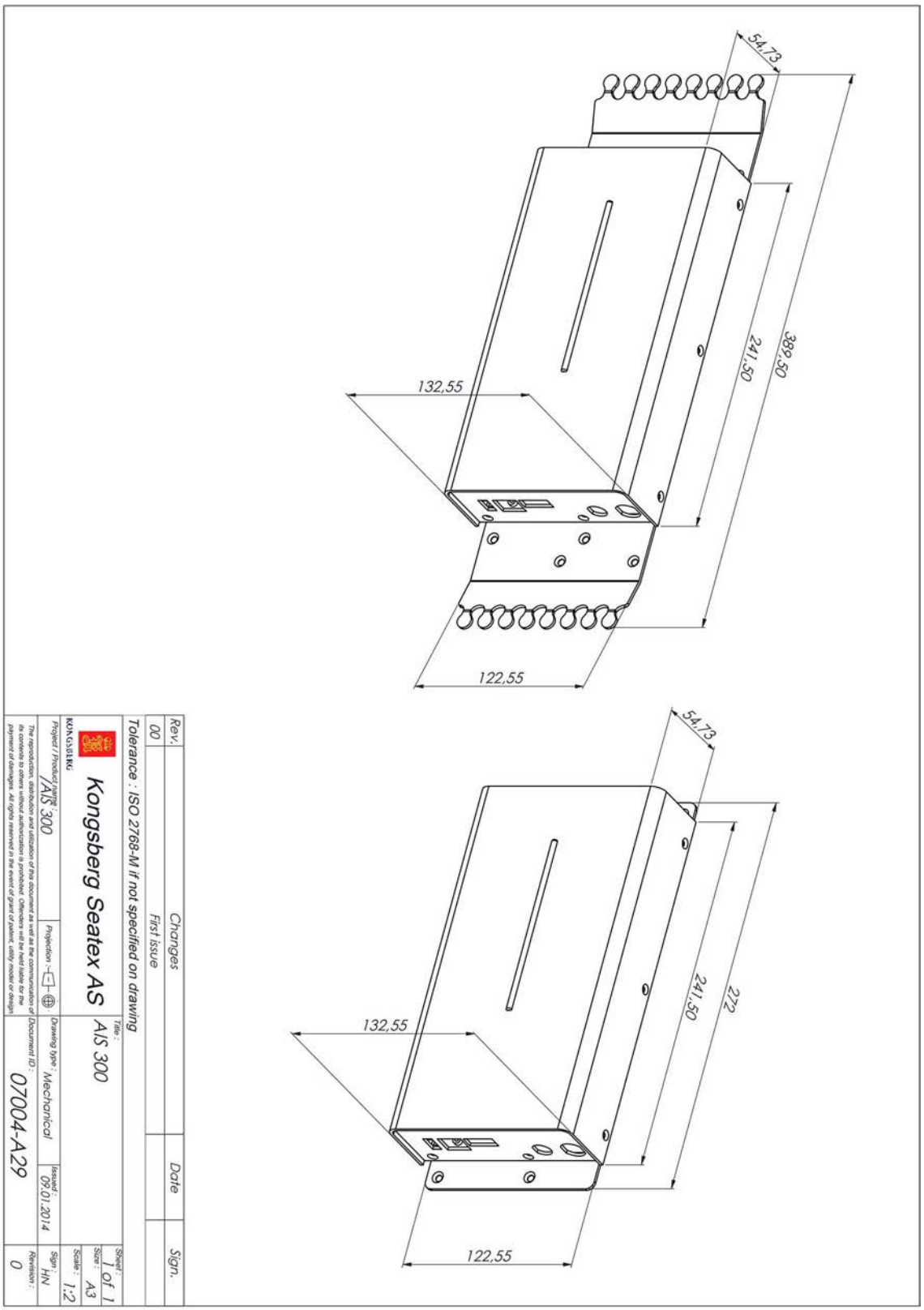
8 Mechanical drawings

This chapter contains an outline drawing including mechanical dimensions of the AIS Unit.

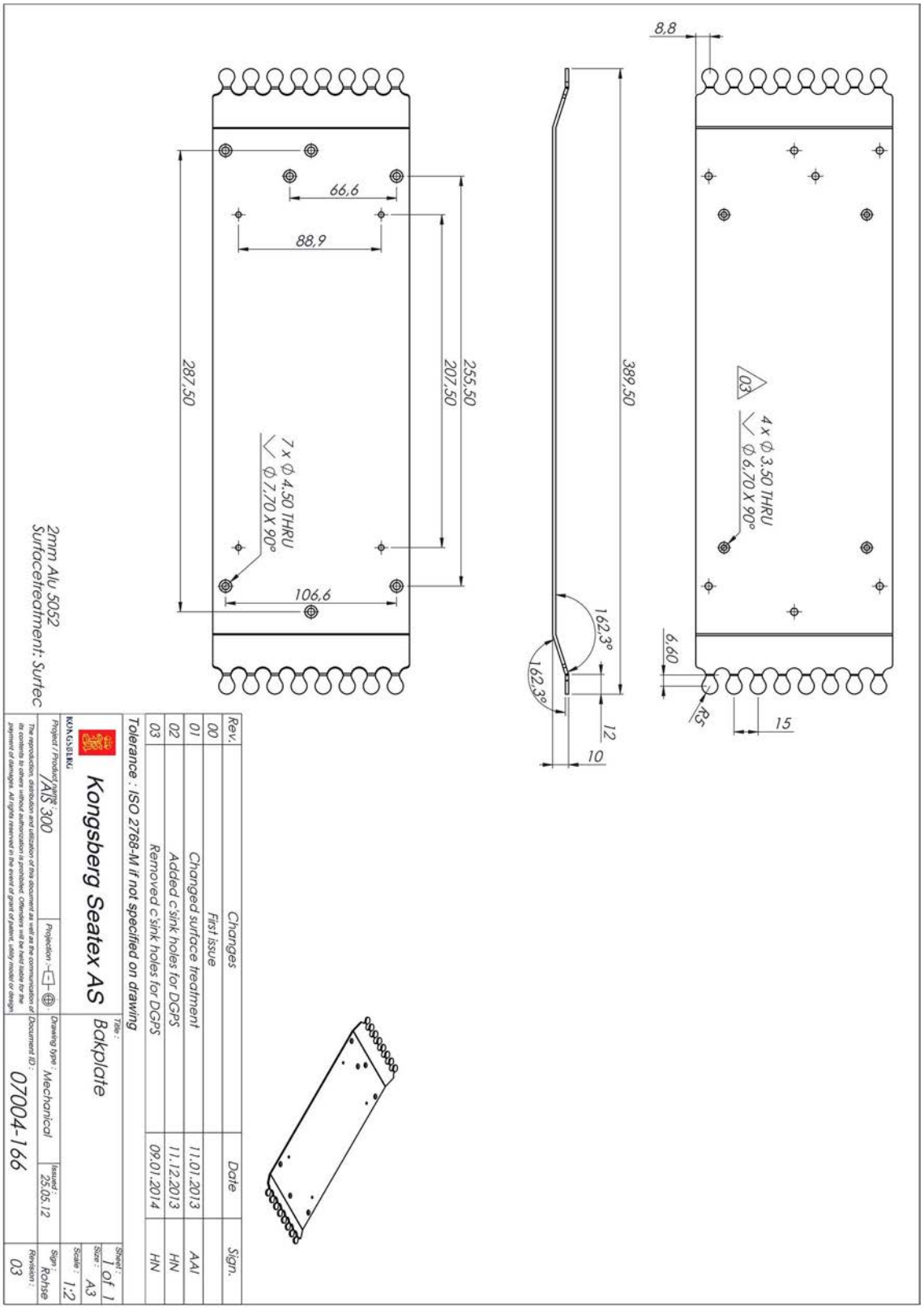
Note

The drawings are not to scale. To-scale drawings are available on request.

8.1 AIS Unit dimensions

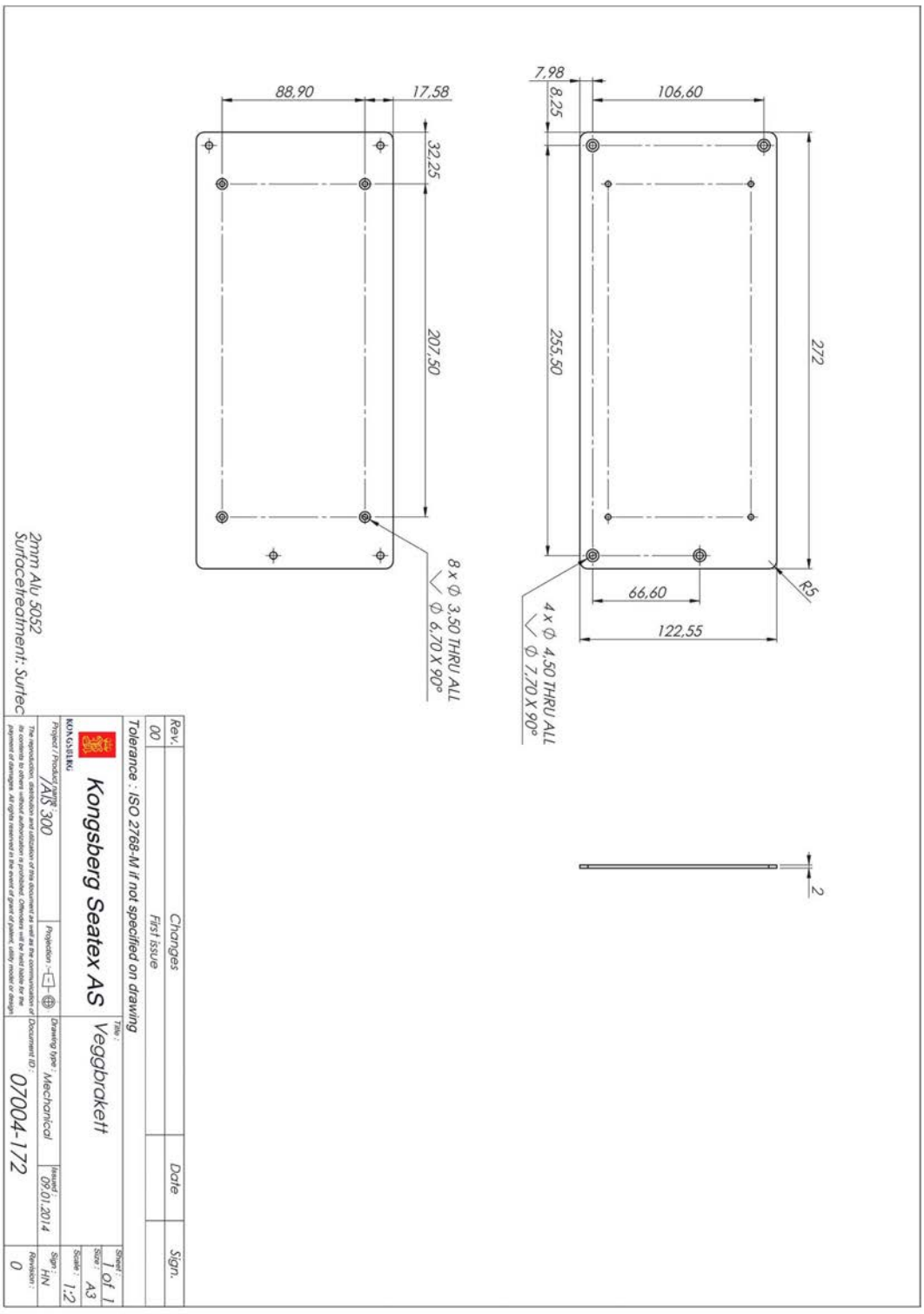


8.2 Bracket with strain relief dimensions



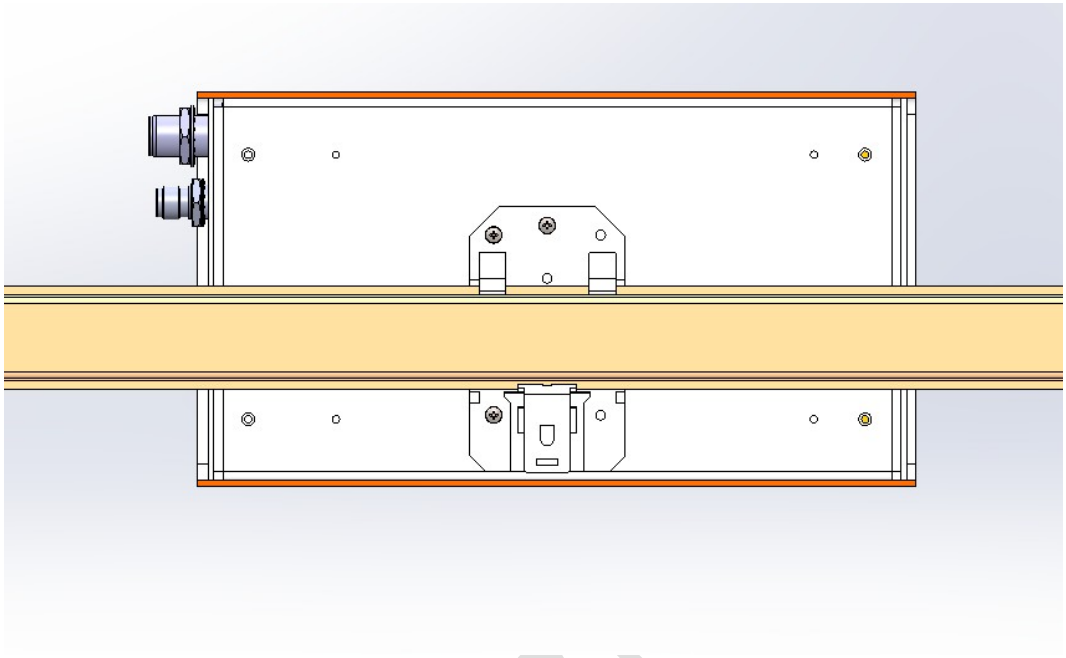
8.3 Wall mounting bracket dimensions

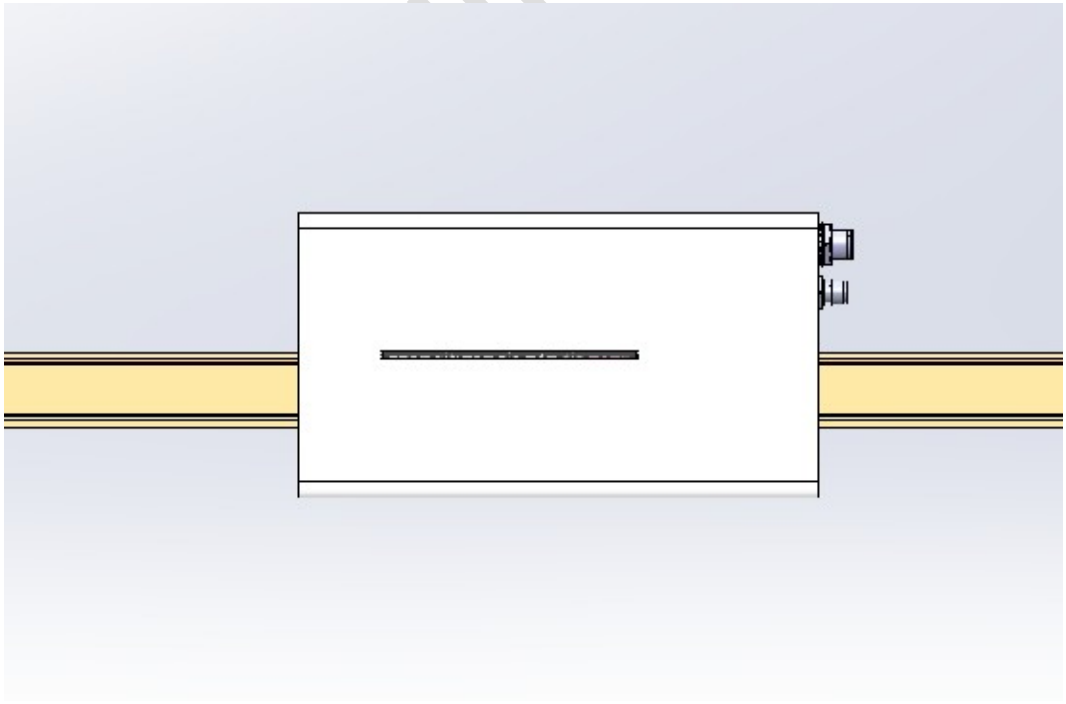
This wall mounting bracket is optional and not part of the standard delivery.



8.4 DIN rail mounting

For vessels when wheelmark is not required.





9 Parts list

9.1 Standard components

Part number	Description
A300-01	Kongsberg AIS 300 mobile station
A101-01	GPS antenna, GPS 4
A101-02_H *)	Mounting kit for GPS 4
A100-58	VHF antenna, AV7N
A300-02	Instruction Manual, AIS 300
A300-03 **)	Connector set for serial and power
A300-04	Bracket with strain relief
A300-08 ***)	AIS 300 pilot plug

*) A101-02_H (Mounting kit for GPS antenna) consists of :

- A101-02 (Mounting bracket for GPS 4)
- A101-03 (Interconnection cable for GPS 4 antenna, with N-female)
- A100-93 (Cable main unit to GPS antenna cable, with N-female, 0.5 m)

**) A300-03 consists of 4 x 10 pin connector for the green Phoenix connectors and one 2–pin power connector.

***) With bracket, no cable. For plug with cable order A300–07.

9.2 System accessories

Part number	Description
A100-59	GPS/VHF antenna cable (RG–214), price per m, maximum length 30 m
A100-60	GPS/VHF antenna cable (low loss), price per m, maximum length 100 m
A100-71	Connector kit for GPS antenna cable (low loss), two connectors
A100-73	Connector kit for VHF antenna cable (low loss), two connectors

Part number	Description
A100-61	Connector kit for GPS antenna cable (RG–214), two connectors, (1 ea.)
A100-66	Connector kit for VHF antenna cable (RG–214), two connectors, (1 ea.)
G071-91	Cable main unit to VHF antenna cable, 0.5 m, (1 ea.)
A101-03	Interconnection cable for GPS 4 antenna, with N-female, (1 ea.)
A100-93	Cable main unit to GPS antenna cable, with N-female, 0.5 m, (1 ea.)
A101-02	Mounting bracket for GPS 4, (1 ea.)
A300-05	Wall mount bracket without strain relief
A300–06	DIN rail bracket for DIN rail mounting
A300–07	Pilot plug with 10–metre cable

10 References

Reference documents

1 *NMEA 0183 Standard for Interfacing Marine Electronic Devices*, Version 3.00

2 *RTCM Recommended Standards for Differential Navstar GPS/GLONASS Service*, Version 2.3

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

4 *Maritime navigation and radiocommunication equipment and systems - Automatic identification systems (AIS) - Part 2: Class A shipborne equipment of the automatic identification system (AIS) - Operational and performance requirements, methods of test and required test results*, IEC 61993–2, ed 2.0

5 *Maritime navigation and radiocommunication equipment and systems - Digital interfaces - Part 1: Single talker and multiple listeners*, IEC 61162–1, ed 4.0

6 *Characteristics of a Transponder System Using Digital Selective Calling Techniques For Use With Vessel Traffic Services and Ship-To-Ship Identification*, ITU-R M.825

Appendix A
EU declaration of conformity

EC type examination certificate, module B, issued by BSH.

Bundesrepublik Deutschland
Federal Republic of Germany
BSH-Cert
Benannte Stelle – Navigations- und Funkausrüstung
beim Bundesamt für Seeschifffahrt und Hydrographie
Notified Body – Navigation and Radiocommunication Equipment
at the Federal Maritime and Hydrographic Agency

NOTIFIED BODY 0735

EC TYPE EXAMINATION (MODULE B) CERTIFICATE

This is to certify that:

BSH-Cert, specified as a "notified body" under the terms of „Schiffssicherheitsgesetz" of 09 September 1998 (BGBl. I, p. 2860) modified last 23 January 2014 (BGBl. I, p. 78), did undertake the relevant type approval procedures for the equipment identified below which was found to be in compliance with the Navigation requirements of Marine Equipment Directive (MED) 96/98/EC and the last modification by Directive 2015/559/EU.

Manufacturer	**Kongsberg Seatex**
Address	**Pirsenteret, 7462 Trondheim, NORWAY**
Applicant	**Kongsberg Seatex**
Address	**Pirsenteret, 7462 Trondheim, NORWAY**
Annex A.1 Item (No & item designation)	**4.32 Universal automatic identification system equipment (AIS)**
Product Name	**AIS300**
Trade Name(s)	---

Specified Standard(s)

IMO Resolution A.694(17)	**IEC 61993-2 Ed.2.0, 2012**
IMO Resolution MSC.74(69) Annex 3	**IEC 61108-1 Ed.2.0, 2003**
IMO Resolution MSC 191(79)	**IEC 60945 Ed.4.0, 2002 incl. Corr. 1, 2008**
ITU-R M.1371-5 (Class A), 2014	**IEC 61162-1 Ed.4.0, 2010**
ITU-R M.825-3, 1998	**IEC 61162-2 Ed.1.0, 1998**
ITU-R M.1084-5, 2012	**IEC 62288 Ed.2.0, 2014**

Based on the Directive 2013/52/EU, additional applied version: Directive 2015/559/EU
This certificate remains valid unless cancelled, expired or revoked.

Date of issue: **21. May 2015**
Expiry date: **20. May 2020**

Issued by: **BSH-Cert**
Bernhard-Nocht-Str. 78, 20359 Hamburg, Germany
Notified body 0735

Certificate No.: **4581/001/4322586/15**

USCG-Module-B No.: **165.155/EC0735** Unique Identifier: **4322586**

This certificate consists of 2 pages.

Siegel

Kai-dens Schulz-Reifer

NOTIFIED BODY 0735

This certificate is issued under the authority of the „Bundesministerium für Verkehr und digitale Infrastruktur".
V 2015-04-30

EC TYPE EXAMINATION CERTIFICATE No. 4581/001/4322586/15 Page 2 of 2

Components necessary for operation:

Component	Part No.	Remarks
AIS300, main module	A300-01	Software version: 1.00.xx
Multi Function Display (MFD/MKD)	DISP-E-MFD	Software version: 1.00.xx
GPS antenna	A101-01	
VHF antenna	A100-58	or equivalent VHF antenna

Approval Documentation:

Assessment Report No.:	BSH/4543/001/4322719/15-4	(IEC 61993-2 Section 15)
Test Report No.:	BSH/4543/001/4322719/15-1	(IEC 61993-2, IEC 61162-1,-2)
Test Report No.:	BSH/4543/001/4322719/15-3	(IEC 62288 Sections 4, 7)
Assessment Report No.:	BSH/4543/001/4322719/14-5	(IEC 60945)
Test Report No.:	BSH/4543/001/4322719/15-6	(IEC 60945 Sections 6, 11.1, 13-15)
Test Report No.:	BSH/4543/001/4322912/15	(IEC 61108-1)

Kongsberg AIS 300 Automatic Identification System Instruction manual
Kongsberg Multi Function Display Instruction manual

Places of production:

Limitations on the acceptance or use of the product:

This certificate covers only flush mounting of the Multi Function Display. A mounting with brackets is not allowed.

Notes:

The manufacturer shall inform BSH-Cert, as the notified body, of any modifications to the type-tested product(s) that ma affect compliance with the requirements or conditions laid down for use of the product(s).
In case the specified regulations or standards are amended during the validity of this certificate, the product(s) must b re-certified before being placed on board vessels to which such amended regulations or standards apply.
The Mark of Conformity (wheelmark) may only be affixed to the type approved equipment, and a Manufacturer's Declaration of Conformity may only be issued, if the product quality system fully complies with the Marine Equipmen Directive and is certified by a notified body against ANNEX B module D, E, or F of the Directive.

U.S. Coast Guard Approval

This product has been assigned a U.S. Coast Guard Module B number (165.xxx/EC0735/Unique Identifier [if other tha EC 0735: /Number of the notified body which certifies the quality assurance system]) to note type approval to Module B only as it pertains to obtaining U.S. Coast Guard approval as allowed by the "Agreement between the Europea Community and the United States of America on Mutual Recognition of Certificates of Conformity for Maritim Equipment" signed February 27th, 2004, and additional information given by U.S. Coast Guard by E-Mail 2010.
The AIS radio transponder is required to be authorized by U.S. Federal Communication Commission (FCC).

Notice on legal remedies available:
Objection to this document may be filed within one month after notification. The objection must be filed in writing to, or put on record at, Federal Maritime and Hydrographic Agency, Bernhard-Nocht-Str. 78, 20359 Hamburg, Germany

Appendix B
Declaration of conformity

KONGSBERG

DECLARATION OF CONFORMITY

(according to ISO/IEC 17050-1)

Manufacturer's name: **Kongsberg Seatex AS**
Manufacturer's address: **Pirsenteret, 7462 Trondheim, Norway**

declares that the product

Product name: **AIS 300**
Trade names: **AIS 300**
Product items:
- **AIS 300 Main module**
- **VHF antenna**
- **Procom/Simrad GPS4 antenna**

Approved with the following MKD:
- **Multi Function Display (MFD/MKD)**

is in conformity with the navigation equipment requirements of **Marine Equipment Directive (MED) 96/98/EC** as modified by amendment **2013/52/EU (Annex A1, 4.32),** and **US-EC MRA on Marine Equipment.**

Reference is made to the following product standards:

IMO Res. A694(17)	IEC 61993-2 Ed.2.0, 2012
IMO Res. MSC.74(69) Annex 3	IEC 61108-1 Ed.2.0, 2003
IMO Res. MSC 191(79)	IEC 60945 Ed.4.0, 2002 incl. Corr. 1, 2008
ITU-R M.1371-5 (Class A), 2014	IEC 61162-1 Ed.4.0, 2010
ITU-R M.825-3, 1998	IEC 61162-2 Ed.1.0, 1998
ITU-R M.1084-5, 2012	IEC 62288 Ed.2.0, 2014

Certificate references:
- EC type examination module B: Certificate no.: BSH 4581/001/4322586/15
- EC quality system certificate module D: DNV Certificate no. MED-D-1717
- USCG-Module-B No.: 165.155/EC0735; Identifier 4322586

Issued by:
- Bundesamt für Seeschifffart und Hydrographie (BSH, notified body identification number 0735). Address: Bernhard-Nocht-Str. 78, 20359 Hamburg, Germany, and
- Det Norske Veritas AS (DNV, notified body identification number 0575). Address: Veritasveien 1, NO-1322 Høvik, Norway

Supplementary information
All the technical documents are held by Kongsberg Seatex AS.

Date and signature
2015-06-02

Arne Rinnan, CTO

Appendix C
Coax connector installation

The connector consists of two parts: the connector head and the cable entry.

The instructions below are an excerpt from *Huber+Suhner assembly instruction, DOC-0000179418, rev. C, March 2008*.

Assembly Instruction, *Montageanleitung,* Instrucciones de Montaje:

Size, *Größe,* Tamaño	**1/2" HF**	
Corrugated Copper Tube Cables *Wellmantelkabel* Cable ondulado	**Huber + Suhner, SUCOFEED_1/2_HF** **Andrew, (Heliax) FSJ4-50B** **Draka NK Cables, (Ohmax) RFF 1/2"-50** **Leoni, FlexLine 1/2" S** **RFS, (Cellflex) SCF12-50**	
Series	**N**	**7/16**
Connector Types *Verbindertypen* Conectores	**11_N-50-9-9** **16_N-50-9-6** **21_N-50-9-9**	**11_716-50-9-9** **16_716-50-9-5** **21_716-50-9-9**
Recommended coupling nut torque *Empfohlenes Anzugsmoment der Kupplungsmutter* Presión de acoplamiento recomendada	**0.68 ... 1.13 Nm [0.49 ... 0.82 ft lb]** ≥ 500 matings, *Steckzyklen,* cantidad de conexionados **3 Nm [2.2 ft lb]** ≥ 100 matings, *Steckzyklen,* cantidad de conexionados	**25 ... 30 Nm [18.05 ... 21.66 ft lb]** ≥ 500 matings, *Steckzyklen,* cantidad de conexionados

Connector consists of one part:
Verbinder besteht aus einem Teil:
Este conector consta de una parte:

Do not open!
Bitte nicht öffnen!
No abrir por favour!

with / *mit* / con

Required Tools: stripping tool 74_Z-0-9-15, metal saw, spanners AF 21 and 22 mm, knife, abrasive paper.

Benötigte Hilfsmittel: *Abisolierwerkzeug 74_Z-0-9-15, Metallsäge, Gabelschlüssel SW 21 und 22 mm, Messer, Schleifpapier.*

Herramientas requeridas: fresador especial 74_Z-0-9-15, sierra para metal, llaves de horquilla de 21 y 22 mm, cuchilla, papel de lija.

without / ohne / sin

Required Tools: metal saw, spanners AF 21 and 22 mm, knife, abrasive paper, measure, file.

Benötigte Hilfsmittel: *Metallsäge, Gabelschlüssel SW 21 und 22 mm, Messer, Schleifpapier, Maßstab, Feile.*

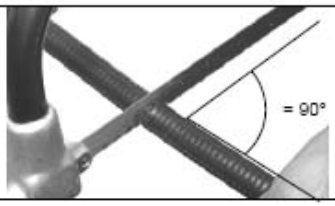
Herramientas requeridas: sierra para metal, llaves de horquilla de 21 y 22 mm, cuchilla, papel de lija, regla graduada, lima.

1.

Cut the cable off square, perpendicular to the cable axis.

Das Kabel rechtwinklig absägen.

Cortar el cable en ángulo recto.



without / *ohne* / sin 

follow with step 12 on page 4 / *weiterfahren mit Schritt 12, Seite 4* / continue con paso no. 12, página 4

2.

Strip the cable with the stripping tool 74_Z-0-9-15. Turn until the stop.

Kabel mit dem Werkzeug 74_Z-0-9-15 bis zum Anschlag abisolieren.

Pelar el cable con el tresador 74_Z-0-9-15 hasta el tope.

3.

Deburr outer conductor carefully.

Aussenleiter sorgfältig entgraten.

Eliminar cuidadosamente las asperezas del conductor exterior.

IMPORTANT / *WICHTIG* / IMPORTANTE

DAMAGED THREAD!
BESCHÄDIGTES GEWINDE!
ROSCA ESTROPEZADA!

GOOD!
RICHTIG!
CORRECTO!

4.

Clean the centre conductor carefully with abrasive paper.

Innenleiter mit Schleifpapier gut reinigen.

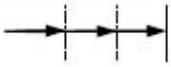
Limpiar cuidadosamente el conductor interior con el papel de lija.

5.

Push the connector onto the prepared cable end as far as the stop. In doing so, the sealing must overcome first. After that the inner conductor has to be engaged with the socket.

Verbinder bis zum Anschlag über das vorbereitete Kabelende schieben. Dabei muss zuerst die Aussenmanteldichtung überwunden werden und danach der Kabelinnenleiter in die Steckerinnenleiterbuchse eingesteckt werden.

Empuje el conector sobre el cable preparado hasta el tope. De esa manera la zapatilla se superara primero y después el conductor del cable interno se introducirá en el pin central del conector.

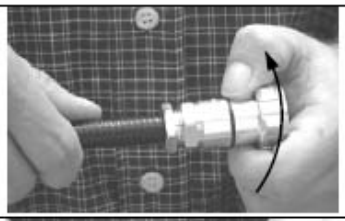


6.

Screw the connector onto the cable as far as the stop without excessive force.

Verbinder mit sanftem Druck bis zum Anschlag auf das Kabel schrauben.

Atornillar el conector en el cable hasta el tope con cuidado.

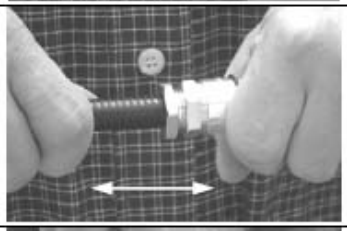


7.

Check connector seat by pulling the cable which should not be pulled out of the connector.

Zur Kontrolle am Kabel ziehen; dabei darf sich das Kabel nicht herausziehen lassen.

Controlar si el cable está fijo, tirandolo. Este no debe salir del conector.



8.

Tighten connector head and cable entry applying a torque of approx. 25 Nm (18 ft-lb). Rotate the cable entry only.

Verbinderkopf und Kabeleinführung mit einem Drehmoment von ca. 25 Nm anziehen. Nur die Kabeleinführung drehen.

Montar la cabeza del conector y la entrada del cable con aproximadamente 25 Nm girando la guía del cable.

9.

Tighten the back nut of the cable entry as far as the stop.

Die hintere Mutter der Kabeleinführung bis zum Anschlag anziehen.

Apretar la tuerca posterior de la guía del cable hasta el tope.

10.

Fasten mated connector pair with approx. 3 Nm/2.2 ft lb (N) or 25 Nm/18 ft lb (7/16) respectively.

Verbinderpaar mit ca. 3 Nm (N) bzw. 25 Nm (7/16) zusammenschrauben.

Apretar el acoplamiento con aprox. 3 Nm (N) o 25 Nm (7/16) respectivamente.

11.

If exposed to extreme environmental conditions, especially icy conditions or polluted atmosphere, the connector (connection) should be covered with a self-vulcanising tape or a cold shrink tube (e.g. 73_Z-0-0-337).

Bei extremen Umweltbedingungen, vor allem grosse Kälte oder stark verschmutzte Luft, muss der Verbinder (die Verbindung) mit selbstvulkanisierendem Dichtungsband oder einem Kaltschrumpfschlauch (z.B. 73_Z-0-0-337) zusätzlich geschützt werden.

Bajo condiciones ambientales extremas, especialmente temperaturas muy bajas o un ambiente contaminado, el conector (la conexión) debe ser protegido mediante una cinta autovulcanizable o un tubo exterior colocado en frió (p.ej. 73_Z-0-0-337).

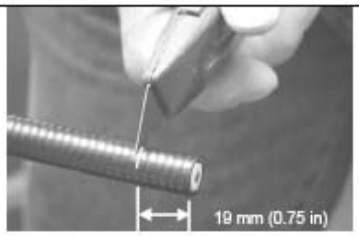
without / *ohne* / sin

12.

Cut back the cable jacket 19 mm (0.75 in).

Kabelmantel 19 mm zurückschneiden.

Cortar y separar 19 mm del revestimiento exterior.

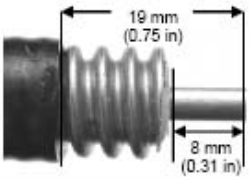


13.

Cut back the outer conductor 8 mm (0.31 in). Do not damage the centre conductor.

Aussenleiter 8 mm zurückschneiden. Innenleiter darf nicht beschädigt werden.

Cortar 8 mm del conductor exterior. No dañar el conductor interior.



14.

Chamfer centre conductor.

Innenleiter anfasen.

Dar forma cónica al conductor interior.

Follow with step 3 on page 2 / *Weiterfahren mit Schritt 3 auf Seite 2* / Continue con paso no. 3, página 2

Appendix D
½" coax cable specifications

SCF12-50 Series
1/2" Superflexible Foam Coax

APPLICATIONS	
OEM jumpers, Main feed transitions to equipment, GPS lines, Riser-rated In-Building (JFN types, only)	
GENERAL INFORMATION	
Cable Type	Foam-Dielectric, Superflexible
Size	1/2"
STRUCTURE	
Inner Conductor Material	Copper-Clad Aluminum Wire
Diameter Inner Conductor, mm (in)	3.6 (0.14)
Diameter Dielectric, mm (in)	8.3 (0.33)
Outer Conductor Material	Corrugated Copper
Diameter Copper Outer Conductor, mm (in)	12.3 (0.48)
Diameter over Jacket Nominal, mm (in)	13.7 (0.54)
MECHANICAL SPECIFICATIONS	
Cable Weight, kg/m (lb/ft)	0.21 (0.14)
Minimum Bending Radius, Repeated Bends, mm (in)	32 (1.25)
Bending Moment, N•m (lb-ft)	1.8 (1.3)
Flat Plate Crush Strength, N/mm (lb/in)	20.4 (110)
Tensile Strength, N (lb)	650 (146)
Recommended / Maximum Clamp Spacing, m (ft)	0.30 / 0.30 (1.00 / 1.00)
ELECTRICAL SPECIFICATIONS	
Impedance, Ohm	50 +/- 1
Velocity, percent	82
Capacitance, pF/m (pF/ft)	82.0 (25.0)
Inductance, µH/m (µH/ft)	0.207 (0.063)
Maximum Frequency, GHz	11.7
Peak Power Rating, kW	20.5
RF Peak Voltage, Volts	1430
Jacket Spark, Volt RMS	5000
Inner Conductor dc Resistance, ohm/1000 m (ohm/1000 ft)	2.9 (0.88)
Outer Conductor dc Resistance, ohm/1000 m (Ohm/1000 ft)	3.4 (1.04)

See Installation, Operation and Storage Temperatures on page 28.
For premium return loss codes see page 29.

CONNECTORS AND ACCESSORIES	
Connectors	See pages 70-77
Jumpers	See pages 82-87
Accessories	See pages 97-102
Coaxial Devices	See pages 106-108
Technical Appendix	See pages 639-648

SCF12-50J/JFN ATTENUATION AND AVERAGE POWER

Frequency MHz	Attenuation dB/100 m	Attenuation dB/100 ft	Average Power kW
0.5	0.229	0.0697	20.5
1.0	0.324	0.0986	20.5
1.5	0.397	0.121	20.5
2.0	0.458	0.140	18.8
10	1.03	0.314	8.37
20	1.46	0.446	5.90
30	1.80	0.548	4.80
50	2.33	0.710	3.70
88	3.11	0.949	2.77
100	3.33	1.01	2.59
108	3.46	1.06	2.49
150	4.10	1.25	2.10
174	4.43	1.35	1.95
200	4.76	1.45	1.81
300	5.89	1.79	1.46
400	6.85	2.09	1.26
450	7.29	2.22	1.18
500	7.71	2.35	1.12
512	7.81	2.38	1.10
600	8.50	2.59	1.01
700	9.23	2.81	0.934
800	9.92	3.02	0.869
824	10.1	3.07	0.855
894	10.5	3.21	0.818
900	10.6	3.22	0.815
925	10.7	3.27	0.803
960	11.0	3.34	0.787
1000	11.2	3.41	0.770
1250	12.7	3.86	0.682
1500	14.0	4.26	0.616
1700	15.0	4.57	0.575
1800	15.5	4.72	0.557
2000	16.4	5.01	0.525
2100	16.9	5.15	0.511
2200	17.3	5.28	0.498
2400	18.2	5.55	0.474
3000	20.7	6.30	0.417
3500	22.6	6.88	0.382
4000	24.4	7.4	0.353
5000	27.8	8.5	0.310
6000	31.0	9.4	0.278
7000	34.0	10.4	0.254
8000	36.8	11.2	0.234
9000	39.6	12.1	0.218
10000	42.3	12.9	0.204
11700	46.6	14.2	0.185

Standard Conditions:
For attenuation: VSWR 1.0, cable temperature 20° C (68° F).
For average power: VSWR 1.0, ambient temperature 40° C (104°F), inner conductor temperature 100° C (212° F). No solar loading.

Appendix E
RG–214 specifications

HUBER+SUHNER® DATA SHEET
Coaxial Cable: RG_214_HIFLEX

Rev.: O.00

Description

PE-50 Ohm - double screen

Technical Data

Construction

	Material	Detail	Diameter		
Centre conductor	Copper, Silver plated	Strand-19	2.25	mm	
Dielectric	POE (Polyolefine Elastomer)		7.3	mm	
Outer conductor	Copper, Silver plated	Braid, 93 %	8	mm	
Outer conductor	Copper, Silver plated	Braid, 95 %	8.7	mm	
Jacket	PVC II (non migration)	RAL 9005 - bk	10.8	mm	+/- 0.15
Print	HUBER+SUHNER RG 214 HiFlex 50 Ohm (PA no.)				

Electrical Data

Impedance	50	Ω	+/- 2
Max. operating frequency	6	GHz	
Capacitance	101	pF/m	
Velocity of signal propagation	66	%	
Signal delay	5.03	ns/m	
Insulation resistance	≥1 x	10^6 MΩm	
Min. screening effectiveness	>70	dB (up to 1 GHz)	
Max. operating voltage	5	kV_{rms} (at sea level)	
Test voltage	10	kV_{rms} (50 Hz/1 min)	

Mechanical Data

Weight		18.5	kg/100 m	
Min. bending radius	static	15	mm	
	repeated (for max. 50 bendings)	60	mm	
	dynamic	100	mm	

Environmental Data

Temperature range		-25 °C... + 85 °C
Installation temperature	-20 °C... + 60 °C	
Flammability	IEC 60332-1	
2002/95/EC (RoHS)	compliant	

Ordering Information

Order as	RG_214_HIFLEX

Additional Information

Remarks

(For details refer to the HUBER+SUHNER RF CABLES GENERAL CATALOGUE or contact your nearest HUBER+SUHNER partner)

Suitable Connectors

Cable group	crimped (U32)
	clamped (U33)
	soldered —

HUBER+SUHNER® DATA SHEET
Coaxial Cable: RG_214_HIFLEX

Rev.: O.00

Matrix **Attenuation** [formula: (a*f^0.5 + b*f)] **and Power CW** [formula: (p*/ f^0.5)]

Coefficients:

a=	0.1924	b=	0.0567	$f_{max.}$=	6	$p_{at\ 1GHz}$ =	320
	Frequency		**Nom. attenuation**		**Nom. attenuation**		**Max. CW power**
	(GHz)		**(dB / m)**		**(dB / ft)**		**(watt)**
			sea level 25° C ambient temperature		sea level 25° C ambient temperature		sea level 40° C ambient temperature
	0.3		0.12		0.037		584
	0.6		0.18		0.055		413
	0.9		0.23		0.070		337
	1.2		0.28		0.085		292
	1.5		0.32		0.098		261
	1.8		0.36		0.110		239
	2.1		0.40		0.122		221
	2.4		0.43		0.131		207
	2.7		0.47		0.143		195
	3.0		0.50		0.152		185
	3.3		0.54		0.165		176
	3.6		0.57		0.174		169
	3.9		0.60		0.183		162
	4.2		0.63		0.192		156
	4.5		0.66		0.201		151
	4.8		0.69		0.210		146
	5.1		0.72		0.219		142
	5.4		0.75		0.229		138
	5.7		0.78		0.238		134
	6.0		0.81		0.247		131

HUBER+SUHNER is certified according to ISO 9001 and ISO 14001

HUBER+SUHNER – Excellence in Connectivity Solutions

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RF Industrial
9100 Herisau, Switzerland
Phone +41 (0)71 353 41 11
Fax +41 (0)71 353 45 90
www.hubersuhner.com

Appendix F
Antenna specifications

F.1 GNSS antenna mechanical dimensions and installation

Excerpt from Procom datasheet

Application

Active receiving antenna for the 1575 MHz NAVSTAR GPS Satellitte Navigation System

Electrical specifications

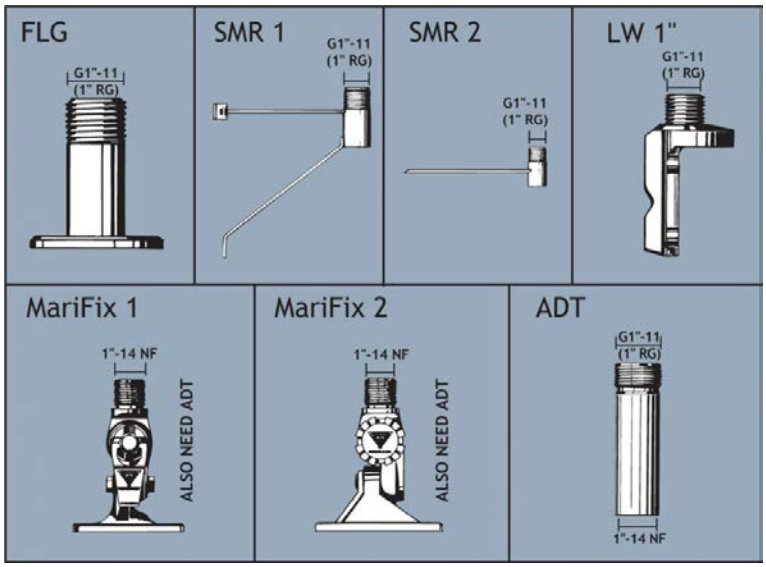
Model and type	GPS 4, quadrifilar helix active antenna
Frequency	1575 MHz
Impedance	Nom. 50 Ω
Polarisation	Circular right-hand
Gain (in axial direction)	> 32 dBi
SWR (output)	< 2.0
Supply voltage	5 ± 0.5 V DC
Current consumption	Approx. 44 mA
EMC	Full protection (IEC 801, IEC 255)

Mechanical specifications

Materials	Antenna dome: weather-resistant low-loss plastic,
Colour	White
Wind surface	Approx. 0.0072 m^2
Max. wind speed	200 km/h
Wind load	Approx. 9.6 N @ 150 km/h
Temperature range	-50 °C to +70 °C
Connector	FME-female (pin) (N-female pigtail when delivered by Kongsberg Seatex AS)
Total height	Approx. 23 cm
Antenna diameter	33 mm
Weight	Approx. 150 g

Mounting

Vertical on 1–inch water pipe or on PROCOM 1–inch mounting brackets.



F.2 VHF antenna mechanical drawing and installation

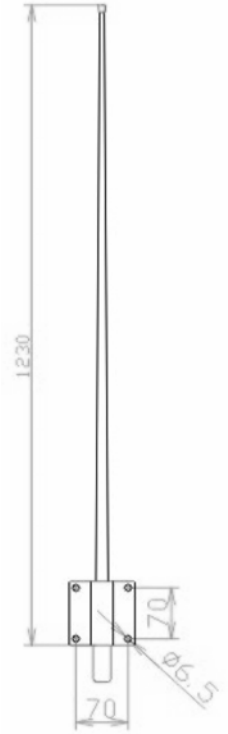
Excerpt from Comrod datasheet

Type

Comrod AV7.

Application

High quality dipole antenna designed for the marine VHF radio telephone service.



Electrical specifications

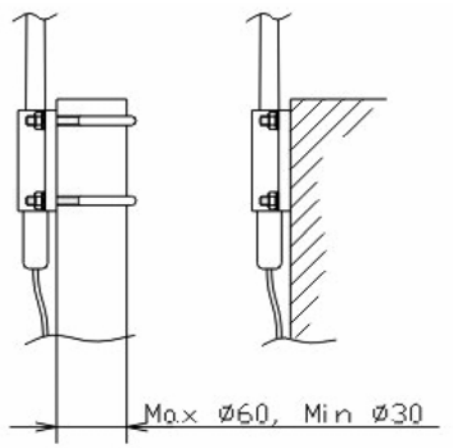
Frequency range	156 to 162 MHz, VSWR < 1.5:1 145 to 165 MHz, VSWR < 2:1
Nominal impedance	50 Ω
Power rating	100 W
Gain	2 dBi
Pattern	Horizontal plane: Omnidirectional Vertical plane: see reverse page
Polarisation	Vertical
Connector	UHF female is standard
DC-grounded	Yes

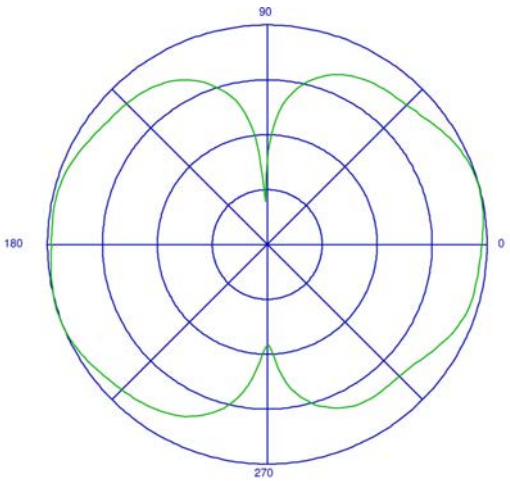
Mechanical specifications

Design	Centerfed coaxial dipole. Radiating elements completely enclosed in polyurethane foam within a fiberglass tube. Mounting bracket in aluminium.
Height	1.25 m (4 ft)
Weight	1 kg, including U-bolts
Wind rating	55 m/s = 125 mph
Finish	Polyurethane lacquer, white
Temperature range	-55 °C, +71 °C (-67 °F, +160 °F)

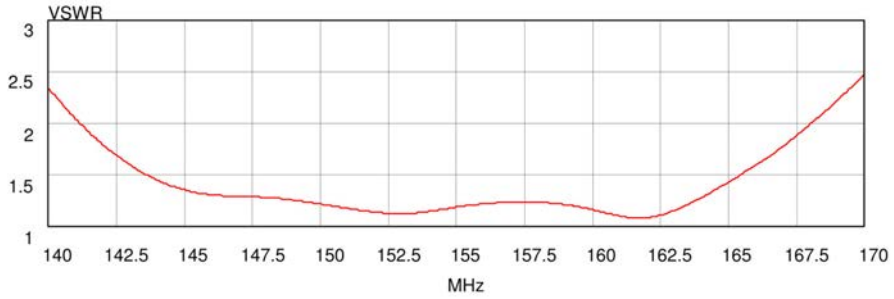
Mounting

Mounted to the bulkhead by means of 4 holes in the aluminium bracket or to a mast or tube with U-bolts. The tube may be horizontal or vertical.





Vertical radiation diagram
f=160MHz
40 dB dynamic range, 10dB/div



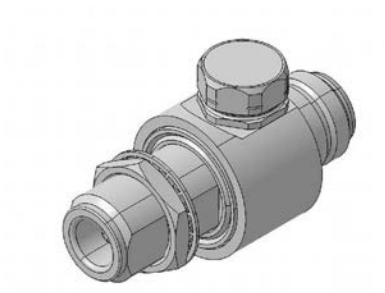
Standing wave ratio

Appendix G
Lightning arrestor specifications

Excerpt from Huber+Suhner data sheets.

HUBER+SUHNER® DATA SHEET
EMP Protector: 3401.17.A

Rev.: J



Description
GDT technology up to 1.0 GHz

Benefits

Broad-band operation
DC continuity for outdoor powering
The protector can also be installed reversely
Delivered without gas discharge tube
Data refer to GDT 9071.99.0547, 230 V

Product Configuration

Main path connectors	Port 1: unprotected, N jack (female) - Port 2: protected, N jack (female)
Mounting and grounding	MH12 (MH=bulkhead mounting)
Side of bulkhead	protected side

Technical Data

Electrical Data

Impedance	50 Ω
Frequency range	0 to 1000 MHz
Return loss	≥ 26.44 dB
Insertion loss	≤ 0.1 dB
RF CW power	≤ 150 W
PIM 3rd order	not specified
Surge current handling capability	30 single / 20 multiple kA (test pulse 8/20 µs)
Residual pulse energy	350 µJ typically (test pulse 4 kV 1.2/50 µs / 2 kA 8/20 µs) main path - protected side

Mechanical Data

Weight	87 g

Environmental Data

Operating temperature	-40 °C to +85 °C
Waterproof degree	IP 65 (according to IEC 60529, data refer to the coupled state)
2002/95/EC (RoHS)	compliant

Material Data

Piece Parts	Material	Surface Plating
Housing	Brass	SUCOPLATE (R) Plating
Port 1 center contact	Copper Beryllium Alloy	Gold Plating (without Nickel underplating)
Port 2 center contact	Copper Beryllium Alloy	Gold Plating (without Nickel underplating)

Related Documents

Outline drawing	DOU-00003942.1
Mounting instruction	DOC-0000176104

Remarks

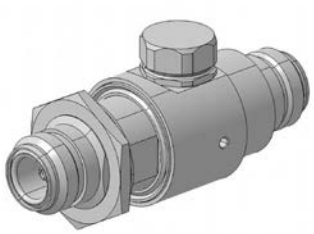
Customer number	NATO: NSN 5820-99-726-4346, 5920-14-516-6621, 5920-17-100-7884, 5920-66-127-4034

HUBER+SUHNER® DATA SHEET
EMP Protector: 3402.17.A

Rev.: K

Description

GDT technology up to 2.5 GHz



Benefits

Broad-band design
DC continuity for remote powering
The protector can also be installed reversely
Delivered without gas discharge tube
Data refer to GDT 9071.99.0547, 230 V
Compliant to IEC 61643-21

Product Configuration

Main path connectors	Port 1: unprotected, N jack (female) - Port 2: protected, N jack (female)
Mounting and grounding	MH25 (MH=bulkhead mounting)
Side of bulkhead	protected side

Technical Data

Electrical Data

Impedance	50 Ω
Frequency range	0 to 2500 MHz
Return loss	≥ 20 dB
Insertion loss	≤ 0.2 dB
RF CW power	≤ 150 W
PIM 3rd order	not specified
Surge current handling capability	30 single / 20 multiple kA (test pulse 8/20 µs)
Residual pulse energy	350 µJ typically (test pulse 4 kV 1.2/50 µs / 2 kA 8/20 µs) main path - protected side

Mechanical Data

Weight	126 g

Environmental Data

Operating temperature	-40 °C to +85 °C
Waterproof degree	IP 65 (according to IEC 60529, data refer to the coupled state)
2002/95/EC (RoHS)	compliant

Material Data

Piece Parts	Material	Surface Plating
Housing	Brass	SUCOPLATE (R) Plating
Port 1 center contact	Copper Beryllium Alloy	Gold Plating (without Nickel underplating)
Port 2 center contact	Copper Beryllium Alloy	Gold Plating (without Nickel underplating)

Related Documents

Outline drawing	DOU-00019177.1
Mounting instruction	DOC-0000176104

Remarks

Customer number	NATO: NSN 5920-99-773-3078

Appendix H
Production test

The AIS Unit, serial number: ....., has been mounted and tested according to the valid revision of the product description.

Type: AIS 300 ☐ AIS 300BF ☐

Test item	Test status
LED behaviour during start-up	☒ Accepted ☐ Not accepted
LED behaviour operation Implicit; GPS OK, RX, TX; Radio OK	☒ Accepted ☐ Not accepted
AIS LAN interface – output (UDP 4711 and TCP 4712) and LAN input	☒ Accepted ☐ Not accepted
Serial port – Service (RS232)	☒ Accepted ☐ Not accepted
Serial port –PI (RS422)	☒ Accepted ☐ Not accepted
Serial port – Sensor 1 (RS422)	☒ Accepted ☐ Not accepted
Serial port – Sensor 2 (RS422)	☒ Accepted ☐ Not accepted
Serial port – Sensor 3 (RS422)	☒ Accepted ☐ Not accepted
Serial port – RTCM (RS422)	☒ Accepted ☐ Not accepted
Serial port – Pilot (RS422)	☒ Accepted ☐ Not accepted
Serial port – LR (RS422)	☒ Accepted ☐ Not accepted
USB port	☒ Accepted ☐ Not accepted
Blue Sign	☒ Accepted ☐ Not accepted
Relay	☒ Accepted ☐ Not accepted

Default settings as follows;

AIS LAN IP adr	10.0.21.60		Frequencies Ch A/B/C	161.975/162.025/156.525 (MHz)
Subnet adr	255.255.255.0		Power	12 (W)
Default Gateway	10.0.21.1		Host name	According to type
AIS LAN PI port	UDP broadcast/4711		MMSI	0
AIS LAN PI port	TCP/4712		User/Password	ais/1234

Comments: