



# AIS FOR ATON **QUICK GUIDE** to equipment selection for fairway managers and port authorities

# AIS FOR ATON QUICK GUIDE

## to equipment selection for fairway managers and port authorities

### About this guide

As the trend toward e-navigation picks up pace, fairway managers and port authorities are increasingly being asked by ship owners and operators to integrate the Automatic Identification System (AIS) into their Aids to Navigation (AtoN) devices. But what is AIS, how does it relate to AtoN, and what do you need to consider before making an investment decision and selecting the equipment that best meets your needs? This guide aims to answer those questions.

#### WHAT IS AIS?

AIS is an automatic identification system originally developed to allow ships to view maritime traffic in their area and be seen by that traffic themselves. The system offers a way for ships to transmit dynamic data like course, speed, and position to other vessels and on-shore monitoring stations, as well as static data such as their Maritime Mobile Service Identity (MMSI). Since 2002, AIS has been mandatory on all passenger vessels and all cargo vessels over 300 GRT (gross registered tonnage).

It is important to point out that the purpose of AIS is to increase safety at sea and facilitate navigation; it is not primarily intended as a remote-monitoring solution. If you are interested only in remote monitoring there are more suitable solutions available that rely on satellite communication to avoid cluttering up the limited bandwidth of the AIS channel.

#### Quick facts

- AIS uses four worldwide channels in the VHF maritime mobile band
- It enables the automatic exchange of dynamic data (e.g. from sensors onboard vessels) and manually entered data (such as voyage-related information and MMSI)
- It's a mandatory requirement for all vessels of 300 GRT or more and all passenger vessels regardless of size
- The International Maritime Organization (IMO) and the International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA) has adopted AIS as a standard

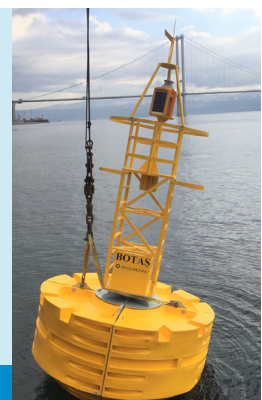
#### ADDING MODERN TECHNOLOGY TO AN ANCIENT NAVIGATION AID

An AIS AtoN can be thought of like a 'super buoy' with the capability to transmit, or transmit and receive, different types of AIS messages. An AIS AtoN can consist of a transponder only, or a transponder, lantern, and other equipment, such as hydrological sensors, integrated in the same unit.

Currently, the main driver behind the implementation of AIS AtoN is to promote and enhance the safety and efficiency of navigation by providing a redundant safety system to complement existing networks of beacons and lanterns. The decision to equip an AtoN with AIS should be based on a thorough risk assessment.

**Important:** Regardless of type, every AIS AtoN must be properly registered and have a unique nine-digit identification number known as a Maritime Mobile Service Identity (MMSI) that must be applied for through the relevant national authority.

SC160 with AIS



#### CHOOSING THE RIGHT EQUIPMENT

##### Understanding equipment options

There are several factors to consider when selecting the AIS AtoN equipment that's right for your specific application, including transmission and reception capabilities, antenna type and height, and power supply and consumption.

## Type 1 or Type 3 AIS AtoN?

There are two main types of AIS AtoN stations: type 1 and type 3. There are also type 2 stations that are very similar to type 1 but also include a receiver to enable remote configuration.

**Type 1** stations are simple, fixed-access, transmit-only stations. They combine the necessary hardware with software that transmits AIS messages in specific transmission slots.

### Type 1

- Use the FATDMA (Fixed Access Time Division Multiple Access) scheme, which requires a nearby base station to reserve transmission slots for AIS messages
- Are the cheapest option, with low power and maintenance requirements
- Are more demanding from an administrative perspective because of the need to liaise with the relevant national authority in order to reserve transmission slots; in some countries identifying the person or persons with the right process knowledge can be challenging

**Type 3** AIS AtoN stations are more complex, with the capability to both send and receive AIS messages; however, they are much less demanding from an administrative perspective.

### Type 3

- Can use either the FATDMA scheme, where an AIS base station is used to reserve transmission slots for AIS messages, or the RATDMA (Random Access Time Division Multiple Access) scheme, where the AIS AtoN autonomously allocates its own transmission slots
- Are typically around 30% more expensive than type 1 stations, but are much easier to set up as essentially all you need to do is define the transmission interval (typically three minutes)
- Have higher power requirements than type 1 stations (as much as 10 times higher) because the receiver needs to be powered up for about a minute before transmission in order to identify free slots

If power consumption is not a limiting factor for your application, type 3 AIS AtoN stations are the better choice because they eliminate a great deal of time-consuming and often frustrating administration work.

## What are the main AIS message types?

The full list of messages that an AIS AtoN can transmit is defined in the IALA Recommendation A-126. In this guide we will focus on the two main message types: Message 21 and Message 6.

**Message 21** broadcasts information on:

- AtoN type, name, position, and system status
- Position accuracy indicator and type of position fixing device
- On/off position status
- Real and virtual AtoN identification
- Dimension of the AtoN and reference positions

**Message 6** is an addressed binary message that can be used for sending AtoN status reports to the AtoN owner. This can include information on things like the battery, lantern status, and solar-power system charging current, supporting increased availability through early fault notification and preventive maintenance actions. Message 6 content can also be used to enable remote control of the AIS AtoN. Because there is no global standard for the content of Message 6 it can vary between manufacturers; the de facto standard is the UK's General Lighthouse Authority (GLA) standard.

While the ability to send Message 6 is useful for the reasons mentioned above, it's important to remember that broadcasting it requires a system that receives and processes the information before forwarding it to the AtoN owner. This obviously adds complexity and cost to any system setup, so it's worth considering whether or not you really need Message 6 capability.

While the transmission frequency of messages depends on several factors, it ranges from every three seconds to every three minutes. Every time an AIS AtoN sends a message it has to reserve a slot for the next message. An AIS slot is about 26.66 milliseconds long, meaning around 2,250 single slot messages can be transmitted every minute per channel.

## What transmission range do you need?

AIS AtoNs typically have a transmission range of five to 15 nautical miles. In areas of heavy traffic the sheer volume of AIS transmissions can result in the base station becoming overloaded, reducing the range it can cover. Choosing the right type of AIS AtoN is also important here, as using type 1 stations may result in a lack of available transmission slots.

Since AIS uses the VHF maritime mobile band operation system, antenna height plays a key role in determining the transmission and reception reach for AIS AtoN stations. For example, if your buoy is only 1.5 meters above the water your range will suffer if you choose a short antenna. As a rule, the higher the antenna, the greater the range.

When considering your options, it is important to develop a solid specification that clearly sets out the transmission range you require for your AIS AtoN.

### Things to consider

- *All AIS applications must use a marine VHF type antenna*
- *AIS uses the 161,975 MHz and 162,025 MHz frequency channels, so the antenna should have a broad bandwidth or be tuned to a frequency close to these channels*
- *In addition to antenna height, length and installation height, transmission range is also affected by power supply and the quality of the antenna system*
- *An antenna with a standing wave ratio (SWR) of lower than 1.5 is recommended; the SWR indicates how much of the transmitted power is bounced back to the transmitter instead of being broadcast*

## What hardware is needed

Another important consideration is what AIS physically adds to a device like a buoy. This includes a power source, as well as an antenna, transmitter, receiver, and communications module attached to the lantern so it can broadcast its status as part of Message 21 transmissions.

## How much power will the AtoN consume?

The power consumption of an AIS AtoN depends on several factors. As stated earlier, an AIS AtoN station using RATDMA (type 3) will consume significantly more power than one that only uses FATDMA (types 1 and 2). The transmission and sleep intervals will also have an impact on power consumption.

A unit that combines a lantern and an AIS transponder will require even more power. Depending on where the unit is located geographically, one option is to use an integrated solar panel and battery. In this case it will be important to calculate the annual hours of sunlight for the location in question (see Marine Selector Tool at [sabik-marine.com/online-tools](http://sabik-marine.com/online-tools)).

It is important to take steps to measure the actual consumption of the agreed AIS AtoN specification rather than relying on generic data supplied by the manufacturer. This will help avoid unnecessary downtime and potentially costly modifications at a later stage.

The lantern's required range and its flash pattern also have an impact on power consumption.

A well-designed self-contained AIS buoy should have a useful battery life of between five and 15 years.

## What is the network capacity?

When considering the implementation of AIS AtoNs, another factor that needs to be borne in mind is the available network capacity in the area where they will be installed. For example, in very busy sea lanes there are so many ships at any one time that there might not be enough network capacity to equip every AtoN with AIS. For this reason the national maritime agencies in such areas may not permit extensive AIS AtoN deployment.

It's important to remember that it isn't necessary for every buoy to have AIS. If the entrance to the port or harbor has AIS, it is usually sufficient for only every tenth buoy on the fairway to have AIS. If you are marking an offshore windfarm, for example, it's enough to have one AIS buoy in one corner to generate virtual AIS buoys for the other three corners. Other virtual AIS AtoNs can be created if the transmitter software enables it.

## Summary

**Any decision to invest in AIS for AtoN equipment should be based on a thorough risk assessment and understanding of the unique characteristics of your area – there is no one-size-fits-all solution that will meet all your requirements. Before talking to equipment manufacturers or suppliers, you should have a clear idea of what type of station and messages you need as well as specifications regarding the required transmission range and power supply.**

### Sabik Marine offers a range of products with integrated AIS:

- **LED 160 AIS** a full-range lantern for fixed and floating installations
- **SC 160 I AIS** a self-contained LED lantern for buoys and beacons
- **SC 160 II AIS** a self-contained longer-range LED lantern for buoys and beacons



LED 160 with AIS

SC160 with AIS

Sabik also offers the **VEGA AIS** that can be installed underneath a lantern or be used as an AIS transponder without the lantern. The VEGA AIS is ideal extension to Vega lanterns equipped with a data port and allows richer communication between the AIS hardware and the lantern. Our AIS products can be used in both self-contained or standalone applications.

Again, it's worth noting that if you are interested only in remote monitoring there are more suitable solutions available that are designed specifically for that purpose. Sabik experts will be happy help you define and select the equipment that best meets your needs.

**For more information, help, and advice please get in touch with your local Sabik representative**

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