

# e-Navigation\* Solutions

**AIDS TO NAVIGATION**

**ENVIRONMENTAL  
PROTECTION**

**OFFSHORE STRUCTURES MARKING  
AND COLLISION PREVENTION**

**ECONOMIC OPTIMISATION**

**NAVIGATION STUDY  
AND ANALYSIS TOOL**

\* Helping humans to manage information

McMurdo Marine Systems has expertise in the three main components of e-Navigation: onboard systems, shore infrastructures and the associated means of communication (distress beacons, supervision systems, HF, GSM and satellite communication).

McMurdo Marine Systems for professionals has long experience in harnessing its expertise to users' needs by means of root and branch analyses of the needs and specific constraints of their trades.

The AIS (Automatic Identification System) that has now been in use for a decade was originally developed for the prevention of collisions at sea, then subsequently employed for monitoring maritime traffic, marine aids to navigation and is now a major e-Navigation tool.

### AIS AtoN TRANSPONDER

The Kanaton AIS transponder is an aid to navigation AIS station, optimised for installation on floating or fixed Aids to navigation.

#### Maritime and river Aid to navigation

Adapted to maritime marking, it leads to significant advances in navigation aids. In particular, it enables:

- Radar/ECDIS screens on boats to obtain reliable data in any weather conditions regarding the identification of an AtoN
- Navigators and authorities to obtain complete data on the identification of an AtoN (MMSI, Position, etc.)
- AtoN status monitoring (light status, etc.)
- Real time warnings when buoys move off position
- AtoN collision risk reduction
- Virtual and synthetic aids to navigation

#### Environmental protection:

Equipped with a built-in communication capability, the Kanaton transponders used on coastal or sea structures, associated with sensors, enable the processing and saving of meteorological and hydrological data, providing scientists and authorities precious environmental data.

#### Offshore structure marking and collision prevention:

The Kanaton transponder enables to mark offshore structures, whose numbers are continually growing, (instrumented buoys, wind and wave energy farms, oil and gas platforms, offshore docks, pipelines, etc.) to improve navigational safety and prevent collisions.

#### Navigation study and analysis tool:

Thanks to the information obtained, the Kanaton transponder can be a navigation study and analysis tool.

- Analysis of the impact of ships on environment
  - Study of a lateral distribution of ships navigating through a crossing area in the different waterway situations
- Study of ships behaviour in waterways according to the speed of the ship
  - Determination of the effectiveness of lengths and widths of crossing areas in waterways
- Optimisation of the traffic in the entrances to ports and waterways

#### Economic optimisation

The Kanaton transponder can also be a highly valuable aid for the economic optimisation of certain routes:

- Double checking of ships passing through waterways in order to collect fees
- Reduction of movement in an area (maintenance)
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#### Complies with standards:

IEC 62320-2, UN 60945, ITU-R M1371, IALA A-126



#### Features

- Transmits messages 21, 8, 6 (7, 12, 13, 14, 25 type 3 only)
  - Very low power consumption, compatible with solar-powered installations. Transmission period of 3 minutes on the 2 channels:
    - Type 1: < 0.2 Ah/day (FATDMA protocol)
    - Type 3: < 1 Ah/day (RATDMA protocol)
  - Automatic transmission of message 14 when a buoy moves off position or a light is faulty
  - Automatic switching off of the Racon when the buoy moves off position
  - Transmission of message 6 (status message: battery charge, lights, solar panel) for tele-monitoring requirements
  - Transmission of message 8 enabling a network of sensors to be deployed to measure the meteorological and hydrological parameters along the coast
  - Adapts to the main meteorological and hydrological sensors
  - Transmission of an AIS message when a ship is approaching (the ship's AIS transmission is perceived by type 3 AtoN which then switches on)
  - Reception and relaying of configuration messages for itself or for other AtoNs forming a transmission chain
  - Relays safety messages (SART message)
  - It is possible to transmit the AtoN's data over long distances thanks to the satellite link integrated into the type 3 transponder (option)
  - It is possible to associate type 3 KANAToN in redundant configuration in order to deal with breakdowns: intervention in the zone without precipitation
  - It is possible to programme 4 virtual or synthetic AtoNs
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- Very low power consumption
  - Compact, lightweight casing (1 kg) which facilitates installation (the GPS antenna is built into the casing)
  - Totally watertight casing
  - Easy to configure using a PC on a series or USB port
  - Robust power amp with ample dimensions
  - Inputs protected against overvoltage

## Main features

- **Type 1 (FATDMA):** Transmitter in the 160MHz band: configured according to the frequency dedicated locally to AtoN
- **Type 3 (RATDMA):** Transmitter-receiver: completely autonomous; without intervention, it can select the time slot in which it will transmit

**Kanaton** enables to send the following messages:

### Message 21: Identification of the Aid to Navigation

- MMSI identification
- Type
- Name
- Position
- Longitude, latitude
- Dimension
- OFF position indicator (off-position buoy)
- Status, etc.
- Signalling light on off indicators

### Message 8: Meteorological and hydrological messages

**Kanaton** allows meteorological and hydrological messages to be transmitted, that can be configured according to the user's needs. These messages are received by the RS422 link according to a NMEA standard protocol.

### Message 6 : Tele-monitoring of the ATON

The message enables to send binary technical information from the ATON according to programming adapted to the user's needs.

It is possible to programme up to 4 virtual or synthetic ATONs

### Type 3 only:

Message 12 : relaying of safety messages transmitted by a SART

Message 14 : transmission of safety messages

The **Kanaton** transponder comprises VHF and GPS antennae, the different connection cables and their connectors as well as the hardware and software tools necessary for their configuration, testing and maintenance.

All the elements are integrated into a sealed casing (except for the VHF antenna) which can be mounted directly on the exterior.

**BSH certification.**

## TECHNICAL SPECIFICATIONS

Operating temperature:	-20 to -60° C
Polarity inversion protection:	Yes
Operating voltage:	10 to 36 V
Operating current:	<1 mA in sleep <50 mA in operation <2.5 A in transmission

Consumption	
(message 21 every 3 min) type 1:	<0.20AH / day
(message 21 every 3 min) type 3:	<1AH/day
GPS receiver:	GPS L1 C/A-code, SPS 12 channels

### Acquisition time:

- Cold start: 36 s
- Hot start: 4 s

### Sensitivity:

- In acquisition (cold): -141 dBm
- In acquisition (hot, warm): -149 dBm
- In tracking: -156 dBm

Supports WAAS/EGNOS

VHF antenna connector:	N female
Power connector /input output:	Amphénol C16-1
AIS frequency:	AIS1 161.975 MHz AIS2 162.025 MHz
Power:	2W or 12,5 W
Transmission mode:	FATDMA (RATDMA)

### Inputs/outputs:

4 inputs insulated by optocouplers (to read data relating to light faults, lights on and Racon fault information)

### Characteristics:

- Insulation voltage 5300Vrms
- Protection voltage 16V 600W for 1 ms
- Operating voltage 16V to 3,3V

1 output per solid-state relay  
(for Racon disable remote control)

### Characteristics:

- Insulation voltage 5300Vrms
- Max current 200mA at max 16Vx
- Ron resistance < 150 Ohms

### Communication ports:

- TX and RX in RS232 for configuration and reception of technical data
- RX in RS422 for reception of meteorological data

### Power on indicator:

- By tri-colour led (green/yellow/red)

Dimensions:	diameter 165 mm – height 135 mm
Weight	1.1 kg
Casing material:	ASA plastic
Casing colour:	white
Sealing:	IP67

### Accessories:

- 1 VHF antenna
- 2 x 7 strand shielded cables fitted with Amphénol C16-1 connector, length 5 m
- 1 RG213 coaxial cable fitted with an N male connector, length 5 m

# VigieAtoN

## AIS transponder Automatic Supervision System

VigieAtoN is a remote tele-monitoring centre for all systems equipped with AIS transponders (Aids to Navigation AtoN, instrumented measuring buoys, offshore structures).

VigieAtoN allows you to receive all messages from AtoN transponders on a continuous basis. The authorities are informed of the operating status of each transponder in real time. Each message transmitted is checked against the data in a repository so as to detect any malfunctions. When the message is received, Vigie Aton updates the display on the map and on the associated lists.

The monitoring personnel is warned in real time (by SMS, e-mail or fax) of any buoys moving off position, light malfunctions, etc.

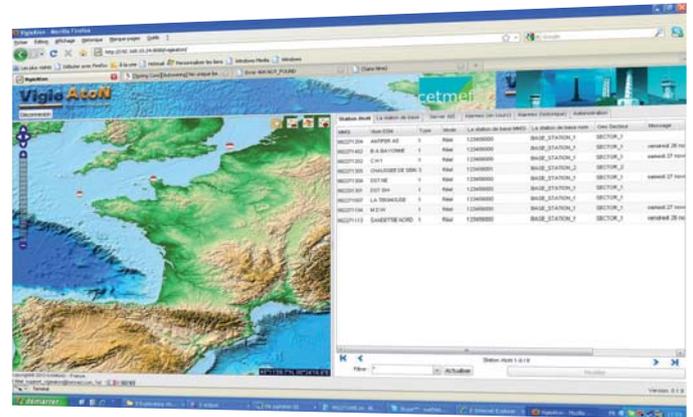
The situation is accessible via an internet browser, and it is not necessary to install any special software. Every user is identified and can only carry out authorised actions. The communications are encrypted in order to ensure the confidentiality and integrity of the data.

VigieAton enables to divide the whole situation into geographical and administrative sub-zones which each give access only to the equipment present in the zone. This enables to adapt the display to the administrative organisation.

VigieAtoN has a very flexible software design which allows to develop specific solutions very quickly.

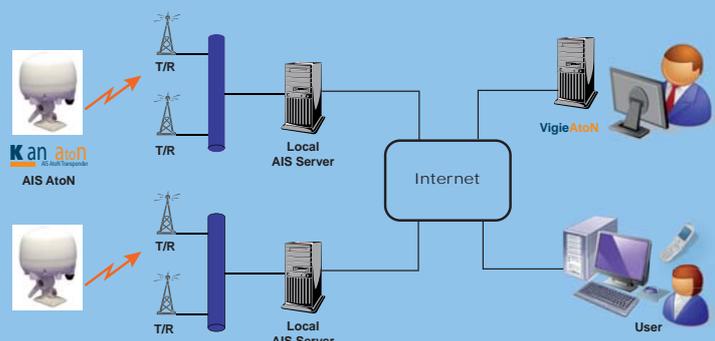
- Web2 application
- Board server
- Database server
- Language: Java, javascript (GWT)
- Linux or Microsoft platform
- Hot back-up/Cold back-up both possible
- Daily data update

Complies with IALA recommendation A-126



### Features

- Display of the position of the transponders in real time on an interactive map
- Check the AtoN status message:
  - Off-position indicator (buoy off-position)
  - Correct operation of the transponder
  - Indications of operation or not of the signalling lights
- Correct operation of the Racon
- Processing and saving of message 6 (technical data) and message 8 (meteorological and hydrological data) transmissions
- Creates an automatic alert when a buoy moves off position
- Enables you to monitor the drift of the AtoN after the buoy has moved off position
- Gives rapid notifications of faults and facilitates preventive maintenance
- Takes account of virtual or synthetic AtoNs
- Display of the ships in the AtoN zone
- Manages the status of the transponders (on zone, undergoing maintenance, etc.)



## ComAtoN Interface Board



### INTERFACE BOARD

To acquire the data from the AtoN, an interface that collects and formats the messages is required. The interface board facilitates connection of the AtoN's various equipment (solar panel, battery, charger, hydro-meteorological sensor, etc.) to the AIS transponder.

The interface board makes the connections required and formats the messages for transmission (message 6, 8 and 21).

It is also possible to transmit controls to the AtoN so as to remotely control the onboard equipment, via the interface board.

The AIS Interface board carries out the following functions:

- Collects data regarding the status of the AtoN and transmits it to the AIS transponder.
- Collects hydro-meteorological data and transmits it to the AIS transponder.
- Positions the remote controls received on the AtoN equipment.
- The AIS interface board integrates easily into the light and buoy equipment by connecting to the series interfaces on AIS KanAtoN transponders 1 or 3.
- The AIS interface board is implemented by means of the same configuration software as the KannAtoN transponders 1 or 3.
- The AIS interface board is completely supported by the supervision software Vigie-AtoN. The processing of data relating to the status of the AtoN is carried out by VigieAtoN which generates alarms in the event of variations in the values transmitted. VigieAtoN can be configured with variable timing and thresholds, so as to be adaptable to different types equipment that is to be tele-monitored.

### EXTERNAL INTERFACE

The AIS interface board is connected to the following elements:

- Two AIS transponders; with redundant configuration
- The RACON
- The AtoN lights
- The hydro-meteorological sensors
- The AtoN power supply
- External LED status lights
- Different types of equipment on the AtoN

### INTERFACES WITH THE AIS TRANSPONDERS INTERFACE BOARD

The AIS interface board exchanges the following data with the AIS transponders:

- The technical data acquired by the Board from the AtoN equipment is transmitted by the AIS transponders in message 6 and message 21.
- The transponders status signals; including the AtoN moving off-position data detected by the transponders; which enable the interface board to secure the AtoN equipment (the RACON for example).
- The VDM message received by the AIS Transponders for remote control of the AtoN equipment.
- The hydro-meteorological messages acquired by the AtoN's sensors which will be transmitted to the ships by the AIS Transponders (message 8).

### INTERFACES WITH THE AtoN EQUIPMENT

- The interface board has 2 analogue inputs, 8 logic inputs and 4 logic outputs.
- The interface board builds message 6 according to the format defined in recommendation A-126 edition 1.4 and adopted by several European authorities.



### CURRENT SENSOR

The current sensor is an isolated sensor to measure the light current. Associated to the interface board the current sensor is used to detect automatically the light on/off status and transmit this information in the message 21.



### OPTO SENSOR

The opto sensor is an isolated sensor to measure the light activity. Associated to the interface board the opto sensor is used to detect automatically the light on/off status and transmit this information in the message 21.

## Navigation Aids remote monitoring/remote control system using AIS technology

The purpose of the system will be to inform the departments responsible for operating the navigation aid system about operating errors (breaks or damage) that may occur on Navigation Aids, diagnose the damage and malfunctions and, if necessary, put emergency equipment into operation. It will also enable remote control of starting or stopping of equipment installed on the Navigation Aids.



### The technological solution rolled-out

The solution proposed by McMurdo Marine Systems will put the AIS standard into application, in particular the functionalities provided by addressed binary messages. Messages 21 and 6 will be used to exchange remote monitoring data between the Navigation Aids and the shore.

- The system will be made up of KANNAtoN3 AIS transponders that will provide remote monitoring and remote control of navigation aids in VHF. The acquisition of the operating parameters and the application of the remote control will be performed via a COMAtN interface board. A network of Shore Stations, connected in a network to a server, will act as an interface between the shore and the sea for the reception of the remote monitoring messages and transmission of the remote controls. For these stations, McMurdo Marine Systems has created a new low-cost design of AIS shore stations (Transmission/Reception stations).
- The use of the AIS technology for remote monitoring of navigation aids also allows important savings as compared to GSM solutions, because there are no additional communication costs.
- The system will operate using a Web application placed on a server that will receive the AIS messages collected on shore.