

QK-AS07-N2K Manual

NMEA 2000 GPS and Heading sensor

With optional NMEA 0183 output



Designed in UK



AS07-N2K Features

- NMEA 2000 'plug and play' instant network connection (no configuration required)
- Support GPS, Glonass and Galileo GNSS
- 3-Axis Magneto resistive Sensor
- 1Hz position and heading update rate as default setting
- Enables 3° Compass Heading Accuracy
- Calibratable to compensate for magnetic deviation caused by ferrous metals and other electromagnetic fields (very rarely required, only provide this function to the authorized distributors)
- Low (<100mA) power consumption at 12V DC
- IPX6 waterproof enclosure

PLEASE NOTE:

AS07-N2K models from 15th May 2021 onwards, include the heading functionality. Previous models include positioning data only.

Additional Features with Optional Output Switch - AS07-C (add-on purchase)

- Configurable 1-10 Hz rapid position update rate, through the Windows Configuration tool
- Configurable filtering of data output protocols, through the Windows Configuration tool
- NMEA 0183 compatible (NMEA 0183 RS-422)
- Default NMEA 0183 baud rate set to 4800bps
- Configurable baud rates (4800 / 9600 / 38400 / 115200 bps) through the Windows Configuration tool
- Calibratable to compensate for magnetic deviation (very rarely required)

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1. Introduction

1.1. The AS07-N2K

The AS07-N2K contains two integrated sensors within the single unit

- a multiple GNSS positioning sensor and
- a three-axis magnetic compass.

The AS07-0183 can be used out of the box and features superior sensitivity for consistent signal acquisition, reliable position accuracy, and accurate speed and course-over-ground readings. The AS07-N2K is designed for marine environments and suitable for other outdoor and vehicular use, with an IPX6 waterproof housing. Additionally, from may 2021 onwards it also features heading information.

The AS07-N2K can be connect directly to the NMEA 2000 backbone. It is powered by the NMEA 2000 backbone with no need for additional configuration.

1.2. The AS07-C (optional purchase)

The AS07-N2K can be used out of the box, to provide instant positional and heading data to your NMEA 2000 bus.

Alternatively, the AS07-N2K can be used with the AS07-C Optional Output Switch. The AS07-C provides additional Configuration/Conversion, specifically:

1. Optional additional configuration using Windows PC,
 - Filtering of desired NMEA 2000 PGN messages, to eliminate unwanted data.
 - Adjusting the frequency of NMEA 2000 data (1/2/5/10 per second).
 - Calibratable to compensate for magnetic deviation(very rarely required)
2. Backward compatibility with NMEA 0183 devices.

1.3. GPS, Glonass and Galileo GNSS

The AS07-N2K receives and process messages from GPS, Galileo and Glonass positioning satellites. GPS, Galileo and Glonass are all space-satellite based navigation systems, also known as Global Navigation Satellite Systems (GNSS).

- **GPS** (Global Positioning System), was created by the US government and operated by the US Space Force.
- **GLONASS** provides a comparable alternative to GPS. It was created by Russia.
- **GALILEO** was created by the EU through the European GNSS Agency.

Global Navigation Satellite Systems work by triangulating data from several satellites. At least three satellites from a system must be accessible/in range to triangulate a location fix.

By accessing more than one GNSS, the AS07-N2K:

- increases location accuracy
- maximizes reliability in the event one system/satellite is out of range or inaccessible.

1.4. Compass Heading

The AS07-N2K is actually two sensors in a single unit; a multiple GNSS positioning sensor and a three-axis magnetic compass. Simply connect it to the NMEA 2000 backbone and it will immediately start calculating the heading of the boat and outputting this data. You can filter out this message type if not required (using the Windows Configuration tool with AS07-C).

2. Installation

2.1. Dimensions, Mounting and Location

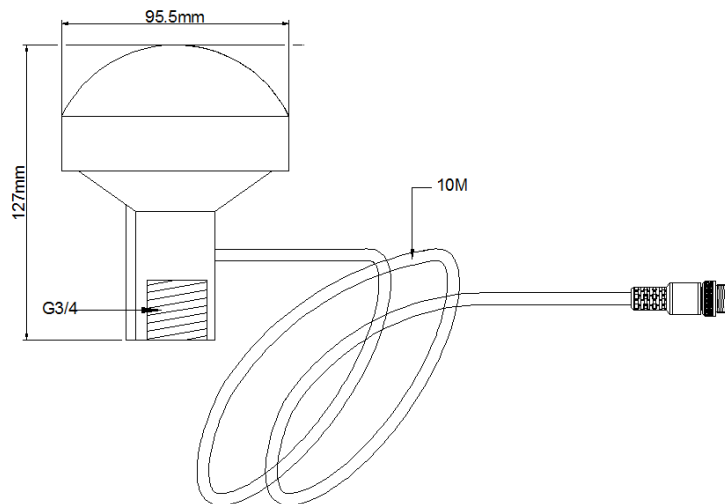
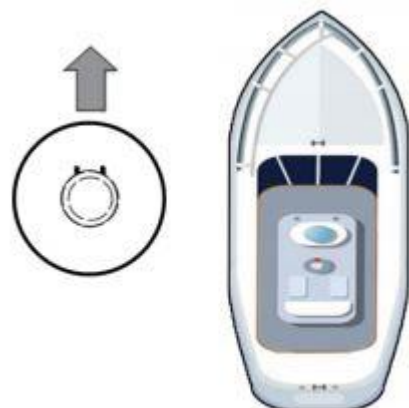


Figure 1 AS07-N2K Dimensions

AS07-N2K is designed to be securely positioned in an outdoor environment. The AS07-N2K should be mounted to a strong and sturdy location. The AS07-N2K has a standard G 3/4 screw thread and can be installed using the corresponding antenna base (included) or a G ¾ Base of your choice.

Mount the AS07-N2K in a:

- **Sturdy outdoor location**, with 'line of sight' to the sky
- **As close to the vehicle/boat's center of gravity as possible.** Avoid mounting too high up, to ensure a more accurate compass reading
- **Minimum 0.3 meter from other compasses** (standard and steering)
- **Minimum 2 meters from a VHF antenna**
- **Ensure the mounting location will not disrupt moving equipment** (eg. Radar)
- **Do NOT install near ferrous metals** or anything that can create a magnetic field such as: magnetized materials, electric motors, electronic equipment, engines, generators, power/ignition cables, and batteries.
- **Do not install within a steel/ magnetic container**, including not within the hull of a steel boat/vehicle
- **With the correct orientation.** AS07-N2K has two raised lines on the tube, the center point of these should be pointed straight forward, towards the front of the boat, as illustrated.
- If this is not possible, you can configure this adjustment to +90 to -90 degrees using the Windows configuration tool. (See the Configuration chapter for more details)



3. Connections

The AS07-N2K sensor has the following connections.

- **NMEA 2000 port.** The AS07-N2K is powered by the NMEA 2000 bus and sends positional and heading data (PGN messages) through the NMEA 2000 bus, to be available to all connected devices.
- **G 3/4 thread** for connection to chosen base.

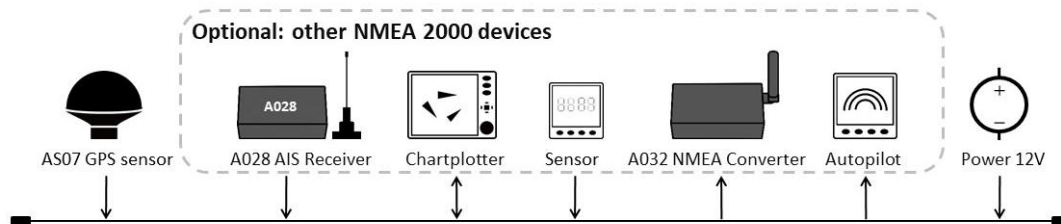


Figure 2: Typical system connection

3.1. NMEA 2000 - Connecting to the NMEA 2000 network

The AS07-N2K sends positional and heading PGN messages, through the NMEA 2000 bus, to be available to all connected devices.

The AS07-N2K is pre-fitted with a five-core screened cable for the NMEA 2000 connection, fitted with a male micro-fit connector. Simply connect the cable to the network backbone using a T-piece connector. It will work immediately once connected to a powered NMEA 2000 bus.



Figure 3: 5 Pin NMEA 2000 male micro-fit connection

NMEA 2000 is a serial data network operating at 250 Kbit/second utilizing the Controller Area Network (CAN). The NMEA 2000 network allows multiple electronic devices to be connected together on a common channel for the purpose of easily sharing information. Because it is a network, and because multiple devices can transmit data, a comprehensive set of rules dictates the behavior of the network devices. The CAN automatically provides some of these rules for control of access to the network, packet transmission, and for error detection.

Similar to NMEA 0183, NMEA 2000 defines standard data formats and definitions, but in addition provides more extensive network management rules for identifying nodes on the network, sending commands to devices, and for requesting data. Besides the greater amount of control and integration provided, NMEA 2000 replaces with a single cable the wiring of up to 50 NMEA 0183 interconnections and can handle the data content of 50 to 100 NMEA 0183 data streams.

4. AS07-C: Using the Optional Output Switch

The AS07-N2K is designed to be used out of the box, for instant positional data to your NMEA 2000 bus.

Alternatively, the AS07-N2K can be used with the AS07-C (optional purchase) for,

1. Additional configuration using Windows PC,

- Filtering of NMEA 2000 PGN messages, to eliminate unwanted data.
 - Adjusting the frequency of NMEA 2000 data. The default setting is 1 Hz (data transferred once per second) The frequency can be set to 1/2/5/10 per second. 1Hz is the default setting and is generally recommended. Please note: 10 Hz may cause data overflow on the NMEA 2000 system.
 - Calibratable to compensate for magnetic deviation (very rarely required)
2. Backward compatibility with NMEA 0183 devices.

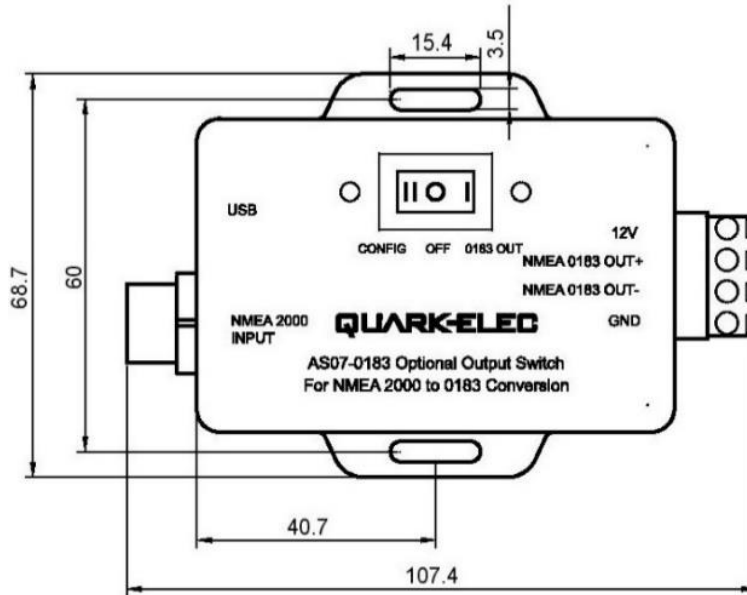


Figure 4 AS07-C Dimensions

4.1. AS07-C Connections

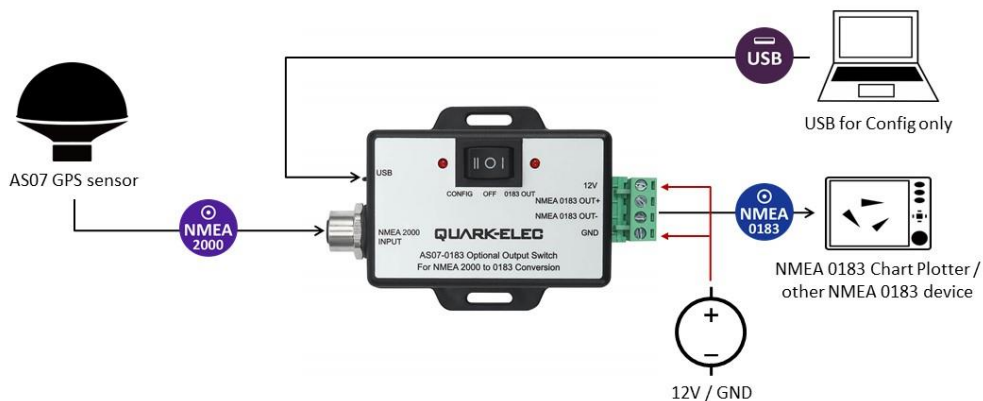


Figure 5: AS07-C Connections

When used with the AS07-C, instead of a NMEA 2000 connection, the AS07-N2K with the AS07-C can have the following connections:

- **Power:** 12V and GND terminals need to be connected.
- **USB:** A type B micro-USB connection allows for connection to a PC. This connection is used to adjust optional additional settings (see Configuration section).

- **NMEA 0183 output:** AS07-N2K sends out the GNSS messages via the NMEA 0183-RS422 output at a baud rate of 4800bps as default (Baud rates can be adjusted, see configuration section).

4.2. Connecting AS07-C via USB for Windows Configuration

The AS07-C is supplied with a USB connector. The USB cable can be linked directly to a USB port on a PC.

4.2.1. Will you need a driver to connect via USB?

To enable the USB data connection of the AS07-N2K, related hardware drivers may be needed dependent on your system requirements.

Mac:

No driver required. For Mac OS X, the AS07-N2K will be recognized and shown as a USB modem. The ID can be checked with the following steps:

1. Plug the AS07-N2K into a USB port and launch Terminal.app
2. Type: `ls /dev/*sub*`
3. The Mac system will return a list of USB devices. AS07-N2K will display as -
“/dev/tty.usbmodemXYZ” where XYZ is a number. Nothing further needs to be done if it is listed.

Windows 7,8,10:

The drivers usually install automatically if your device is running an original Windows 10 version. A new COM port will automatically show up in the device manager once powered and connected via USB.

The AS07-N2K registers itself to the computer as a virtual serial com port. If the driver does not install automatically, it can be found on the included CD and downloaded from www.quark-elec.com.

4.2.2. Checking the USB COM Port (Windows)

After the driver is installed (if needed), run the Device Manager and check the **COM (port) number**. The port number is the number assigned to an input device. These can be generated randomly by your computer). The Configuration software will require a COM port number in order to access the data.

The port number can be found in Windows ‘Control Panel>System>Device Manager’ under ‘Ports (COM & LPT)’. Find something similar to ‘STMicroelectronics Virtual Com Port’ in the list for the USB port. If the port number need to be changed for some reason, double click the AS07-N2K and select the ‘Port Settings’ tab. Click the ‘Advanced’ button and change the port number to the one required.

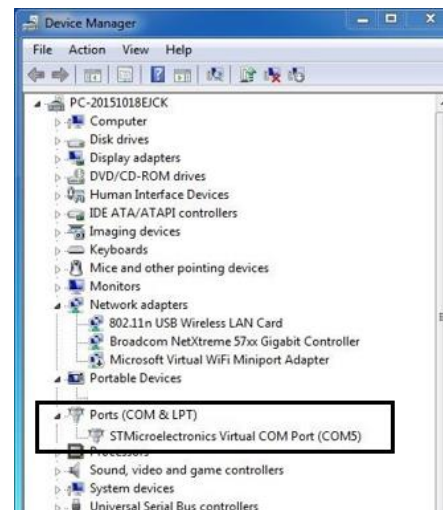


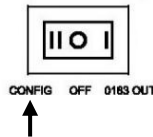
Figure 6: View of COM port in Device Manager

4.3. The Configuration tool (Windows PC)

The free Configuration software is on the CD provided and is downloadable from www.quark-elec.com.

4.3.1. Optional NMEA 2000 configuration

- The configuration tool must be used with a windows PC via USB cable.
 - The configuration tool must not be opened while other programs are using the AS07-N2K.
1. Disconnect AS07-N2K from the backbone
 2. Connect AS07-N2K to AS07-C (through NMEA 2000 connector), **switch AS07-C to 'Config'**



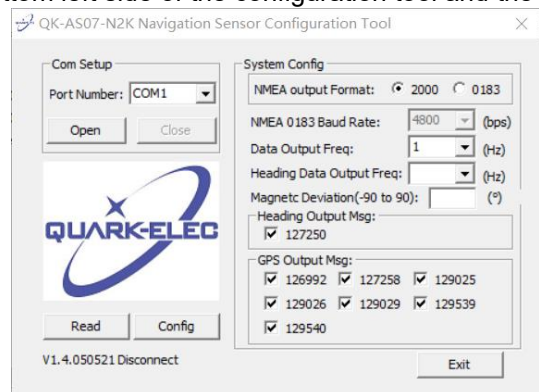
3. AS07-C must be powered through 12V power. Connect 12V and GND
4. Connect to a Windows computer via USB. (Once any necessary drivers have been installed, AS07-N2K will be shown as a virtual com in device manager.)
5. Open the Configuration tool
6. Select your COM port number
7. Click **'Open'**. Now, 'Connected' will show on the bottom left side of the configuration tool and the Configuration tool is read to be used
8. Click **'Read'** to read the device's current settings.
9. **Configuring NMEA 2000 settings**

- Select **'2000'** in System Config

Data Output frequency is set to transmit at 1Hz (1 time per second) as default. This can be set to 1/2/5/10 times per second

1Hz is the default setting and is generally recommended. Please note: 10 Hz may cause data overflow on the NMEA 2000 system

- Output messages are set to transmit all data types as a default setting. However, the AS07-N2K has an internal filter, so the user can remove unwanted PGN message types



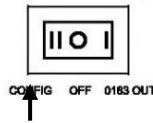
10. Click **'Config'**. After a few seconds your settings will now be saved and you can close the Configuration tool
11. Click **'Close'** under Com Setup, and click **'Exit'**
12. Disconnect AS07-C from PC
13. Remove AS07-C power supply
14. **To return to NMEA 2000 use, disconnect from the AS07-C, and reconnect the AS07-N2K to the NMEA 2000 bus**

4.3.2. Configuring the AS07-N2K for backward compatibility with NMEA 0183 devices

- The configuration tool must be used when plugged into a windows PC via USB cable.
- The configuration tool must not be opened while other programs are using the AS07.

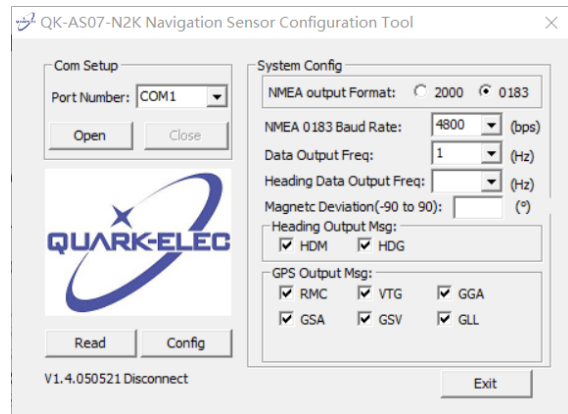
1. Disconnect AS07-N2K from the backbone

2. Connect AS07-N2K to AS07-C (through NMEA 2000 connector), **switch AS07-C to 'Config'**



3. AS07-C must to be powered through 12V power. Connect 12V and GND
4. Connect to a Windows computer via USB. (Once any necessary drivers have been installed, AS07-N2K will be shown as a virtual com in device manager.)
5. Open the Configuration tool
6. Select your COM port number
7. Click **'Open'**. Now, 'Connected' will show on the bottom left side of the configuration tool and the Configuration tool is read to be used
8. Click **'Read'** to read the device's current settings
9. Configuring NMEA 0183 settings

- Select **'0183'** in System Config
- **NMEA 0183 Baud Rates:** 'Baud rates' refer to the data transfer speed. AS07's output port's default baud rate is 4800bps, however, the baud rate is configurable if required.
- When connecting two NMEA 0183 devices, both devices' baud rates, must be set to the same speed. Select the baud rate to match your chart plotter or connecting device.
- **Data Output frequency** is set to transmit at 1Hz (1 time per second) as default. This can be set to 1/2/5/10 times per second.

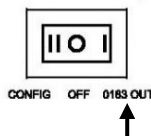


1Hz is the default setting and is generally recommended. Please note: 10 Hz may cause data overflow on the NMEA 0183 device.

- **Output messages** are set to transmit all data types as a default setting. However, the AS07-N2K has an internal filter, so the user can remove unwanted NMEA 0183 message types.

Simply, untick the boxes for any unwanted message types, to disable the output of that message type. (see table ['Data Output Protocols'](#) for data definitions).

10. Click **'Config'**. Your setting will now be saved and you can close the Configuration tool
11. Click **'Close'** under Com Setup, and click **'Exit'**
12. Disconnect AS07-C from PC
13. Remove AS07-C power supply
14. **If you've configured the settings for NMEA 0183 use, now switch AS07-C to '0183 OUT' and connect to NMEA 0183 equipment.**



4.4. NMEA 0183 wiring - RS422 or RS232?

AS07-N2K uses the NMEA 0183-RS422 protocol (differential signal), however some chart plotters or devices may use the older NMEA 0183-RS232 protocol (single-ended signal).

Check which protocol your connecting NMEA devices (e.g. Chart plotter) uses. If you are unsure whether your connecting NMEA 0183 device uses NMEA 0183 RS422 or RS232, the input/output connections on the device will give you some indication. Unfortunately, manufacturers who use the older RS232 protocol are not consistent in their product labelling. The following table may help you identify which protocol your product uses, however always check the manual to be certain. If your connecting device uses the older RS232 protocol, use a QK-AS03 Protocol Bridge. The QK-AS03 connects and converts RS422 to the older RS232 and visa-versa, through a simple connection, no configuration needed.

RS422 (Differential)	RS232 (single-ended)
TX+ and TX- / RX+ and RX- <ul style="list-style-type: none"> Swap two wires if not work. 	TX+ and TX- (GND) / RX+ and RX- (GND)
	TXa+ and TXa- (GND) / RXa+ and RXa- (GND)
	Output +Ve and -Ve / Input +Ve and -Ve
	Occasionally older NMEA 0183 RS232 devices are labelled like RS422 (TX+ and TX- / RX+ and RX-) so check the products' manuals.

5. Data Output Protocols

	NMEA 2000 output	NMEA 0183 output
Wire connection	NMEA 2000 five-core screened cable (12V, GND, CAN_H, CAN_L, Shield)	4 wires: 12V, GND, NMEA Out+, NMEA Out-
Signal type	CAN bus	RS-422
Supported messages	127258 - Magnetic Variation 129025 - Position and Rapid Update 129026 - COG and SOG, Rapid Update 129029 - GNSS Position Data 129033 - Time and Date 129538 - GNSS Control Status 129539 - GNSS DOPs 129540 - GNSS Sats in View 127250 - Vessel Heading	\$xxGGA - GPS Fix Data \$xxGLL - Geographic Position Latitude and Longitude \$xxGSA - GNSS DOP and Active Satellites \$xxGSV - GNSS Satellites in View \$xxRMC - Recommended Minimum Specific GNSS Data \$xxVTG - Course Over Ground and Ground Speed \$xxZDA - Time and Date 'xx' above represents 'GP' if GPS, 'GL' if GLONASS and 'GA' if GALILEO \$xxHDG - Heading with Deviation & Variation \$xxHDM - Heading Magnetic

6. Specification

Item	Specification
Operating temperature	-5°C to +80°C
Storage temperature	-25°C to +85°C
AS07-N2K Power supply	12 VDC (via NMEA 2000 backbone)
AS07-N2K supply current	≤100mA
AS07-C Power supply	12-24VDC
AS07-C supply current	≤165mA (configuration mode); ≤105mA (NMEA 0183 output mode);
GPS Satellites Tracked	14-channel (maximum)
GPS Satellites Acquired	51-channel (maximum)
WAAS/EGNOS Satellites Tracked	Any available channel
GPS Position Accuracy	3m (10') with WAAS (95% of the time, SA off)
GPS-Fix Update Rate	Up to 10 times per second (user selectable)
Cold Start Acquisition	60 seconds
Compass accuracy (steady conditions)	+/- 3°
Compass accuracy(dynamic conditions)	+/- 5° (pitching and rolling up to 30°)
NMEA data format	NMEA 2000 (and NMEA 0183 with AS07-C)

7. Limited Warranty and Notices

Quark-elec warrants this product to be free from defects in materials and manufacture for two years from the date of purchase. Quark-elec will, at its sole discretion, repair or replace any components that fail in normal use. Such repairs or replacement will be made at no charge to the customer for parts and labour. The customer is, however, responsible for any transportation costs incurred in returning the unit to Quark-Elec. This warranty does not cover failures due to abuse, misuse, accident or unauthorized alteration or repairs. A returns number must be given before any unit is sent back for repair.

The above does not affect the statutory rights of the consumer.

8. Disclaimer

This product is designed to aid navigation and should be used to augment normal navigational procedures and practices. It is the user's responsibility to use this product prudently. Neither Quark-elec, nor their distributors or dealers accept responsibility or liability either to the products user or their estate for any accident, loss, injury or damage whatsoever arising out of the use or of liability to use this product.

Quark- products may be upgraded from time to time and future versions may therefore not correspond exactly with this manual. The manufacturer of this product disclaims any liability for consequences arising from omissions or inaccuracies in this manual and any other documentation provided with this product.

9. Document History

Issue	Date	Changes / Comments
1.0	02-04-2020	Initial release
	12-05-2021	

10. For more info...

For more technical information and other enquiries, please go to the Quark-elec forum at:

<https://www.quark-elec.com/forum/>

For sales and purchasing information, please email us: info@quark-elec.com



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