QUARK-ELEC

QK-AS07-0183 Manual

NMEA 0183 GPS and Heading sensor

Designed in UK

AS07-0183 Features

- 1Hz position and heading update rate (default and recommended setting)
- GPS and Heading can be set to different output frequency if desired (up to 10Hz rapid position update configurable)
- High accuracy GPS location sensor, supporting GPS, Glonass and Galileo
- 3-Axis Magneto resistive Sensor
- Enables 3° Compass Heading Accuracy (available after 1ST Jan 2021)
- Heading angle programmable to compensate for installations where the sensor heading marker is positioned off of the direct course heading. Sensor must still be located at the front tip of the vessel, but could be rotated up to +90° degrees or -90° degrees if necessary
- Calibratable to compensate for magnetic deviation caused by ferrous metals and other electro-magnetic fields (very rarely required,only provide this function to the authorized distributors)
- Multiple formats of NMEA data output filterable through Windows configuration tool if desired.
- Configurable baud rates (4800 / 9600 / 38400 / 115200 bps) through the Windows Configuration tool.

PLEASE NOTE:
AS07-0183 models from January 2021 onwards, include the heading functionality.
Previous models include positioning data only.

Contents

1. Introduction

1.1. The AS07-0183

The AS07-0183 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.

The QK-AS07 contains high-accuracy, GPS, Glonass, Galileo, GNSS positioning and a compass heading sensor for use in marine vessels, automotive, fleet vehicle, and other settings that require a highly accurate positioning receiver.

AS07-0183 features superior sensitivity for consistent signal acquisition, reliable position accuracy, compass heading, and accurate speed and course-over-ground readings. The AS07 is designed for marine environments and suitable for other outdoor and vehicular use, with an IPX6 waterproof housing.

The AS07-0183 can be used out of the box, to provide instant positional and heading data to NMEA 0183 devices.

It is powered by 12V-24V and can be connected directly to NMEA 0183 devices with RS232 or RS422 interfaces.

Alternatively, the AS07-0183 can be connected via a USB/RS232 adaptor to a Windows computer. This provides additional configurations:

- Filtering of desired NMEA 0183 sentences, to eliminate unwanted data

- Adjusting the frequency of NMEA 0183 output rate (1/2/5/10 per second)

- Adjusting the data output baud rate(4.8k,9.6k,38.4k,115.2k bps)
- Programming to compensate for an installation that is not aligned to boat bow / front of the vehicle.
- Calibratable to compensate for magnetic deviation caused by ferrous metals and other electro-magnetic fields. This is only very rarely needed as the AS07-0183 is pre-calibrated. Contact info@quark-elec.com for support if you believe you need to re-calibrate your AS07-0183.

1.2. GPS, Glonass and Galileo GNSS

The AS07-0183 receives and processes 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 AS07-0183:

- increases location accuracy and

- maximizes reliability in case one system is out of range or inaccessible.

1.3. Compass Heading

The AS07-0183 is actually two sensors in a single unit; a multiple GNSS positioning sensor and a three-axis magnetic compass. Simply connect it to a DC power supply and it will immediately start calculating the heading of the boat and outputting this data, both in HDM and HDG format NMEA 0183 sentences. You can filter out any message type if not required (using the Windows Configuration tool).
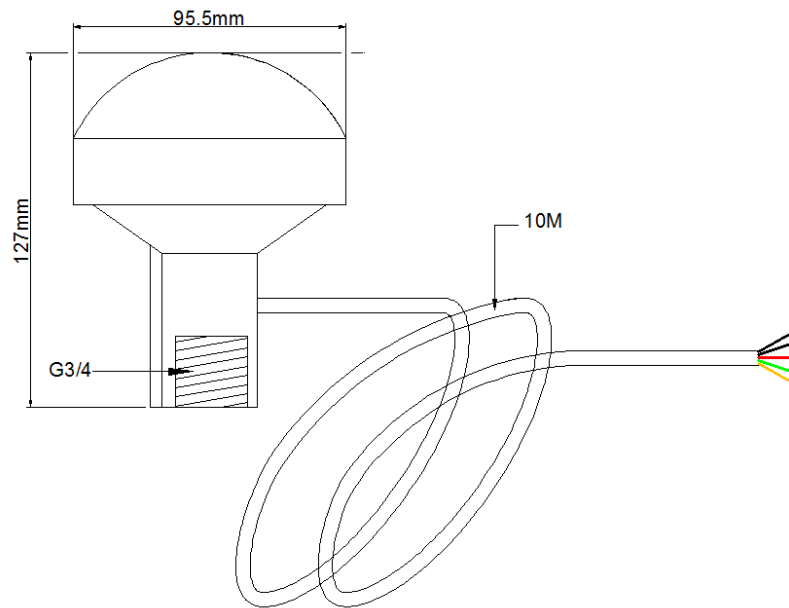
2. Dimensions, Mounting and Location

Figure 1: AS07-0183 Dimensions

The AS07-0183 has a standard G 3/4 screw thread. It is provided with a corresponding antenna base, or can be installed with a G ¾ base of your choice.

The AS07-0183 is designed to be securely positioned in an outdoor environment. The AS07-0183 should be mounted to a strong and sturdy location. It needs to be installed in an area that has full exposure to the sky. The effective area of reception is 5° above the horizon.

Mount the AS07-0183 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**. The AS07-0183 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)
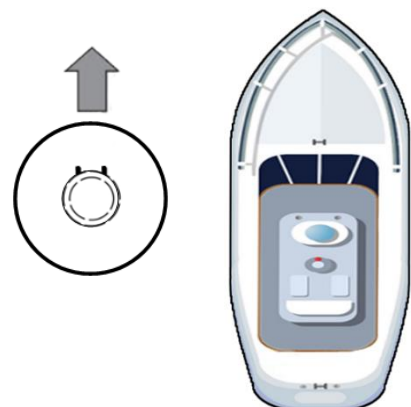
2.1. Direction

As stated above, the AS07-0183 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.

Pointed straight toward the front of the boat/ship
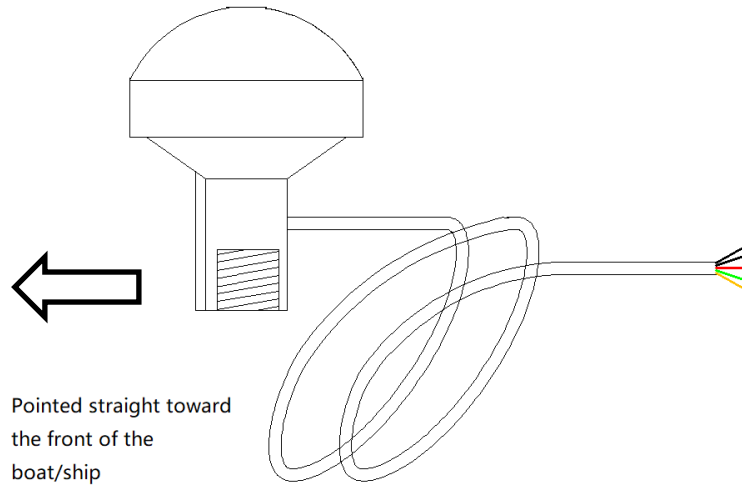
If this is not possible, you can configure this adjustment to +90 to –90 degrees using the Windows configuration tool. (See the full manual for more details)

3. Installation

The AS07-0183 is designed to be used out of the box, for instant positional and heading data to other NMEA 0183 device. The default baud rate has been set as 4800bps, at 1Hz updating frequency.
The two small bars on the sensor must be facing forward and parallel to the centerline of the vehicle/boat for accurate compass readings.

3.1. Connections
The AS07-0183 sensor has the following five wires. If the NMEA IN/ RS232 RX (yellow wire) isn't used, please connect it with GND(black, thin) wire.

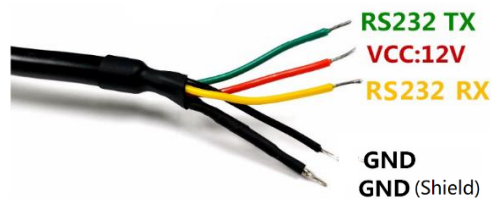| Wire	Function
Red	12V-24V POWER
Black (thin)	GND
Black (thick)	GND (shield)
Green	NMEA OUT / RS232 TX
Yellow	NMEA IN / RS232 RX

Figure 2: AS07-0183 Connection wires

3.2. Connecting to NMEA 0183 (RS232) devices

The AS07-0183 sends positional sentences, in the NMEA 0183-RS232 (single-ended) protocol.

For RS232 interface devices, these wires need to be connected.

	QK-AS07-0183 wire	Connection needed on RS232 device
NMEA 0183	Green: TX (NMEA OUT)	RX (NMEA IN)
	Black (thick): GND shield	GND (sometime called COM)
POWER	Black (thin): GND	GND (for Power)
	Red: Power	12V-24V Power

⚠ **TAKE CARE: There may be two GND connections on your connecting NMEA 0183-RS232 device. One is GND for the NMEA Connection, and one is GND for Power.**
Ensure you check the above table and your device's documentation carefully before connection.

3.3. Connecting to NMEA 0183 (RS422) devices

Although AS07-0183 sends out NMEA 0183 sentences via single end RS232 interface, it also supports RS422 (differential signal)
or RS232 interface devices, these wires need to be connected.

	QK-AS07-0183 wire	Connection needed on RS422 device
NMEA 0183	Green: TX (NMEA OUT)	NMEA IN- (sometimes called NMEA /B,or -Ve)
	Black (thick): GND shield	NMEA IN+ (sometimes called NMEA /A or +Ve)
POWER	Black (thin): GND	GND (for Power)
	Red: Power	12V-24V Power

The following is an example wire drawing for connection with an 0183 RS422 (in this case, the QK-A031 NMEA multiplexer)
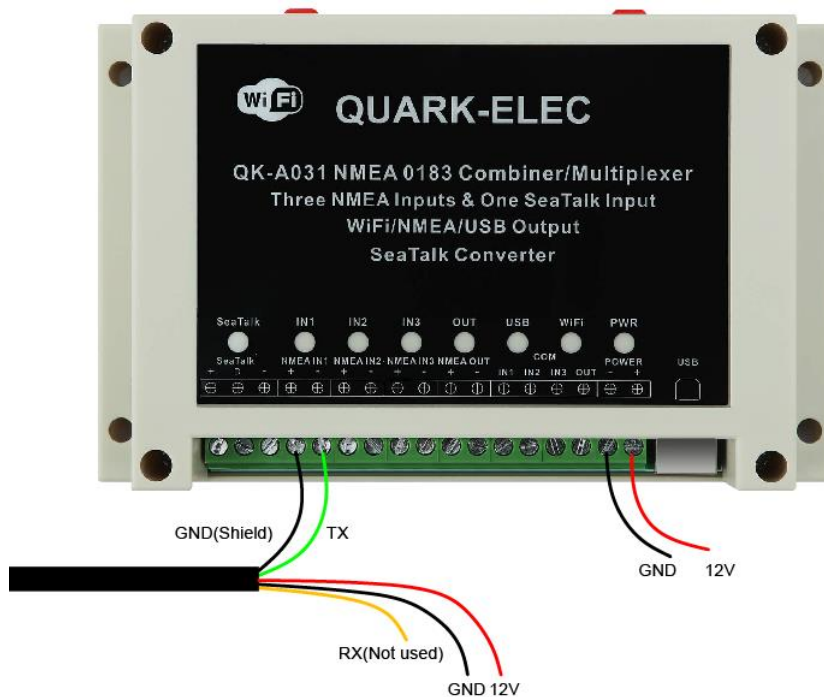

Figure 3: Connecting with RS422 (eg A031)

3.4. Connect Via USB to Windows Computer

The AS07-0183 is designed to be used out of the box.

Alternatively, The AS07-0183 can be connected via USB adaptor(optional) to a Windows PC for:

1. Accessing GPS data on a PC via the USB port.

2. Use the Configuration tool for:

    a. Filtering of NMEA 0183 output sentences, to eliminate unwanted data.

    b. Adjusting the data baud rate

    c. Adjusting data output frequency (data transferred once per second). The frequency of data transfer can be set to 1/2/5/10 per second. 1Hz is the default setting and is generally recommended. Please note: changing the setting to 10 Hz may cause data overflow in some devices.

Figure 4: RS232 to USB adaptor

These wires need to be connected to the USB adaptor and Power for successful USB connection work.

	QK-AS07-0183 wire	Connect to:
NMEA 0183	Green: TX (NMEA OUT)	USB adaptor - RX
	Yellow: RX (NMEA IN)	USB adaptor - TX
	Black (thick): GND shield	USB adaptor - GND
POWER	Black (thin): GND	GND (for Power)
	Red: Power	12V-24V (Power)

⚠ **TAKE CARE: There are two GND connections.**
One is GND for the NMEA Connection, and one is GND for Power.
Ensure you check the above table and your device's documentation carefully before connection.
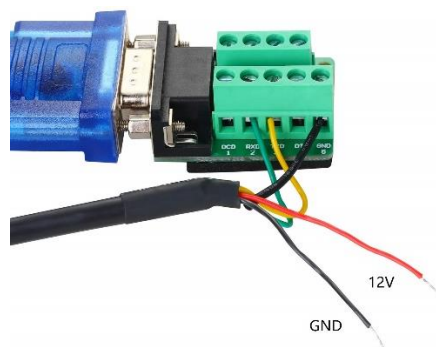
The device still requires power during USB connection.

Figure 5 AS07-0183 to USB adaptor

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

To enable the USB data connection of AS07-0183, related hardware drivers may be needed dependent on your system requirements. Please be noted, although AS07-0183 can be used on Mac and Linux system to output NMEA 0183 data via USB, the configuration tool can only be run on Windows based system.

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

1. Plug the AS07 into a USB port and launch Terminal.app.

2. Type: Is /dev/*sub*

3. The Mac system will return a list of USB devices. AS07 will display as - "/dev/tty.usbmodemXYZ" where XYZ is a number. Nothing further needs to be done if it is listed.

Linux:
No driver is required for Linux. When plugged into the computer, AS07-0183 will show up as a USB CDC device on /dev/ttyACM0.

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 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.

3.4.2. 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 AS07-0183 and select the 'Port Settings' tab. Click the 'Advanced' button and change the port number to the one required.
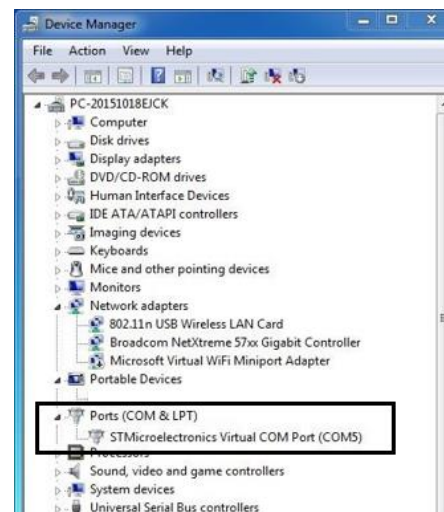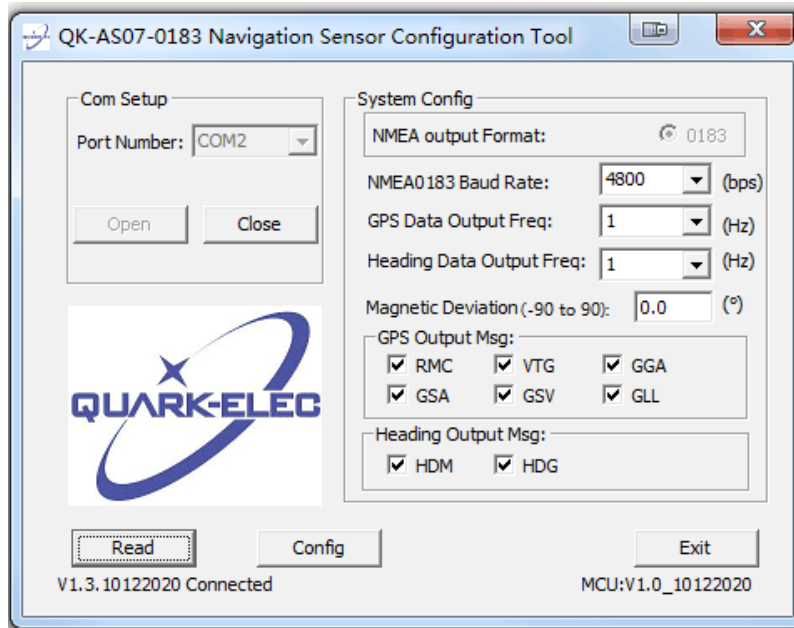

Figure 6: View of COM port in Device Manager

4. The Configuration tool (Windows PC)

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

1. Open the Configuration tool

2. Select your COM port number

3. Click '**Open**'. Now, 'Connected' will show on the bottom left side of the configuration tool and the Configuration tool is read to be used

4. Click '**Read**' to read the device's current settings

5. **Configure the settings as desired:**

    *   **NMEA 0183 Baud Rates**. 'Baud rates' refer to the data transfer speed. The AS07-0183's output port's default baud rate is 4800bps. However, the baud rate can be configured to 9600bps,38400bps,115200bps 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 in some devices.

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

6. Click '**Config**'. After a few seconds your settings will now be saved and you can close the Configuration tool.

7. Click '**Read**' to check the setting have saved correctly before clicking '**Exit**'.

8. Remove AS07-0183 power supply.

9. Disconnect AS07-0183 from PC.

10. **Re-power the AS07-0183 to activate the new settings.**

5. Data Output Sentences

The AS07-0183 support the following output NMEA sentences:
Positioning:
- $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

Heading:
- $IIHDM - Heading in degrees with respect to magnetic north. Pre-configured as the following format: $IIHDM,xx.x,M*yy, where xx.x is the compass heading, and yy is the checksum.

- $IIHDG - Heading in degrees with Deviation & Variation. Pre-configured as the following format: $IIHDG,xxx.x,,,,*yy, where xx.x is the compass heading, and yy is the checksum.

6. Specification

Item	Specification
Operating temperature	-5°C to +80°C
Storage temperature	-25°C to +85°C
AS07-0183 Power supply	12-24 VDC
AS07-0183 supply current	≤50mA
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 0183 (GGA,GLL,GSA,GSV,RMC,VTG,ZDA,HDM,HDG)
Certifications and Standards	CE, IPX6, RoHS

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	23-06-2020	Initial release
1.1	04-01-2021	Heading sensor added. Supports heading messages (HDG, HDM)
	05-05-2022	

For more information

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

QUARK-ELEC

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