A037 Engine Data Monitor & NMEA 2000 Converter

Manual

Designed in UK

Features

- Enable Analogue Signal Conversion to NMEA 2000 Messages
- Engine Data Monitoring and Tank Level Observation
- Pressure, Temperature, and Humidity Measurement
- RPM Tracking for Engine Speed
- Battery Status Check
- Alarm Status Observation
- Tilt/Trim and Rudder Position Observation
- Analogue Engine Gauge Data Conversion
- Compatibility with NMEA 2000 MFDs

Contents

1. Introduction

The A037 Engine Data Monitor & NMEA 2000 Converter is a state-of-the-art solution meticulously designed to enhance the monitoring capabilities of marine engines, ambient temperature and humidity. By utilizing the A037, users can ensure that their boat engines operate under optimal conditions, thereby extending their operational lifespan.

It converts RPM input and pulse signals as well as analogue gauge resistance and/or voltages into NMEA 2000. This conversion facilitates real-time monitoring through NMEA 2000 display devices, facilitating seamless information sharing across the network.

Configurable for both single and dual engine installations, the A037 offers extensive compatibility, supporting up to 4 tank level sensors, 5 voltage input sensors, and 5 resistance input sensors (suitable for rudder, tilt/trim, air temperature, coolant temperature and oil pressure sensors), along with battery shunts. Users can effortlessly monitor a diverse array of engine parameters on NMEA 2000 chart plotters.

Moreover, the A037 is compatible with popular digital sensors in the market, including PT1000(temperature), DS18B20 (temperature) and DHT11 (temperature and humidity), providing the user with multiple options to monitor the engine data and the environmental conditions.

Equipped with two alarm outputs and relay outputs, the A037 enhances user customisation and control. It provides configurable options to trigger relays or external alarms, empowering users with advanced monitoring and notification capabilities.

The A037 is equipped with a Type B USB port designed for configuration and calibration purpose. Simply connect it to a Windows based PC and you'll gain access to configure the device and calibrate the input parameters. Moreover, the USB port can also be used to update the firmware for additional features and improvements.

2. Mounting/ Installation

It is highly recommended that all the installation instructions are read before commencing the installation.
There are important warnings and notes throughout the manual that should be considered before installation is attempted. Incorrect installation may invalidate the warranty.

The A037 was meticulously engineered for application in light commercial, leisure and fishing boat and vessel monitoring markets. Although the A037 comes with conformal coating on the circuit board, the pinouts are open so seawater and dust has the potential to cause a short circuit. It should be securely fitted, avoiding direct exposure to water and areas where salt and dust may come into contact.

The following installation points should be checked before commencing the installation.

- **Cable disconnection.** Do not mount the A037 while the device is powered and disconnect any sensors, cables or NMEA 2000 drop cables before installation.
- **Avoid electronic compass interference.** Maintain a minimum distance of 0.5 meters from any electronic compass (such as Quark-elec AS08) and ensure that the connection cable remains separate from it.
- **Avoid proximity to antenna cables.** While there is no specific minimum distance requirement between the A037's connection cable and VHF or other antenna cables, it is advisable to maintain separation. Do not bundle them together in a single cowling.
- **Minimizing wire noise.** Avoid running noisy wires (such as those connected to ignition coils) adjacent to sensitive gauge or alarm wires as noise may be induced into these wires and this may result in inaccurate measurements.
- **Consider all connection cables.** All connections need to be considered and prepared before selecting a proper installation location.

2.1. Mounting Location

Select a flat location to mount the A037. Avoid mounting on uneven or contoured surfaces, as this could potentially fatigue the device casing.

Ensure that the A037 is mounted in a suitable location appropriately between the NMEA 2000 bus and the senders or gauges.

The A037 is compatible with both existing analogue gauges and standalone use.

2.1.1. For Use Without Analogue Gauges

When directly connecting the A037 to the sender for measurement (where analogue gauges are absent), follow these guidelines:

- Position the A037 close to the engine.
- Ensure that the cable length between the sender and the A037 typically does not exceed 2 meters.

2.1.2. For Parallel Use with Existing Gauges:

If the A037 is used alongside existing gauges to complement displayed information, consider the following:

- Mount the A037 near the gauges (instrument panel).
- Keep the cable length between the gauges and the A037 typically within 2 meters.

2.2. Case Dimensions

The A037 enclosure is made of IP56 insulation class 2 plastic. External dimensions are 150x85.5x35mm.

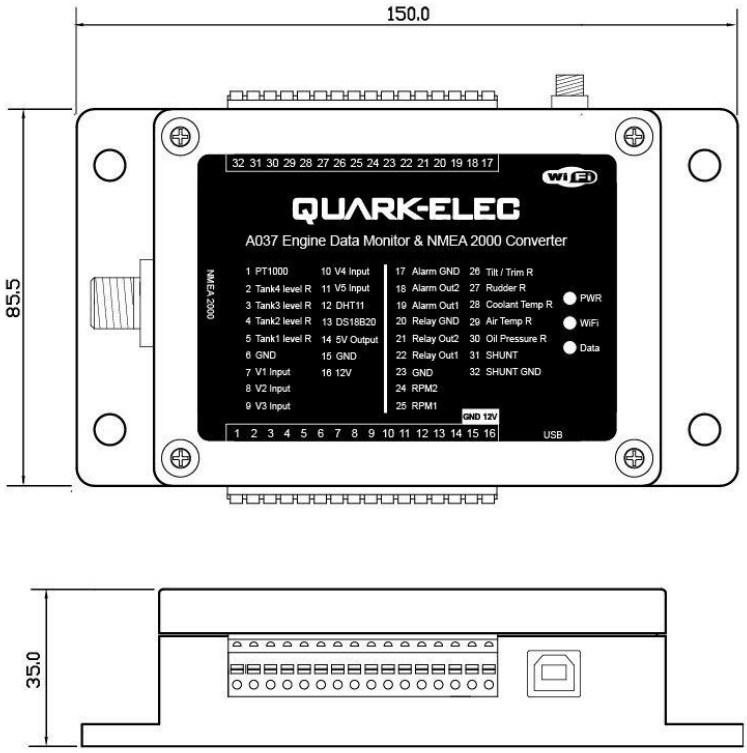

Figure 1: A037 Dimensions in mm

3. Connections

The following is an example of an A037 set up. This gives an idea of the connections that need to be made to install A037. All these connections must be taken into consideration when locating a suitable mounting location for the A037.

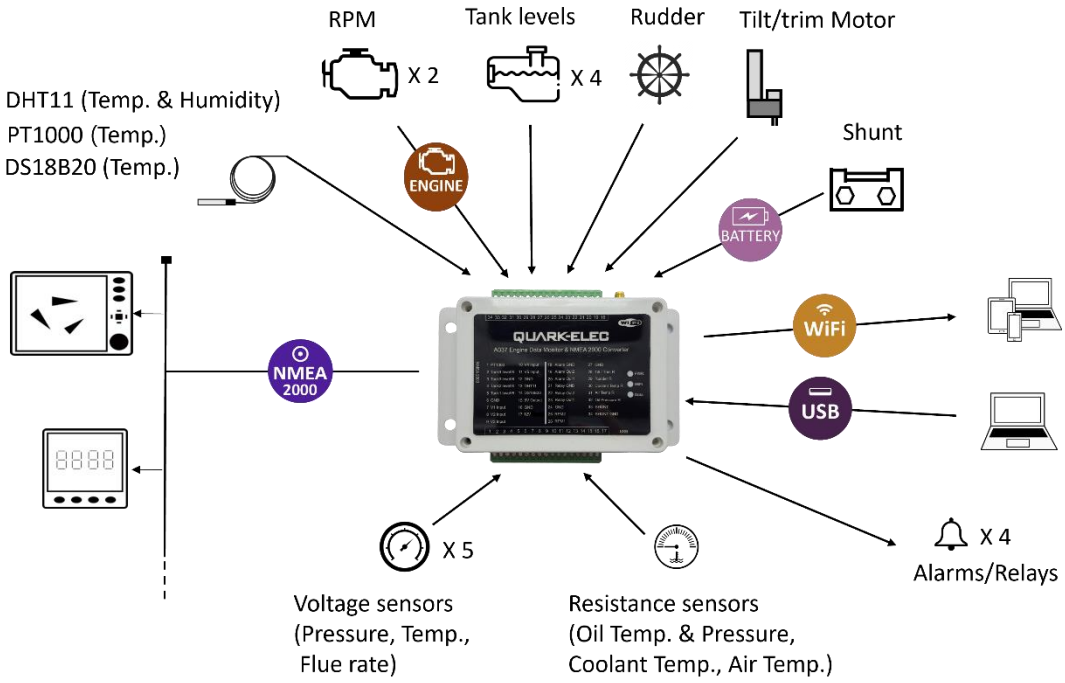

Figure 2 Typical system connections.

The A037 Engine Data Monitor & NMEA 2000 Converter has the following options for connection to inputs, outputs, and host devices.

3.1. Sensor Inputs

- **PT1000/PT100 input.** PT1000 is the most widely used RTD (Resistance Temperature Detector) sensor in many industries as well marine engines. RTD sensors are temperature sensors that operate based on the principle that the electrical resistance of certain materials changes predictably with temperature. PT1000 temperature sensors offer a superior solution for demanding temperature measurement applications where accuracy, stability, and reliability are paramount. The platinum-based construction, higher sensitivity, and wider temperature range make them indispensable tools in industries ranging from pharmaceuticals to aerospace. While PT1000 sensors come with certain challenges such as initial cost and calibration requirements, their benefits far outweigh the drawbacks in most scenarios.

  While PT1000 typically come with two wires, variants with three or four wires are also available. The additional wires are used to compensate for the resistance of the connecting wires themselves, minimizing errors in temperature measurement caused by wire resistance. For many marine applications, two wires of PT1000 are the preferred option. For many marine applications, the standard two-wire PT1000 is adequate. Consequently, this manual predominantly addresses the implementation of PT1000 sensors with two wires. However, the A037 also supports three and four-wire PT1000.

  Although most two-wire PT1000 sensors are not polarized. It's good practice to check the datasheet for accurate connection details. Establish a connection by attaching one lead to the A037's GND (either pinout 6 or 15) and the other lead to PT1000 (pinout 1).

  Performing calibration on the PT1000 sensor before using is an essential step to ensure optimal functionality. This calibration process can be executed through the configuration settings on a Windows computer. More details can be found from PT1000 Sensor Input Section.

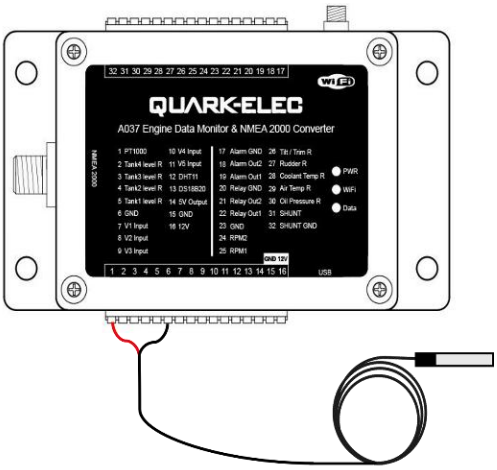

Figure 3 PT1000 wiring (two wires)

Similar to the PT1000, the PT100 is another widely used platinum RTD sensor, commonly employed across industrial, marine, and automotive applications. The wiring for the PT100 shares similarities with the PT1000 when connected to the A037 device.

- **DS18B20 Input.** The DS18B20 is a popular, pre-assembled waterproof temperature sensor with the sensing component enclosed at its tip, making it ideal for measuring temperatures in liquids or locations distant from the A037. Being a digital sensor, there is no concerns about signal degradation over extended distances, and there is no need for pre-calibration before use.

  The DS18B20 operates on a 5V power supply, achieved by connecting its VCC to the 5V pinout on A037 (Pinout 14) and GND to either Pinout 6,15 or 23 on A037. Additionally, the DS18B20 has a data wire responsible for transmitting temperature data to the A037. Connect the Data wire to the DS18B20 pinout on A037 (Pinout 13). Before powering up, thoroughly verify the VCC and GND connections to avoid potential permanent damage to the DS18B20. Once properly connected and powered up, the DS18B20 will operate seamlessly.

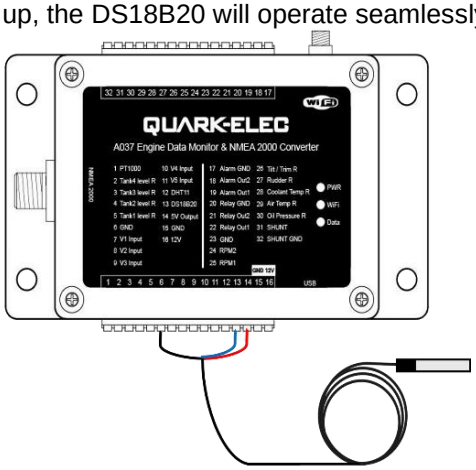

Figure 4 DS18B20 wiring

- **DHT11 Input.** Similar as DS18B20, DHT11 is a very common digital sensor, which output temperature and humidity data. It is an ideal device to detecting ambient/engine room temperature and humidity. DHT11 is pre-calibrated and ready for use. The single data wire interface makes the integration with the A037 quick and easy. Its small size, low power consumption and up to 20-meter signal transmission making it the best choice for use on boats.

  Same as DS18B20, The DHT11 operates on a 5V power supply, achieved by connecting its VCC to the 5V pinout on A037 (Pinout 14) and GND to either Pinout 6,15 or 23 on A037. Additionally, connect the Data wire to the DHT11 pinout on A037 (Pinout 12). Ensure to carefully review the connections before initiating the power-up process to prevent any possible permanent damage to the DHT11. Upon successful connection, the sensor will function smoothly.

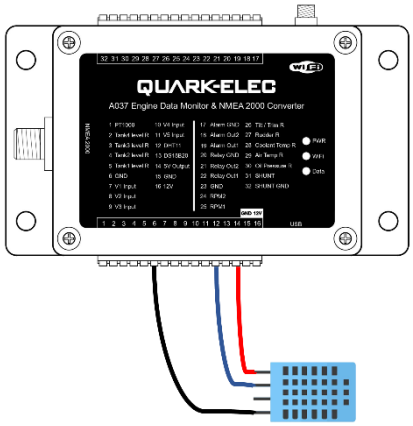

Figure 5 DHT11 wiring

- **Four Tank level inputs.** Resistive liquid tank level sensors are very commonly used to monitor the liquid level in boats water tanks. The A037 supports up to 4 tanks, which can be used to monitor fuel, fresh water, waste oil, live well and black water level. After connecting the sensors, the user will need to calibrate the sensor and setup the proper capacity value via the configuration tool.
- **Five Voltage inputs.** The A037 supports various voltage output sensors for engine and battery monitoring, capable of measuring parameters such as oil pressure, engine rotation rate, battery voltage, temperature and more. With five voltage channels, the device offers comprehensive calibration options, allowing users to create an 8-point calibration table or select a predefined industry-standard calibration table for the most common sensors and gauges.
- **Two RPM inputs.** Two RPM inputs can be assigned to Port and Starboard, whereas the analogue or pulse inputs can be independently assigned to both engines, as desired. RPM signals could come from different sources depending on the engine. They may come from an alternator output, the ignition coil, or pulse sender (diesel engines).
- **Tilt/ Trim input.** This resistive input can be connected to Tilt/trim sensor directly or the parallel with tilt/trim gauge to monitor the position of the engine position.
- **Rudder input.** Connect this input to rudder angle sensor to get the angle information. Prior to usage, users must calibrate the resistance data using the configuration tool.
- **Coolant Temp input.** This is a resistance input specified for temperature sensors, tailored for measuring coolant temperature with pre-configured settings available with the option to manually enter the values.
- **Air Temp input.** Similar to the Coolant Temp input, this is another resistance input channel specifically designed for air temperature sensors.
- **Oil Temp input.** Similar to the Coolant Temp input, this is the third resistance input channel specifically intended for oil temperature sensors. The input sensor data will automatically convert to the related PGNs, allowing it to be displayed on the multifunction displays (MFD).
- **Shunt input (battery status) input.** The shunt serves as a sensor for measuring the load or unload current in a battery. Connect this input in parallel with the shunt to monitor the battery status.

3.2. Alarm and Relay Output

- **Two Alarm and relay outputs.** Two relay outputs can be used to trigger warning devices, e.g. light, buzzer, alarm.

3.3. Communication Ports

- **WiFi port.** The A037 enables the users to input engine data via WiFi on a PC, tablet, or other WiFi-enabled device. The NMEA 2000 data is output via WiFi in PCDIN format. Please be noted that due to the nature of NMEA 2000 data, most engine data is not supported by NMEA 0183

format. In contrast, NMEA 2000, introduced after 2000, was designed with engine data support in mind, reflecting evolving industry needs.

- **USB port.** The A037 is equipped with a type-B USB connector and comes with a USB cable. This USB connector can be directly linked to a USB port on a PC. The USB port serves two main functions: configuration of the A037 and firmware updates. It's important to note that the converted sensor data is not transmitted via the USB port.

3.4. NMEA 2000 Port

The A037 Engine Data Monitor features an NMEA 2000 connection, enabling it to integrate seamlessly with an NMEA 2000 network on the boat. The A037 reads all available sensor data, converts the received data to NMEA 2000 PGNs, and outputs these PGNs to the NMEA 2000 network. This allows the data to be easily read and displayed by other devices such as chart plotters, MFDs, and instrument displays on the NMEA 2000 network.

When a related sensor is connected and properly configured, the A037 outputs the following PGNs:

NMEA 2000 PGN	HEX code	Function
127245	1F10D	Rudder Angle
127488	1F200	Engine Parameters, Rapid Update (RPM, Boost pressure, Tilt/trim)
127489	1F201	Engine Parameters, Dynamic (Oil pressure & Temperature, Engine Temperature, Alternator potential, Fuel rate, Coolant pressure, Fuel pressure)
127505	1F211	Fluid Level (Fresh Water, Fuel, Oil, Wastewater, Live well, Black water)
127508	1F214	Battery Status - Battery Current, voltage, case temperature
130312	1FD08	Temperature
130313	1FD09	Humidity
130314	1FD0A	Pressure

The A037 comes with an NMEA 2000 drop cable, facilitating its connection to the NMEA 2000 network. It's important to note that the A037 cannot be powered directly from the NMEA 2000 network. Instead, it must be powered through its 12V (Pinout 16) and GND (Pinout 15) pinouts using a 12V power supply.

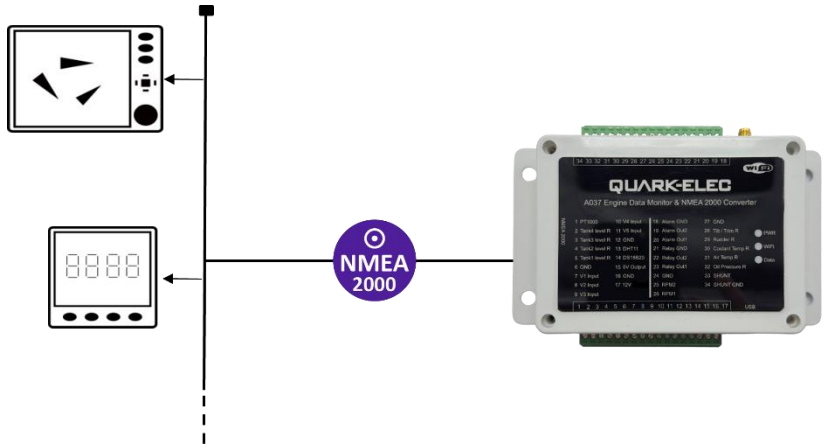

Figure 6 NMEA 2000 bus connection

3.5. Power

The A037 operates on 12V DC power source. Power (Pinout 16) and GND (Pinout 15) are clearly indicated. Both the power and ground connections are clearly marked. It is imperative to switch off the input power during the installation. The A037 incorporates reverse polarity protection to safeguard against potential damage from improper connections.

The A037 transforms analogue data from the engine into digital format through an advanced Analogue-to-Digital Converter (ADC). The accuracy and reliability of this conversion process are contingent upon a stable and low-noise power supply.

3.6. Status LEDs

The A037 is equipped with three LEDs that indicate power, WiFi and Data status respectively.

The status LEDs on the panel provide information about port activity and system status:

- **Data:** This LED flashes when any data is output to the NMEA 2000 bus.
- **WiFi:** The LED flashes for each valid NMEA message sent to the WiFi output.
- **PWR (Power)**: LED light is constantly lit in red when the device is powered.

Figure 7 LED indications

4. PT1000/PT100 Sensor Input

PT1000 is the most widely used RTD (Resistance Temperature Detector) sensors in many industries as well marine engines. The A037 features one PT1000 temperature sensor input.

Figure 8 PT1000 RTD Sensor Probe

Upon connecting the temperature sensor to the A037 for the first time, it's essential to use the windows-based configuration tool, which can be downloaded from our website, to configure the A037 to seamlessly work with the PT1000 sensor. This will allow accurate conversion of the sensor's signal to the NMEA 2000 PGN(PGN130312) for precise monitoring and data transmission.

In addition to the PT1000, the PT100 is also a popular platinum RTD sensor, frequently utilized in diverse industrial, marine, and automotive applications. When connected to the A037 device, the wiring, settings, and calibration procedures for the PT100 is similar as for PT1000. This manual primarily focuses on the detailed description of the PT1000, which can be utilized as a reference for working with the PT100.

4.1. Input Pinout Settings

Please follow the steps below to set up the A037 to work with a PT1000 temperature sensor:

1. First, connect the PT1000 sensor to the A037, one wire to the PT1000 pinout (Pinout 1), the other wire to the GND pinout (Pinout 6).

2. Connect the A037 to a Windows PC using the provided USB cable. For users running Windows 10 or an earlier version of the operating system, it may be necessary to install a device driver to recognize the A037 USB port. The latest driver can be found from Quark-elec website.
3. Power up the A037.
4. Launch the configuration tool on the computer. Ensure that the “Connected” status message with the firmware version and configuration tool version appears at the bottom of the window before changing any settings.
5. Click on the “Input Pinout settings” tab and select “PT1000: Pinout(1)” from the dropdown menu.
6. Select the required temperature unit (°C, °K or °F) from the dropdown list.
7. Enter the maximum and minimum values. These thresholds determine the settings for triggering alarm outputs. Leave it blank if there is no need to link with the output alarms.
8. Select “-Sensors-” form the Sensor Type dropdown list and fill in the Data Output Set with your measurements. Please note, that a thermometer is also required to be able to set up the sensor accurately. We would suggest you start with the lowest temperature of the temperature range you would like to measure. Click Measure and enter the displayed value into the Marker column. Check the temperature displayed by your reference thermometer and enter the temperature value into the Value column. Repeat these steps until you reach the upper limit of the temperature range. A total of ten “Marker-Value” data pairs can be entered into the Data Output Set table, please distribute the measurements through the temperature range evenly.

   Practically, the above calibration process doesn’t need to be completed. As the datasheet or the manual of PT1000 from the supplier should provide the relevant data. For example, many PT1000 were designed to follow IEC 751(1995) and IEC60751(1996).

   Below is an example of Resistance Vs Temperature table for PT100/PT1000 followed with IEC 751(1995) and IEC60751(1996). PT1000 features the same temperature/resistance curve, however the resistance value is 10 times for PT100. For example, the resistance of PT1000 on 0°C is 100x10=1000 Ω .

Temp	Resistance	
	PT100	PT1000
(°C)	**(Ω)**	**(Ω)**
-200	18.52	185.20
-100	60.26	602.60
0	100.00	1000.00
100	138.51	1385.10
200	175.86	1758.60
300	212.05	2120.50
400	247.09	2470.90
500	280.98	2809.80
600	313.71	3137.10
650	329.64	3296.40
700	345.28	3452.80
800	375.70	3757.00
850	390.48	3904.80

9. Click “Save” to save the new settings to the A037.

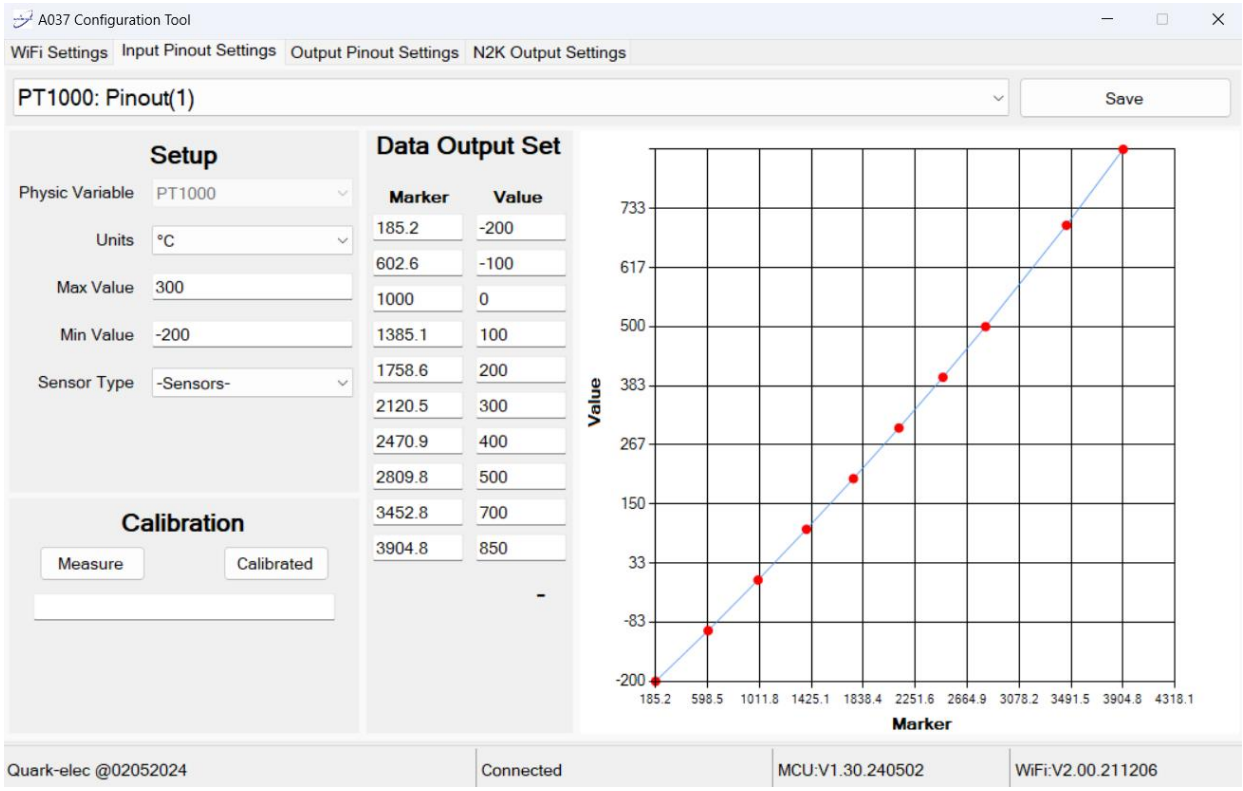

Figure 9 PT1000 calibration

4.2. N2K Output Settings

Please click on the “N2K Output Settings” tab to set up the output PGN.

1. Select “PGN 130312: Temperature” from the dropdown menu.
2. Select “Instance 0” if you are setting up the first temperature sensor, “Instance 1” will be used for the second temperature sensor, etc.
3. Select the temperature source type from the dropdown list. The following options are currently supported:

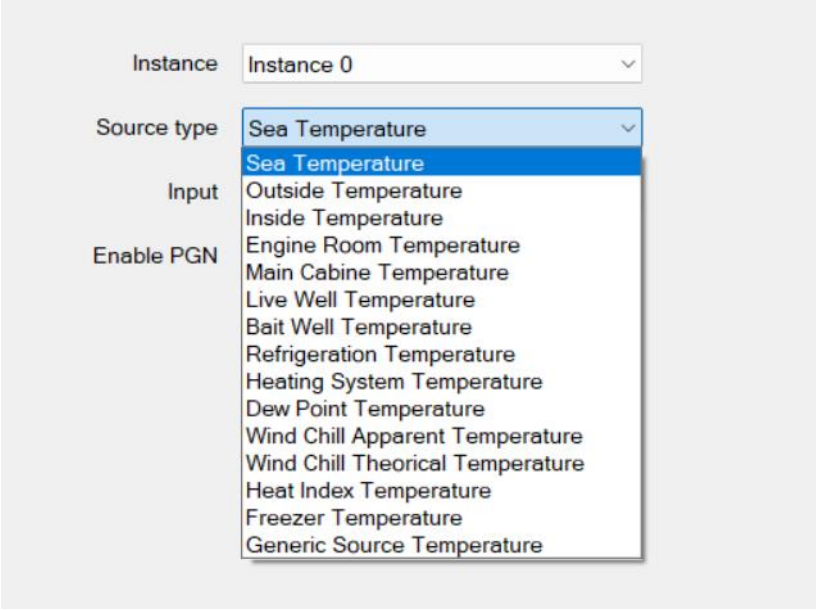

Figure 10 N2K source type selection

4. Select “PT1000: Pinout(1)” from the Input dropdown list.
5. Tick the checkbox next to “Enable PGN” to enable it.
6. Finally, click Save to save the new setting to your device and repower your device.

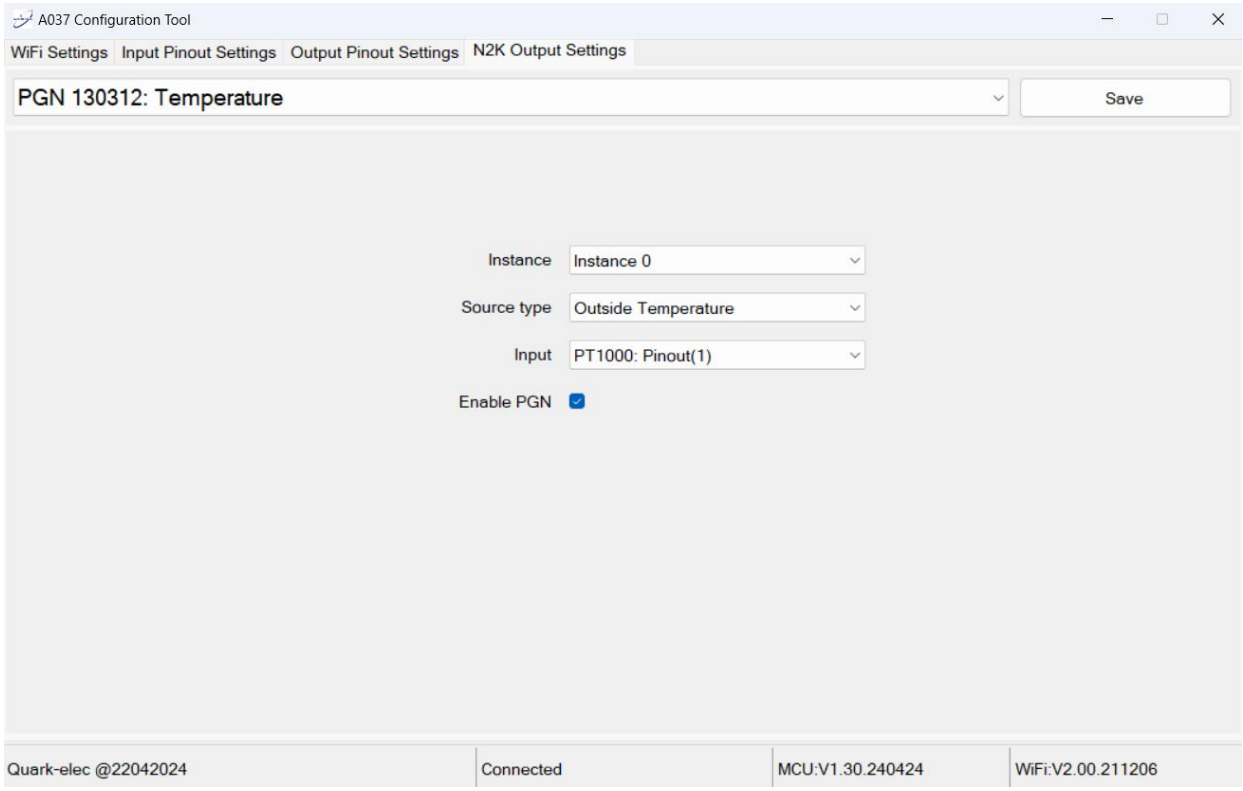

Figure 11 N2K Output settings(PGN130312)

5. Tank Level Sensor Inputs

The A037 features four tank lever sensor inputs, which can be used to monitor fuel, fresh water, wastewater, live well, oil or black water levels on leisure boats, yachts, or light-commercial vessels. Once the fluid level sensor has been connected to one of the tank level sensor pinouts on A037, the configuration tool (Windows PC application – can be downloaded from Quark-elec website) needs to be used to calibrate the sensor and to assign the correct input and the output N2K sentences.
Tank level sensor output resistance values are converted to the NMEA 2000 PGN 127505 by the A037. The following is an example of how to set up and use Tank1 level R input (Pin 5) to monitor fluid level in a tank on a boat.

5.1. Input Pinout Settings

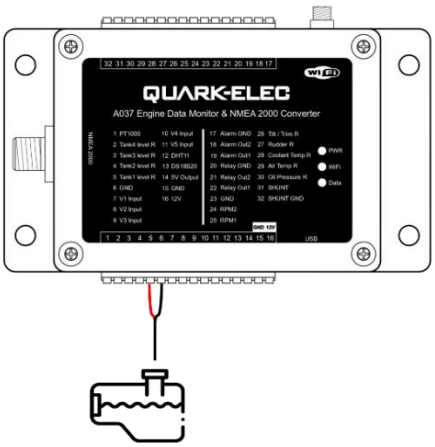

Figure 12 Tank level sensor wiring

Please follow the steps below to set up a tank level sensor:

1. Connect the tank lever sensor to one of sensor inputs – one wire to Pinout 2, Pinout 3, Pinout 4 or Pinout 5, and the other wire to GND (Pinout 6).
2. Connect the A037 to a Windows PC via USB. If you are using Windows 10 or a previous version of the Windows operating system on your computer, a device driver might have to be installed first for the computer to be able to recognize the A037.
3. Power up the A037.
4. Launch the configuration tool on the computer. Ensure that the “Connected” status message with the firmware version and configuration tool version appears at the bottom of the window before changing any settings.
5. Click on the “Input Pinout settings” tab and select the pinout from the dropdown menu to which the tank level sensor is connected to – e.g., TANK 4: Pinout(2).
6. The Physic Variable and Units fields are filled in automatically, these cannot be changed.
7. Enter the maximum and minimum values. These thresholds determine the settings for triggering alarm outputs. Leave it blank if don’t need to link with the output alarms.
8. Please leave the “Sensor Type” setting on “-Sensors-”. Only choose the others if you are authorized installer or been suggested by us.

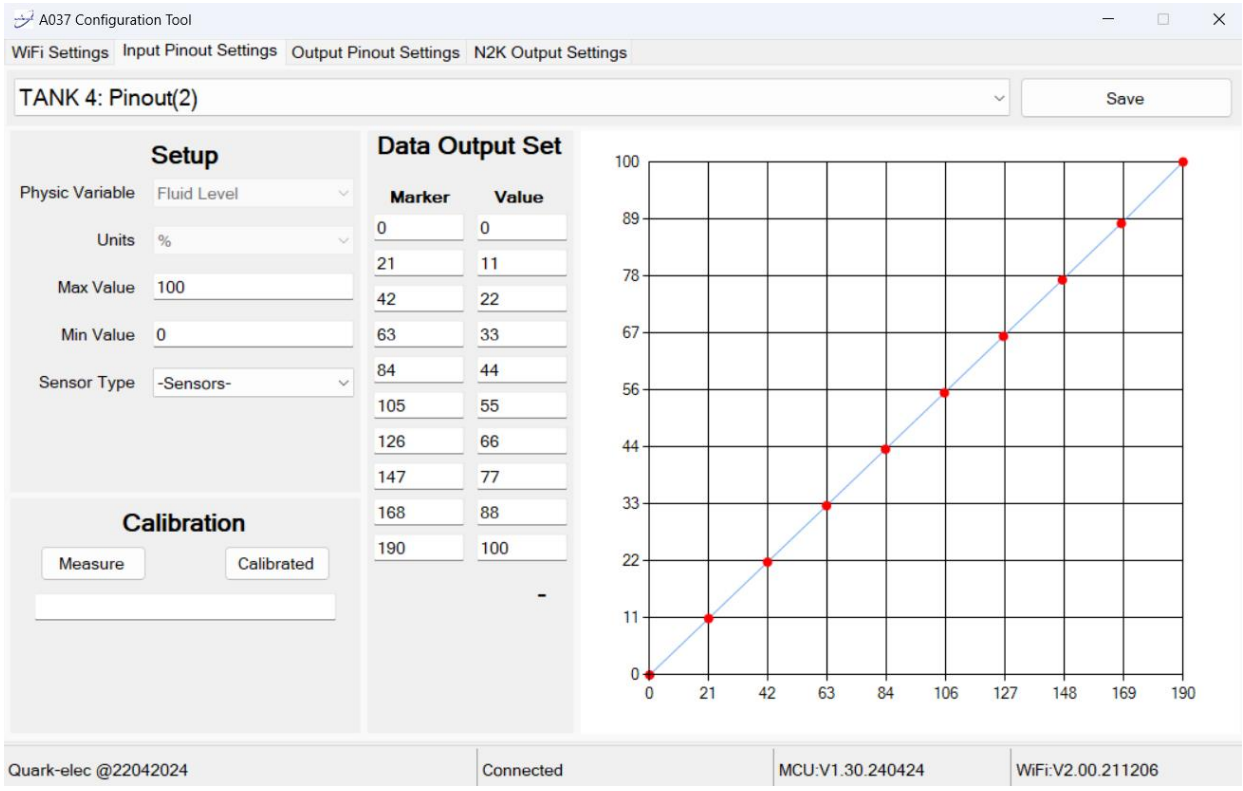

Figure 13 Tank level senor setting

5.2. Calibration

Calibration process is to setup a table with the input data (Marker) and calibration value (Value) so the A037 could output an accurate data.

The “Calibration” tool can be used to read and view the sensor data, output by the tank level sensor. This is required when setting up the “Data Output Set” table with the sensor data and the corresponding fluid level percentage. The “Data Output Set” can be defined in the following way (as shown on the figure above). Generally, input the measured data to “Marker” field and input the related tank level(%) into Value field.

1. Start the process with an empty tank. Click “Measure” to view the sensor data.
2. Enter this value into the first row of the Marker column.

3. For the empty tank, we would suggest you enter a small number, e.g., 0 or 1. This percentage will be displayed by your chart plotter when the tank is empty.
4. Fill up you tank to 20% of its capacity and repeat the steps above.

- Click “Measure” to view the sensor data, enter this data into the second row of the Marker column.
- As the tank has been filled up to 20% of its capacity, 20 should be entered into the second row of the Value column.

5. Fill up the tank to 40%, 60%, 80% and 100% of its capacity, measure the sensor data and fill in the table with these values and the corresponding fuel level percentages.
6. More measurements will help to build up a more precise data set, so in case of tanks with unconventional shapes, the actual fluid level will be displayed more accurately. The “+” and “-“ signs can be used to add more or to remove data fields.
7. Once the table has been accurately filled in, click “Save” to save the new settings and the data set to the device.

5.3. European or American Standard’s Sensor

Two primary standards are prevalent in the market for measuring tank levels on boats: American and European standards. Neither standard holds an inherent advantage or disadvantage over the other, as both are widely employed worldwide.
European standards sensor operates on a variable resistance from 0 ohms at empty to 190 ohms at full. While American standards products work on a variable resistance from 240 ohms at empty to 30 ohms at full capacity.
Below, two diagrams illustrate typical settings for European and American standard tanks. Please not that the examples provided are based on rectangular tanks. For tanks of different shapes, adjustments to the values may be necessary.

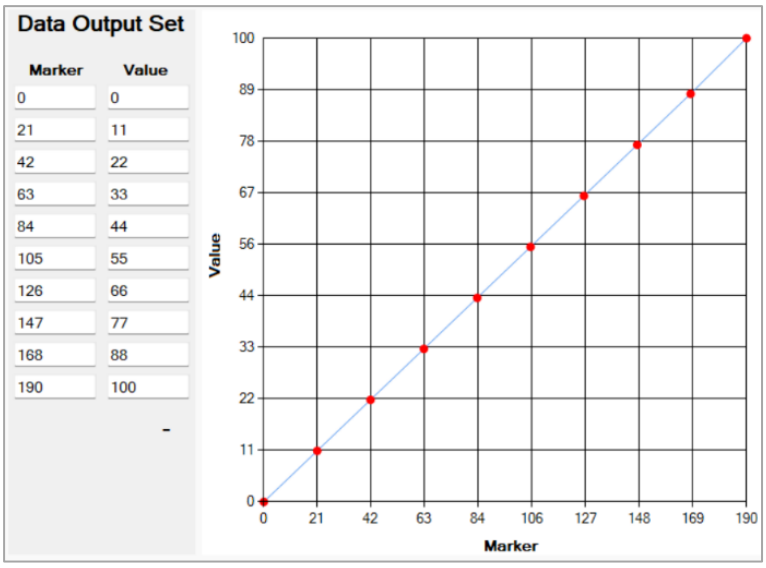

Figure 14 - Standard European sensor setting.

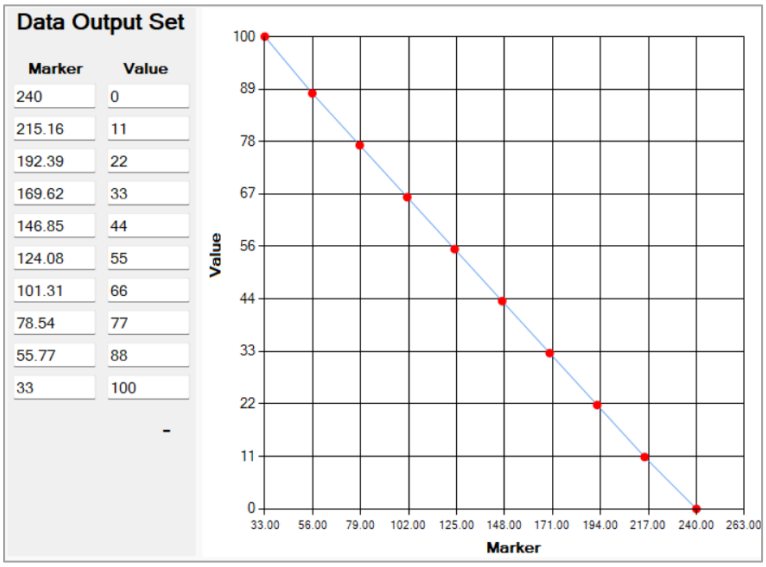

Figure 15 - Standard US sensor setting.

5.4. N2K Output Settings

Once the “Data Output Set” table has been filled in with the required data, please click on the “N2K Output Settings” tab to set up the output PGN.

1. Select “PGN 127505: Fluid Level” from the dropdown menu.
2. Select “Instance 0” if you are setting up the first tank lever sensor, “Instance 1” will be used for the second tank level sensor, etc.
3. Enter your tank’s capacity in cubic meters into the Capacity field.
4. Select one of the following options from the Type dropdown list:

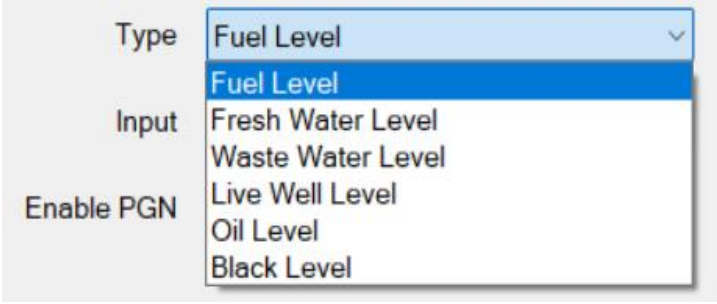

Figure 16 Tank type settings

5. From the Input dropdown list select the Pinout number to which the sensor is connected. In our example is “Tank 4: Pinout (2)”
6. Tick the checkbox next to “Enable PGN” to activate it.
7. Finally, click Save to save these new setting to your device and repower the A037.

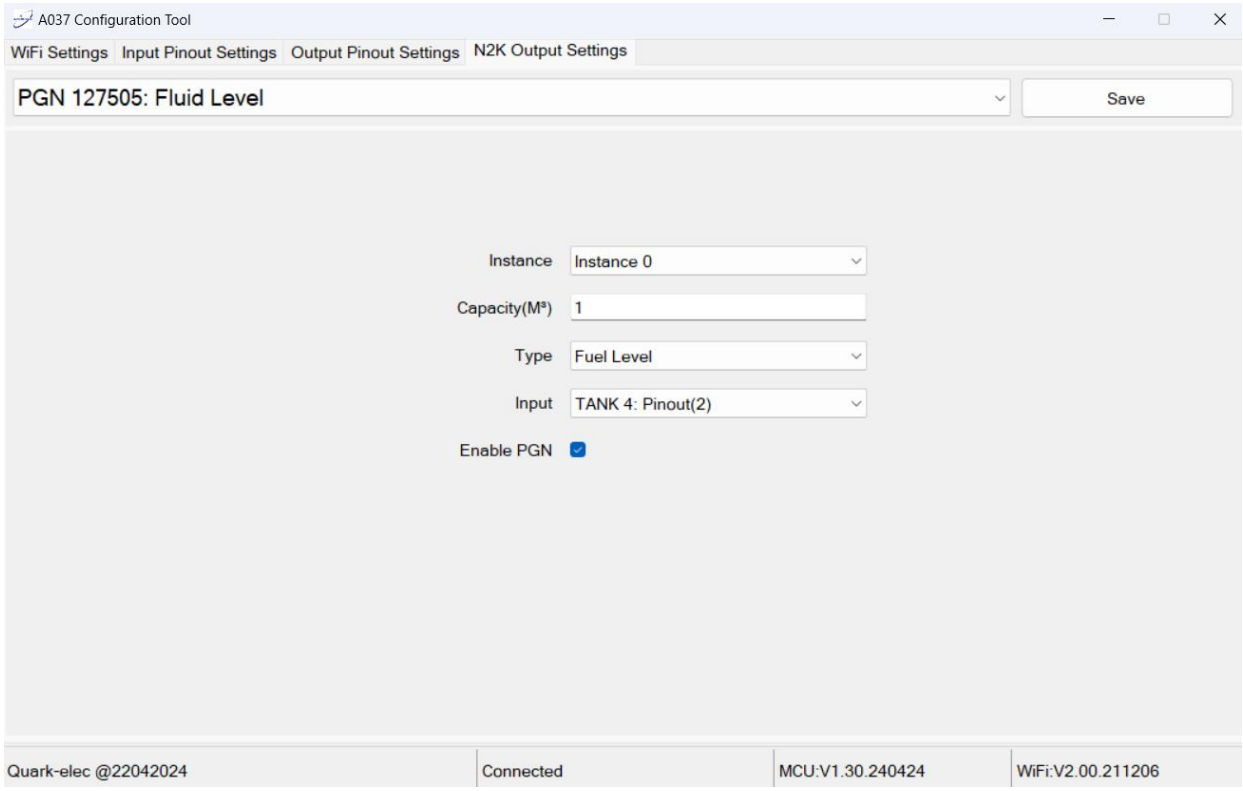

Figure 17 N2K Output settings (PGN 127505 Fluid level)

Repower the A037 after changing any of its settings or after setting up a new sensor with the configuration tool.

6. Voltage Sensor Inputs

There are various voltage output sensors used for engine and battery monitoring, that can monitor oil pressure, engine rotation rate, battery voltage, current, temperature and so on.

The A037 features five independent voltage input channels, which can be connected to voltage output type sensors. Like Tank level sensors input, these five voltage inputs have comprehensive calibration function that allow you to create a 10-points calibration table.

Once the voltage sensor has been connected to one of the sensor input pinouts, the configuration tool (Windows PC application – can be downloaded from Quark-elec website) must be used to calibrate the sensor and to assign the correct input to the output data. The output voltage value from voltage sensor is converted to the NMEA 2000 PGNs by the A037.

6.1. Input Pinout Settings

The A037 supports up to 32VDC input voltage. A sensor typically is using two wires or pins to output, one is used for the output voltage, the other is for GND. Connect the output voltage wire to one of the voltage input pinouts (e.g., in below example its V2 input, Pinout 8) and the other wire to one of the GND pinouts (Pinout 6 or 23). The below details how to set up this pressure sensor.
A voltage output pressure sensor generates an electrical signal corresponding to the pressure it measures. Typically, this signal is a direct current (DC) voltage, providing a ratiometric value relative to the measured pressure. Such sensors are frequently used in marine, automotive applications due to their commonality and effectiveness.

Here, an illustrative example is provided for setup a 0.5V to 5V pressure sensor.

1. Please ensure that all your electronic devices are switched off and disconnected from their power supply, to avoid creating a short circuit during the installation process. Connect the output of the pressure sensor to Pinout 8 and the other pin to GND (Pinout 6,15 or 23) of A037.
2. Power up the A037.

3. Launch the configuration tool on the computer. Ensure that the “Connected” status message with the firmware version and configuration tool version appears at the bottom of the window before changing any settings.
4. Click on the “Input Pinout settings” tab and select “Volts 2: Pinout(8)” from the dropdown menu.
5. Select “Pressure V” from the Physic Variables dropdown list.

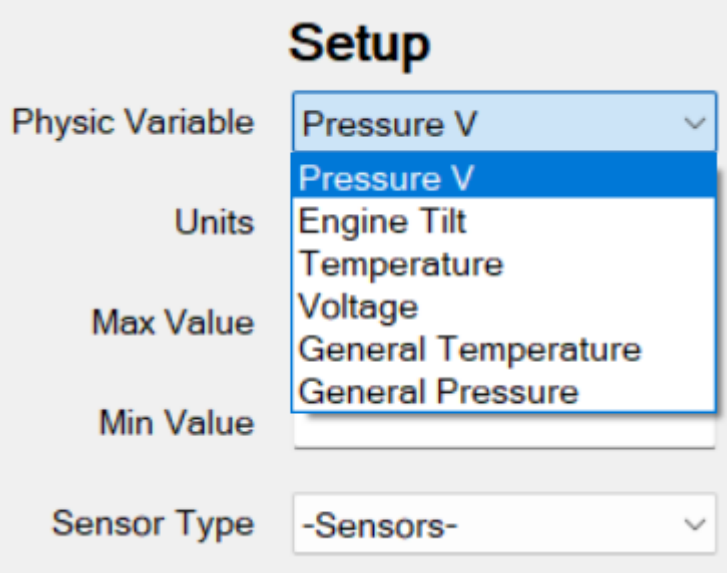

Figure 18 Voltage input data type

6. The Units field will be automatically filled in with “Bar”, this cannot be changed.
7. Enter the maximum and minimum values. These thresholds determine the settings for triggering alarm outputs. Leave it blank if don’t need to link with the output alarms.
8. Choose “Sensors” from the dropdown tab for “Sensor Type” setting.

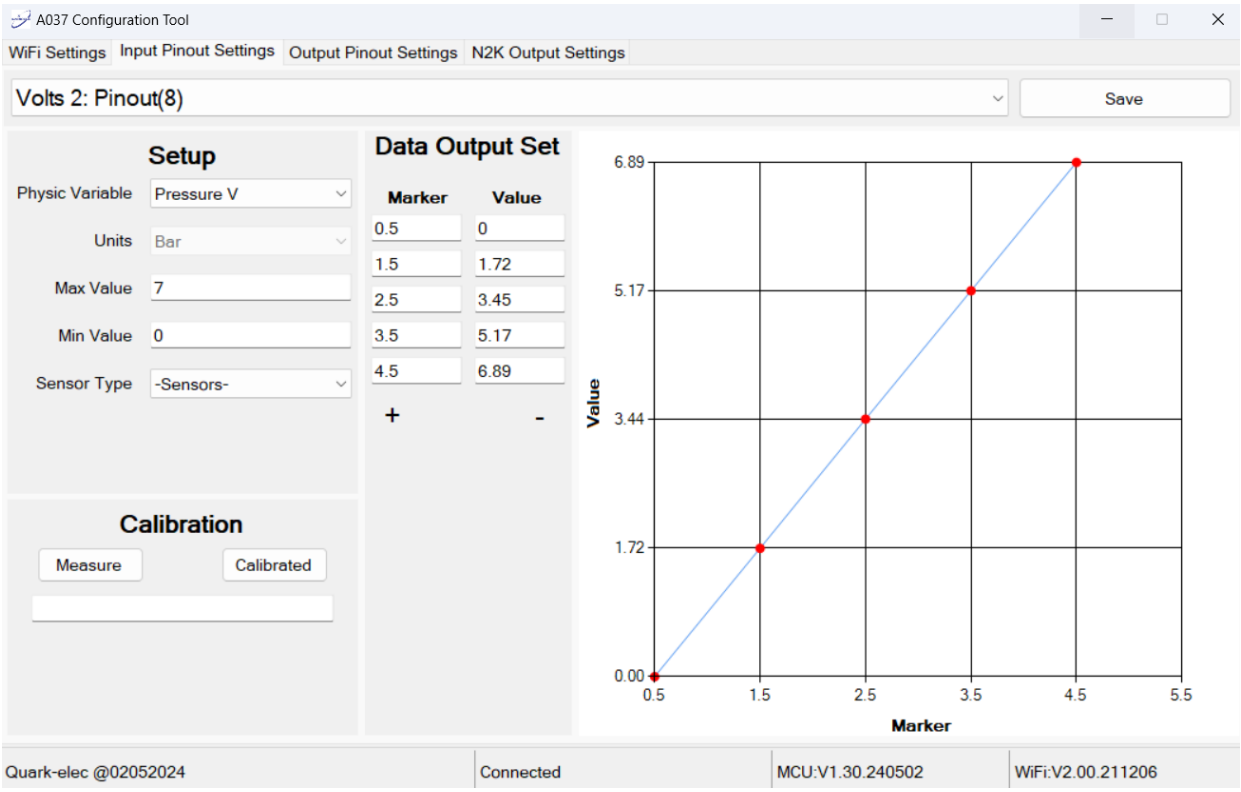

Figure 19 Voltage sensor input settings

6.2. Calibration

The “Calibration” tool can be used to read and view the sensor data (in this example, its voltage), output by the sensor. This is required when setting up the “Data Output Set” table with the sensor data and the corresponding value to be displayed. The “Data Output Set” can be defined in the following way (as shown on the figure above)

1. The sensor’s manual or datasheet should contain a data table or graph showing the sensor’s voltage output in relation to the measured value. Please use this information to fill in the “Data Output Set” table in the configuration tool. In this example, for a measured value of 0.5, the A037 will output 0 Bar. For 1.5, the A037 will output 1.72 Bar, etc..
2. Start with the minimum value, a total number of ten “measured data: pressure value” pairs can be added to the data table. The last value added to the “Data Output Set” should be the maximum voltage value that the sensor can output. Spread the “measured data: pressure value” data pairs evenly through the sensor’s voltage output range.
3. More data pairs will help to build up a more precise data set. The “+” and “-“ signs can be used to add more or to remove data fields.
4. Once the table has been accurately filled in, click “Save”.

6.3. N2K Output Settings

Once the “Data Output Set” table has been filled in with the calibrated data, please click on the “N2K Output Settings” tab to set up the output PGN.

1. Select “PGN 130314: Pressure” from the dropdown menu.
2. Select “Instance 0” for the first pressure sensor, “Instance 1” will be used for the second pressure sensor, etc.
3. Go to “Source type” and select one of the following options:

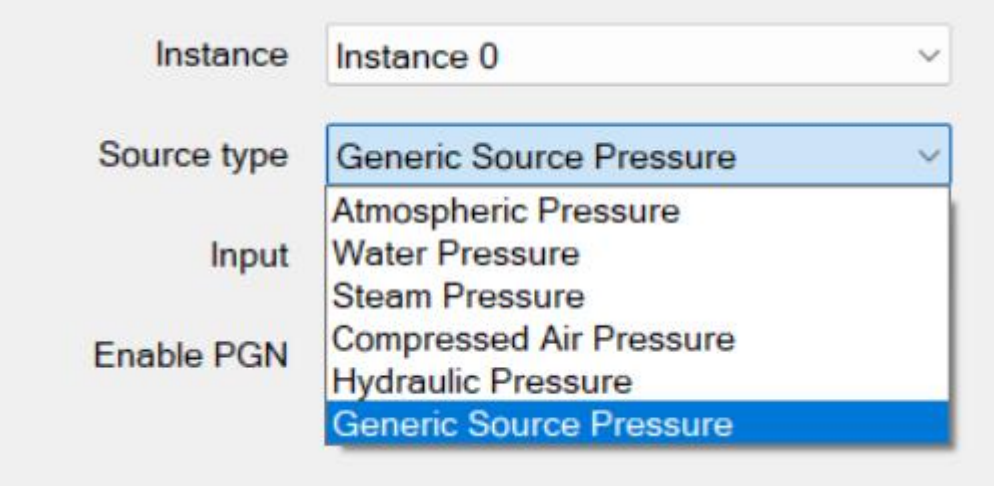

Figure 20 N2K output source settings

In this example, “Generic Source Pressure” has been selected.

4. Go to Input and select the Pinout number to which the sensor is connected. In this example, select Volts 2: Pinout (8) from the drop-down menu.
5. Tick the checkbox next to “Enable PGN” to activate it.

Finally, click “Save” to save these new setting to your device and repower the A037. Now, the pressure sensor is ready for using.

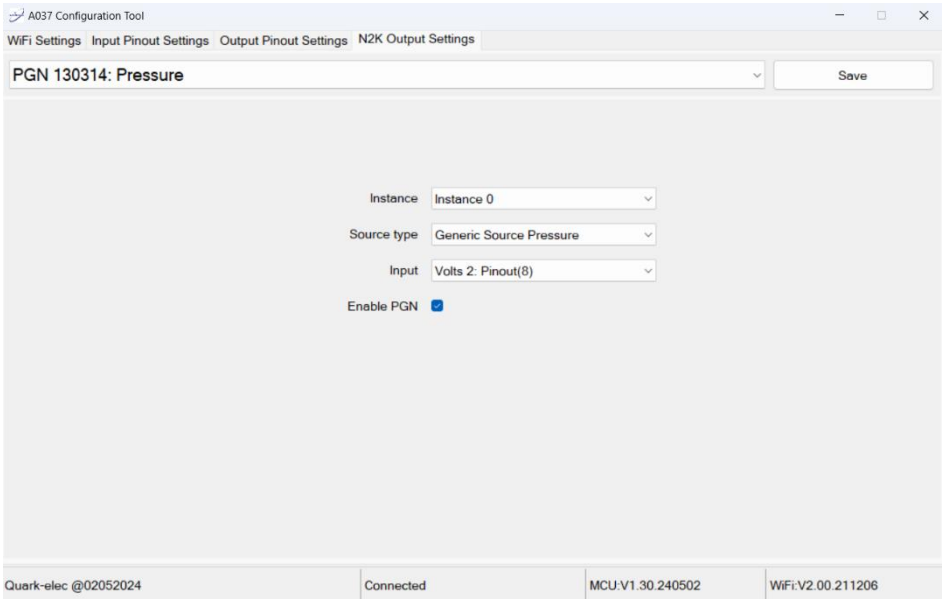

Figure 21 Voltage input settings (N2K output)

7. Tacho Inputs (RPM)

The A037 supports two RPM inputs, which is suitable for use with the majority of boats equipped with two engines.
The tacho inputs, RPM1 and RPM2 of A037 can measure RPM data from the engine. Both are designed to be connected to existing engine senders either with or without the gauge connected.

RPM signals could come from different sources depending on the engine. They may come from a ignition coil, alternator output, or electronics pulse sender. The A037 supports most of these, however the wiring methods may vary.

7.1. Ignition Coil

The following diagram shows how to connect the A037 to an ignition coil or alternator output signal or a single wire flowmeter. Connect the negative connection of the ignition coil to the RPM. And connect GND to GND of A037. If there is only one wire from ignition coil or alternator, then just don't connect this. Single wire (negative connection) is sufficient.

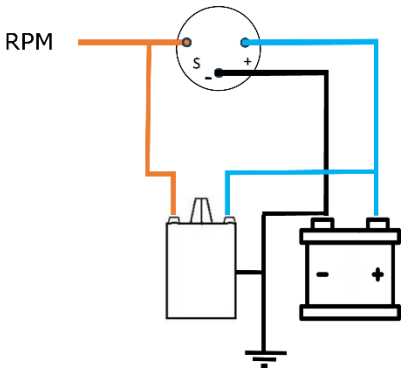

Figure 22 Ignition coil wiring

7.2. Alternator

Connect the Tacho (also called AC Tap or marked as "W") connection of the alternator to the A037 RPM input. Connect GND to GND of A037 if applicable.

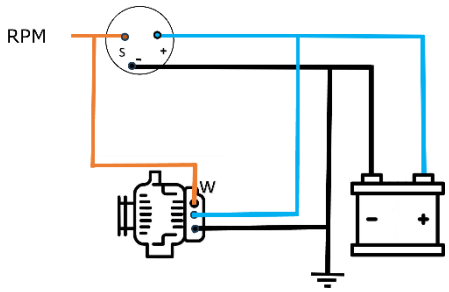

Figure 23 Alternator wiring

7.3. Hall Effect and Electronic Pulse Senders

Connect the signal line of the sender to the RPM on the A037 and connect GND to GND pinout of A037.

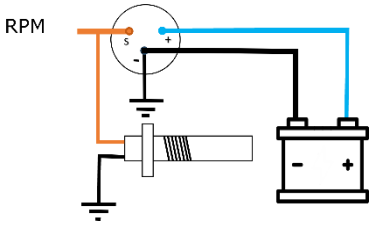

Figure 24 Hall Effect & Electronics Pulse sensor wiring

7.4. Calibration

The Tacho inputs must be calibrated in the configuration tool before use. The following is an example of how to set up one of the RPM inputs with an electronic pulse sender. The Calibration filed shows the measured result as 1800, while a 30Hz Tacho inputs.

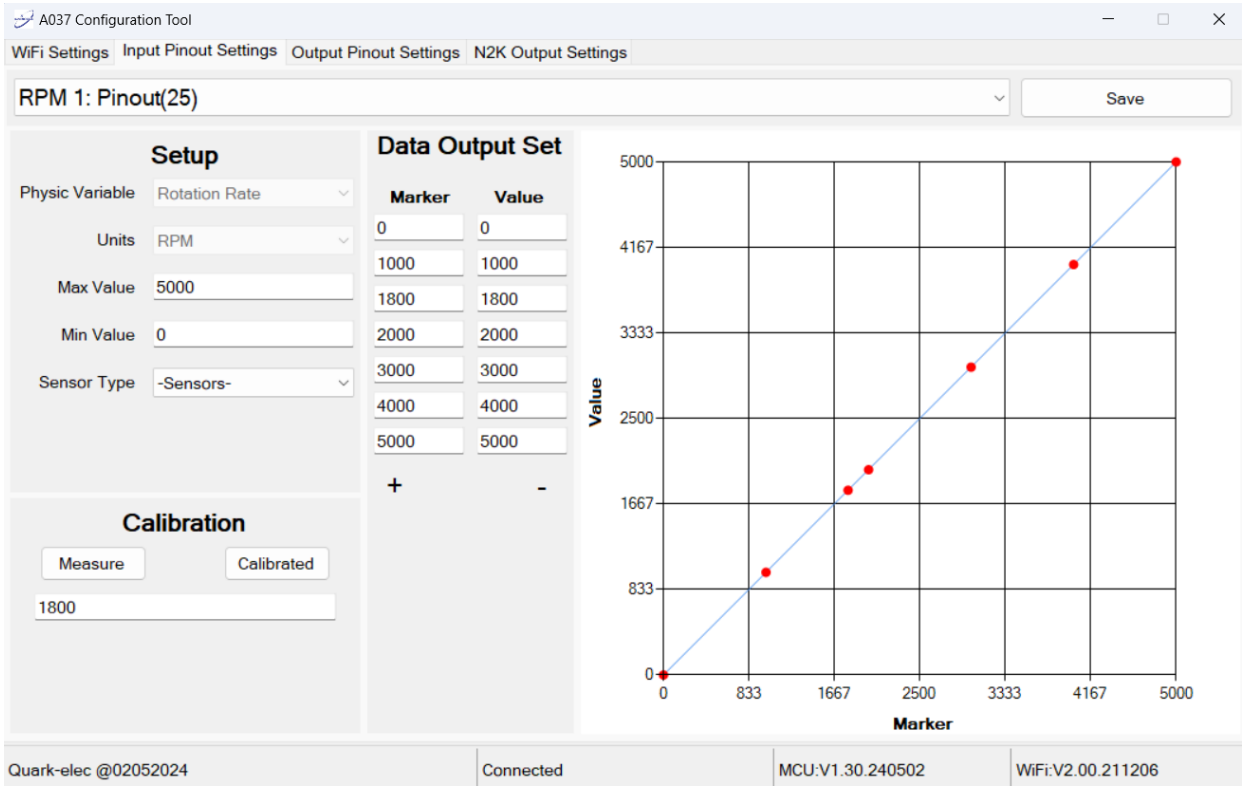

Figure 25 Tacho(RPM calibration)

Follow the steps below to set up the RPM input:

1. Click on “Input Pinout Settings” tab and select the “RPM 1: Pinout(25)” or “RPM 2: Pinout(24)” option from the dropdown menu, to which pinout the sensor is connected.
2. The Physic Variable and Units fields will be automatically filled in. These parameters cannot be changed. Enter the engine’s minimum and maximum RPM values. Select “-Sensors-” from the Sensor Type list.
3. Start your engine and keep it running.
4. By clicking on the Measure button, the configuration tool will display the pulse value(Hz) received from the engine/Tacho. In this example, it is measured as 30, while the engine is running at 1800PRM. This indicates that the engine or tacho is outputting a 30Hz signal at 1800 RPM. So, in the “Data Output Set”, set marker as 1800(30hz times 60 seconds) and the related value as 1800.
5. Repeat the above step multiple times to get a few more marker/value pair. In most cases, you will find these values are in liner patten. For example, when the engine runs at 3000 RPM, the output pulse is 3000/minutes(50Hz).
6. Fill above value pair into “Data Output Set” and put “o” and “o” in the first line and calculate the maximum value based on the above values using liner patten.

Practically, you may find that step 5 is unnecessary. Instead, you can obtain the Tacho PPR (Pulses Per Revolution) from the engine datasheet, or a plaque affixed to the engine. From there, you can calculate the relationship between the marker and the value.
Below, you'll find a general rule that can serve as a reference, but it's advisable to verify this before finalizing the settings.

- For an ignition coil it can normally be counted as:
  PPR = (No. of cylinders × 2) / (No. of strokes × No. of ignition coils)
- For an Alternator (“W”. “R” or “AC”) pinout connection it can be counted as:
  PPR = (Crank pulley diameter / Alternator pulley diameter) × (No. of poles in Alternator / 2)
- For a hall effect or inductive sensor, it is derived from the number of teeth on the flywheel:
  PPR = No. of teeth on flywheel

7.5. N2K Output Settings

Once the calibration process completed, the next step is to activate the NMEA 2000 PGN which contains the RPM information. This can be done as shown below:

1. Click on the “N2K Output Settings” tab and select the “PGN 127488: Engine Rapid Update” option from the dropdown list.
2. For the first engine select “Instance 1 - Port” (for the second engine “Instance 2 - Starboard”, etc.)
3. For Engine Speed select the pinout to which the sensor is connected. In this example this is “RPM 1: Pinout(25)”.
4. If Engine Boost and/or Tilt/Trim data is also available for this engine, these can also be added to the PGN by selecting the pinouts to which these sensors are connected.
5. The last step is to tick the box next to “Enable PGN” and to click Save to save the new settings to the device. Repower the A037 Engine Data Monitor after the setup process to activate the new settings.

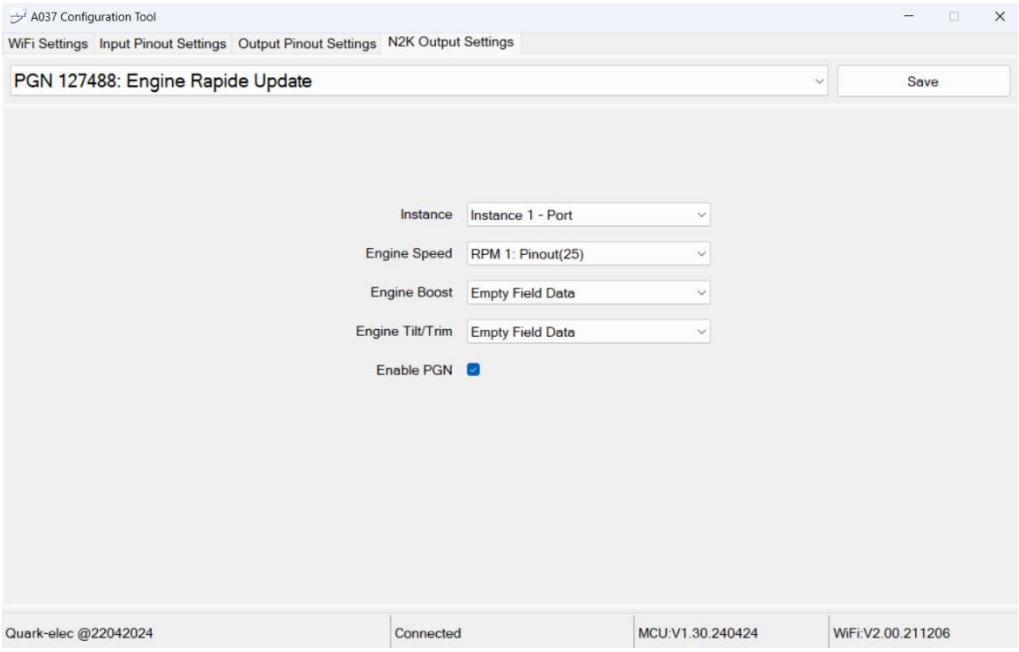

Figure 26 PGN 127488 settings

8. Shunt Input

A shunt is an electrical device that allows the measurement of electrical current in a circuit. The A037 Engine Data Monitor does not come with an electrical shunt, however, the Quark-elec A016 battery monitor with a shunt can be used with the A037 to measure the current. This can be purchased directly from Quark-elec's website or from an authorized Quark-elec distributor, reseller or installer.
The A037 can be connected to the A016 Battery Monitor's shunt as shown on the figure below:

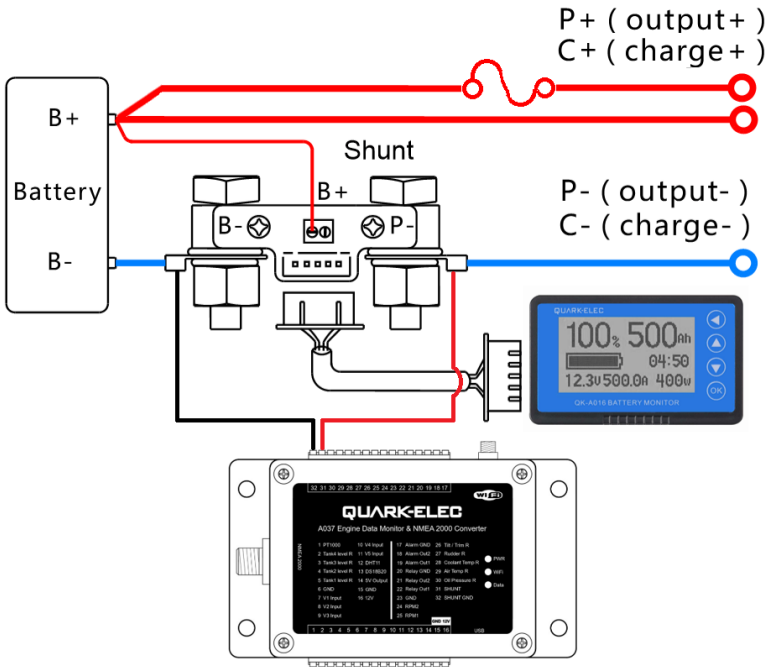

Figure 27 Battery Shunt wiring

8.1. Input Pinout Settings

The shunt's B- pinout must be connected to the A037's Pinout 32 (SHUNT GND), the shunt's P- pinout to the A037's Pinout 31 (SHUNT).

We recommend that all electrical devices should be installed by trained electrical installers, trained marine electronics technicians or engineers only.

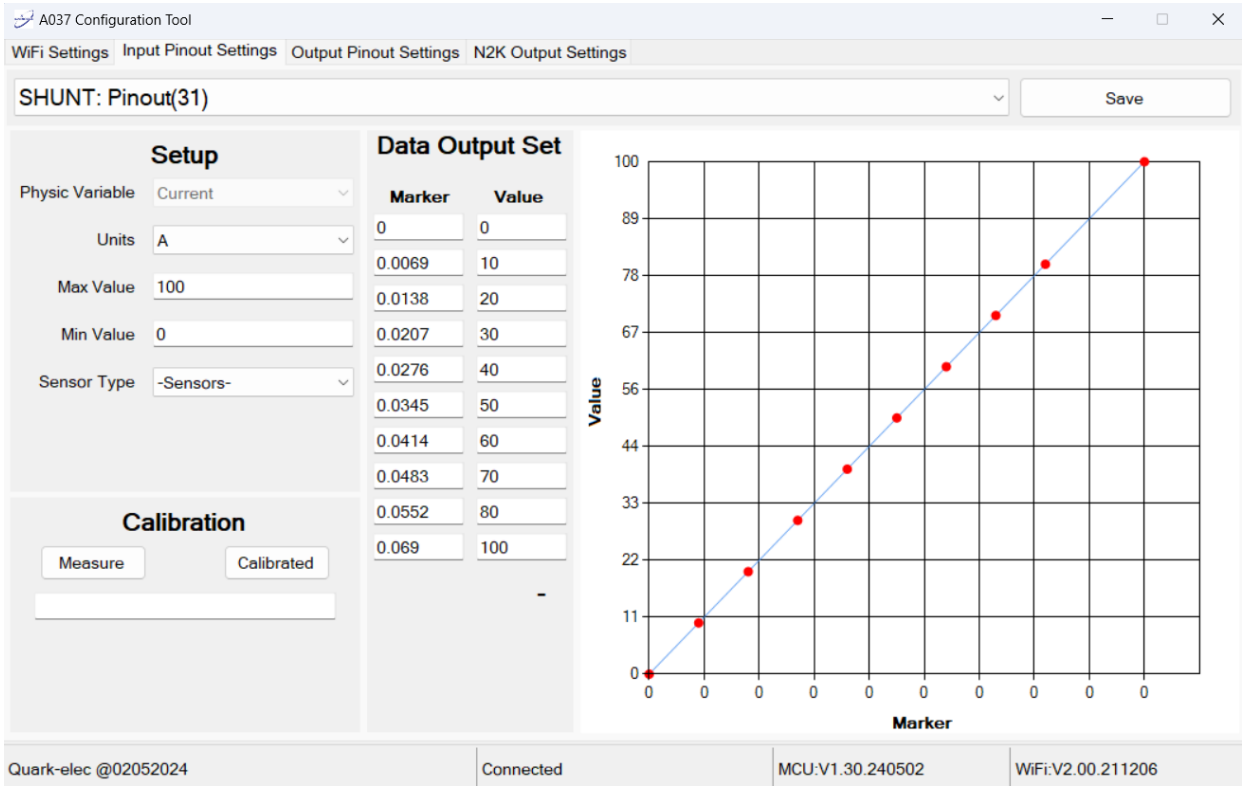

Figure 28 Shunt input settings

8.2. Calibration & N2K Output Settings

The above is an example of how to set up a 100Amp A016 Battery Monitor shunt with the A037 Engine Data Monitor. The steps are the following:

1. Click on the “Input Pinout Settings” tab and select “SHUNT: Pinout(31)” from the dropdown menu.
2. Set the Physic Variable to “Current”, the Units to “A” (Amps).
3. Set the Max Value to 100 and the Min Value to 0, if a 100 Amp shunt is being used.
4. The sensor type should be left on “-Sensors-".
5. The “Data Output Set” table can be filled in based on the measured data. Start by filling in the first row with a Marker value of 0 and a Value of 0.
6. Switch on one device or instrument, click Measure to read the sensor value and read the current from the A016’s display. Fill in the second row with this data – the measured value into the Marker column, the current value into the Value column.

   If you have more than nine devices onboard, two or more devices can be switched on and added to the same measurement.
7. The configuration tool allows a total of nine measurements to be added to the “Data Output Set”. The last Marker: Value pair should be filled in with the measured value and the electrical current value measured with all devices and instruments switched on.
8. Click Save, to save the new data to the device.

The next step is to activate the NMEA 2000 PGN which contains the Shunt (current) data. This can be done as shown below:

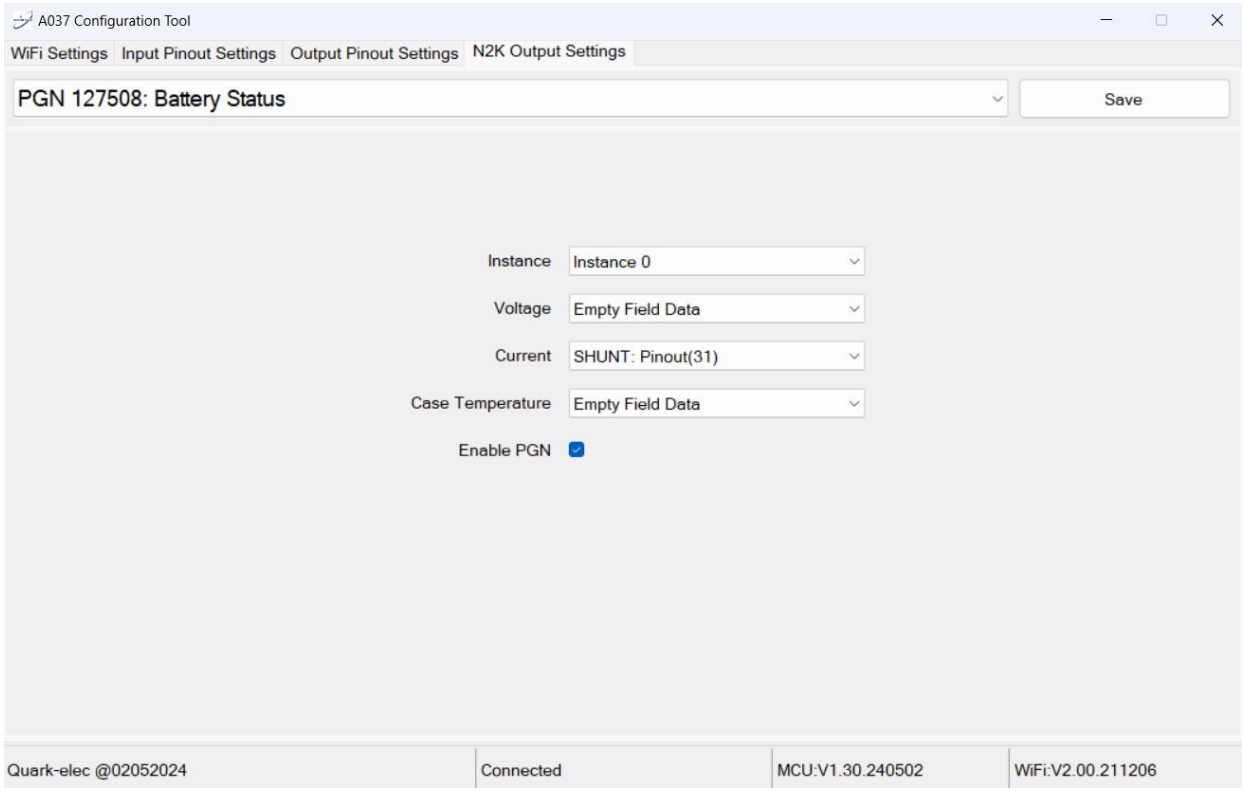

Figure 29 N2K output settings(PGN127508)

1. Click on the “N2K Output Settings” tab and select the “PGN 127508: Battery Status” option from the dropdown list.
2. Select “Instance 0” for Instance.
3. Select “SHUNT: Pinout(31)” for Current.
4. If a voltage sensor or case temperature sensor is also connected to the A037, these sensor data can also be added to this PGN if required by selecting the Pinouts from the Voltage and Case Temperature dropdown lists to which these sensors are connected.
5. The last step is to tick the box next to “Enable PGN” and to click Save to save this configuration to the device. Repower the A037 Engine Data Monitor after the setup process to activate the new settings.

9. Rudder R Input

Apart from 5 tank level sensor inputs, the A037 also provides another 4 resistance specific sensor inputs which can cater for the most used sensors onboard.
Connect the output pinout of the Rudder indicator to Rudder R input(Pinout 27) and the other pinout to GND(pin 6, 15 or 23)

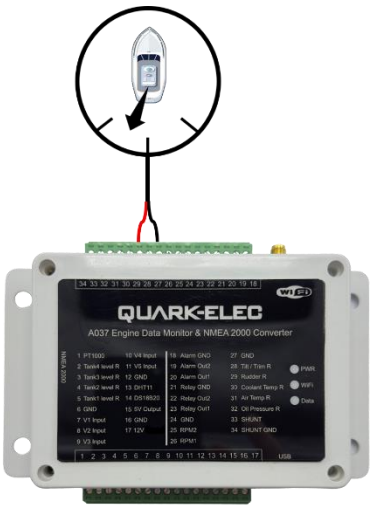

Figure 30 Rudder sensor wiring

9.1. Input Pinout Settings

The rudder input allows the customer to connect an existing resistive type of rudder angle sensor installed on a rudder and provides the rudder angle to NMEA 2000 autopilots, chart plotters and other devices.

The A037 can support most rudder angle sensors in the market, including European (10 to 180 Ohm range) or American (240 to 33 Ohm range) standard sensors. The A037 can be installed as a standalone measuring rudder sensor data or work together with an existing analogue gauge.

9.2. Calibration & N2K Output Settings

The rudder angle readings can be calibrated with up to 10 calibration points to compensate for non-linearity of the sensor's resistance value vs rudder angle.

To set up the rudder angle sensor with the A037, the data displayed by an existing rudder angle gauge can be used if this gauge displays the angle accurately, in degrees. If not, the rudder angle will have to be measured during the setup. The A037 can be set up to convert sensor data to an NMEA 2000 PGN as shown below:

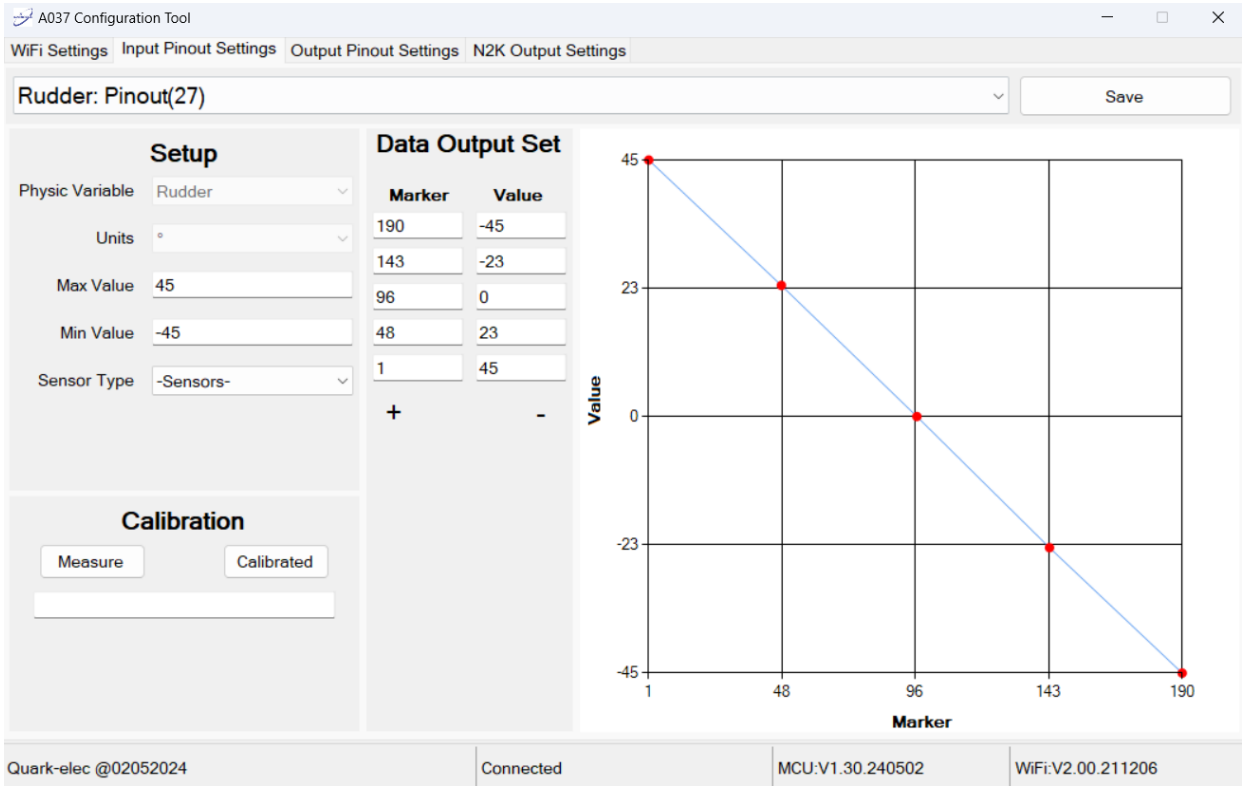

Figure 31 Rudder sensor calibrations

Please follow the steps below to set up the rudder angle sensor:

1. Click on Input Pinout Settings tab and select “Rudder: Pinout(27)” from the dropdown list.
2. Enter the maximum and minimum values of the angle the sensor can measure.
3. Select “-Sensors-” from the Sensor Type dropdown list.
4. The Data Output Set table allows 10 [sensor value: angle] data pairs to be added to the table. Turn the rudder so it reaches one of the end points and click Measure to read the rudder angle sensor value. Enter this into the Marker column and enter the angle corresponding to this into the Value column.
5. Keep adding more [sensor value: rudder angle] data pairs to the Data Output Set until you reach the other end position of the rudder.
6. Click Save to save the data and the new settings to the device.

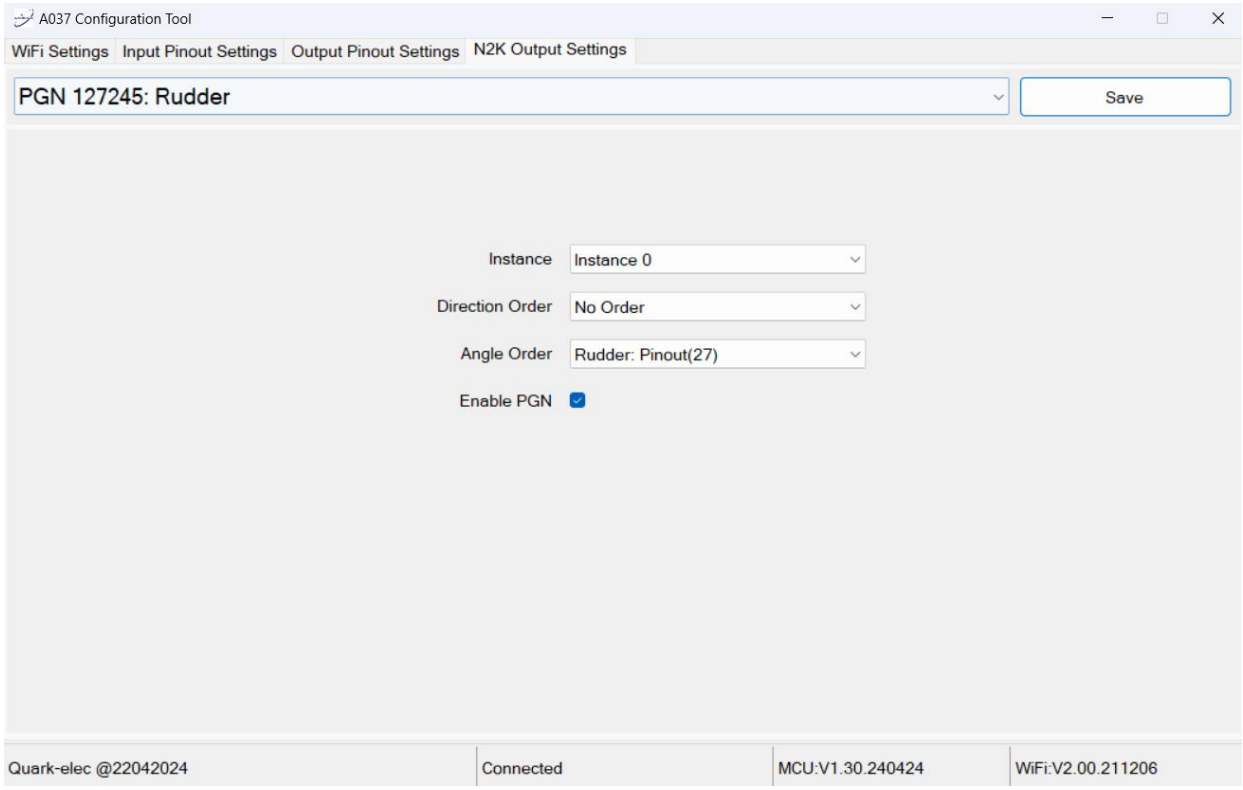

Figure 32 N2K output settings(PGN127245)

To set up the N2K output, please follow the steps below:

1. Click on the “N2K Output Settings” and select “PGN 127245: Rudder” from the dropdown list.
2. Select “Instance 0” for Instance and “No Order” for Direction Order.
3. Select "Rudder: Pinout(27)” for Angle Order.
4. Tick the Enable PGN check box and click Save.

Repower the A037 to activate the new settings.

10. Coolant Temp R Input

In addition to the other inputs listed in this manual, the A037 also features a coolant temperature sensor input and allows the user to connect an existing resistive coolant temperature sensor to the A037. This sensor is based on a temperature-variable resistor, it is connected to the engine’s cooling system and measures the coolant’s temperature. As the coolant temperature rises, the resistance of the sensor reduces.

10.1. Input Pinout Settings

The resistive coolant temperature sensor must be connected to Pinout 28 (Coolant Temp R) and Pinout 23 (GND).
We recommend that all electrical devices should be installed by trained electrical installers, trained marine electronics technicians or engineers only.

10.2. Calibration & N2K Output Settings

The first step is the calibration of the sensor. The calibration of the coolant temperature sensor can be done with the sensor detached from the cooling system and disconnected from the electrical system of the boat. Remember, that to be able to calibrate the sensor accurately, a thermometer will be required.

Please ensure, that during the calibration process, the pinouts of the sensor, the wiring, the A037 or your other electrical devices do not get in contact with water, as this might cause a short circuit and permanent damage to your devices!

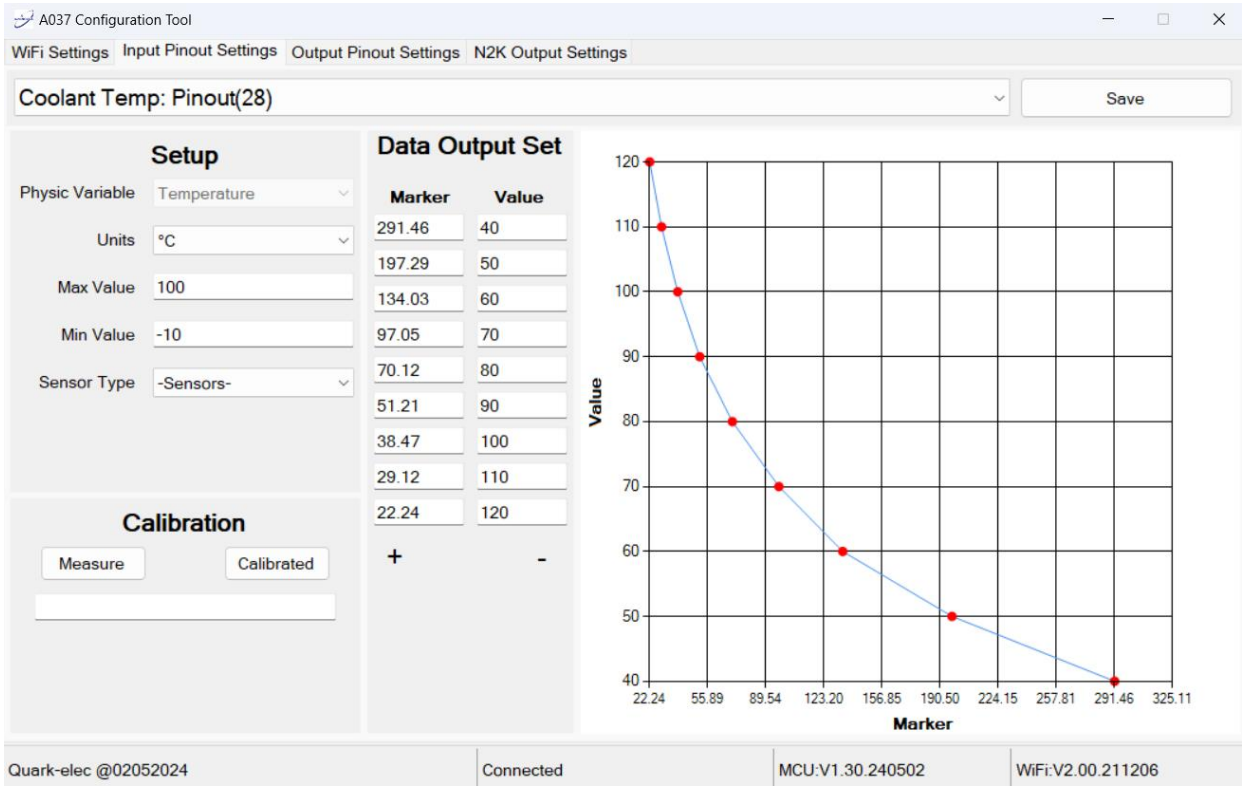

Figure 33 Coolant Temp output settings

Please follow the steps below to calibrate the sensor:

1. Connect the sensor to the A037, to Pinout 28 (Coolant Temp R) and to Pinout 23 (GND).
2. Launch the configuration tool on your computer and click on the “Input Pinout Settings” tab.
3. Select the “Coolant Temp: Pinout (28)” from the dropdown list.
4. The Physic Variable field is filled in automatically with “Temperature”.
5. Units can be set either to Celsius, Fahrenheit or Kelvin, as required.
6. Enter the maximum and minimum temperature values.
7. Select “-Sensors-” from the Sensor Type dropdown list.
8. Submerge the sensor’s measuring tip into cold water placed in a suitable water container.
9. Measure the water’s temperature in the container with the thermometer and click “Measure” at the same time to read the sensor data. Enter the measured sensor data into the Marker field and the measured temperature value into the Value field.
10. Start heating the container and take temperature measurements and sensor data readings periodically. Fill in the “Data Output Set” with the measured values. Please note, that the above image is an example only, you might get different sensor data – temperature values.
11. Click “Save” to save the new data to the device.

Please ensure that, during the procedure, you work safely and wear suitable protective equipment (e.g., safety goggles, safety gloves, etc.) to prevent injury. Quark-elec does not take responsibility for any injury or damage caused by hot water or other issues.

To set up the N2K output, please follow the steps below:

1. Click on the “N2K Output Settings” and select “PGN 130312: Temperature” from the dropdown list.
2. Select “Instance 0” for Instance.
3. Select "Generic Source Temperature” for Source Type and “Coolant Temp: Pinout(28)” for Input.
4. Tick the Enable PGN check box and click Save.

5. Repower the A037 to activate the new settings.

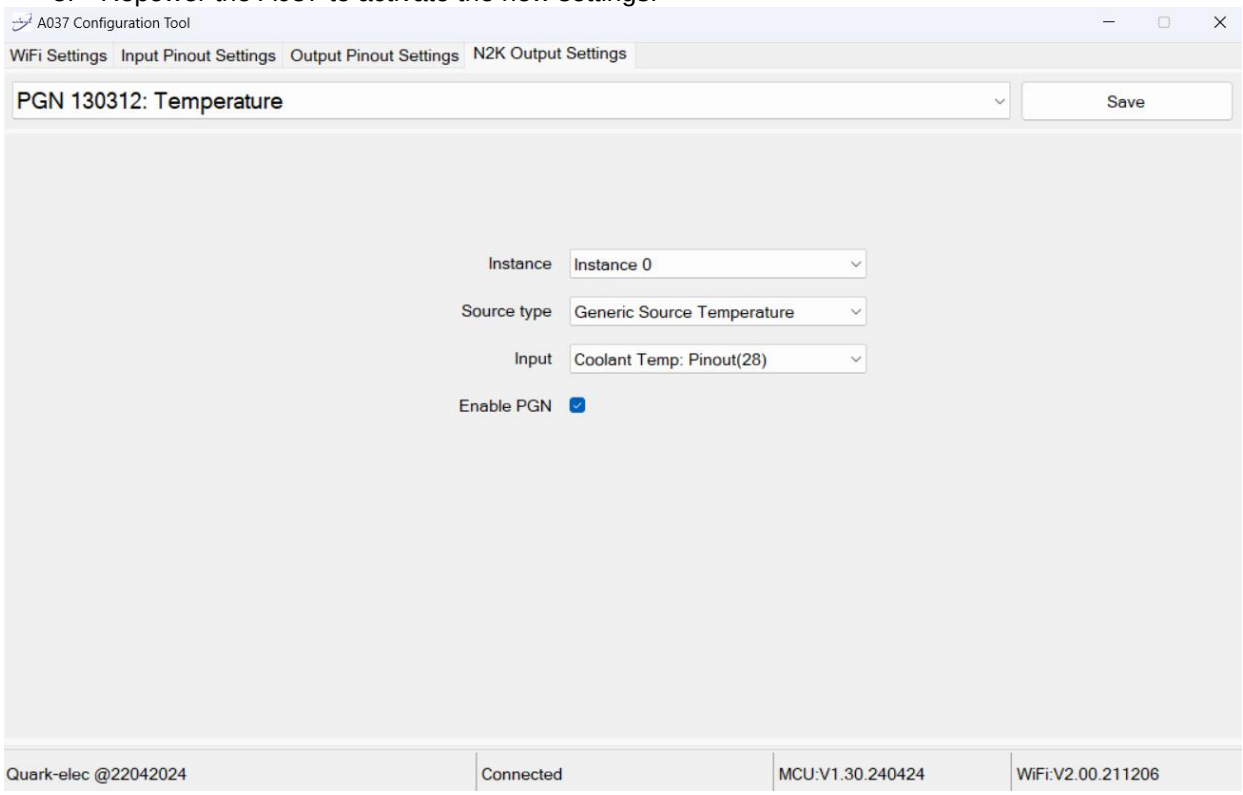

Figure 34 N2K output settings(PGN 130312, Temperature)

11. Air Temp R Input

The A037 features an air temperature sensor input, which allows an RTD (resistance temperature detector) to be connected to it. The resistive temperature sensor's resistance changes as the temperature of air changes around the sensor. This sensor can be used to measure the inside temperature (e.g., engine room temperature, ambient temperature inside the cabin or pilothouse etc.) or the outside temperature on a boat.

11.1. Input Pinout Settings

The resistive air temperature sensor must be connected to Pinout 29 (Air Temp R) and Pinout 23 (GND). We recommend that all electrical devices, measuring equipment and sensors should be installed by trained electrical installers, trained marine electronics technicians or engineers only.

11.1. Calibration & N2K Output Settings

The first step is the calibration of the sensor. The calibration of the air temperature sensor must be done with the sensor connected to the A037. Remember, that to be able to calibrate the sensor accurately, a thermometer will also be required. When calibrating the temperature sensor, we would suggest starting with the lowest temperature or the highest temperature and going through the required temperature range by recording the sensor output and the actual temperature at regular intervals. The measurements should be spread out evenly over the required temperature range.

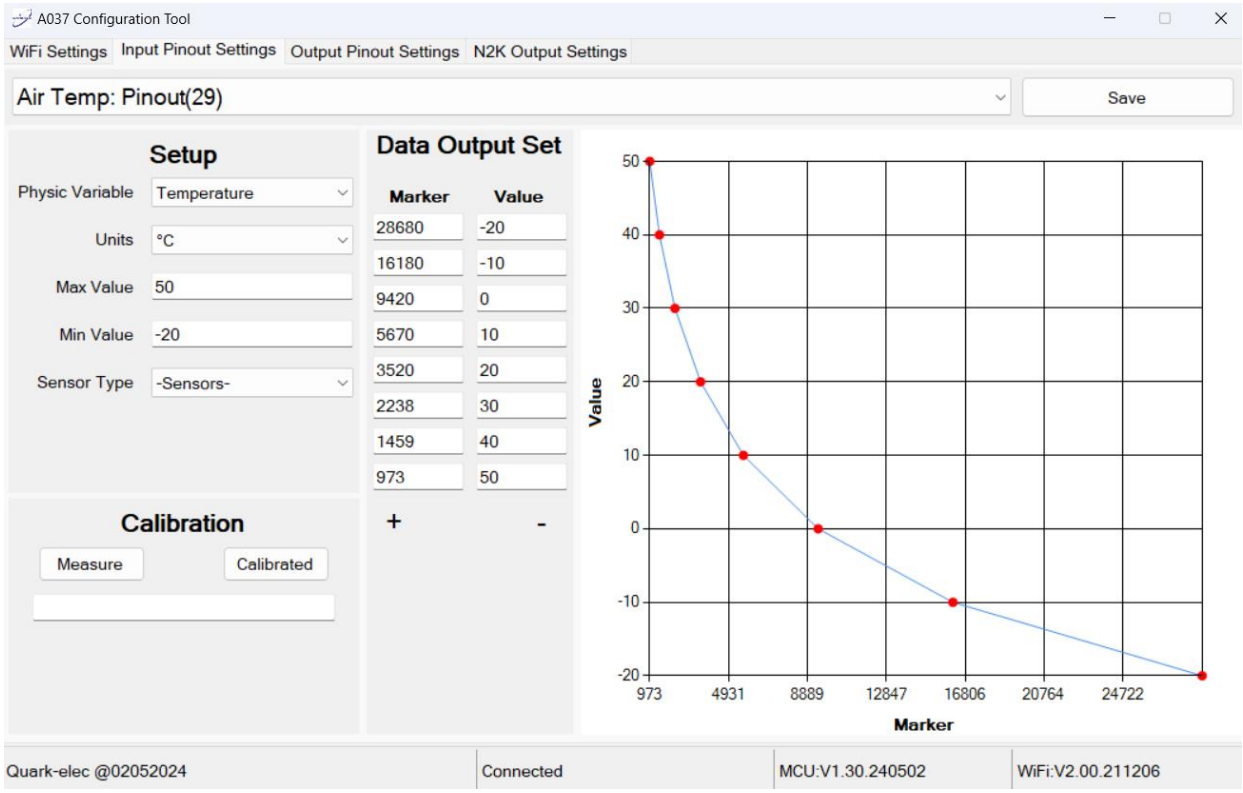

Figure 35 Air Temp output settings

Please follow the steps below to calibrate the temperature sensor:

1. Click on Input Pinout Settings tab and select “Air Temp: Pinout(29)” from the dropdown list.
2. Select the required temperature unit (°K, °F or °C) from the Unit dropdown list.
3. Enter the maximum and minimum temperature values.
4. Select “-Sensors-” from the Sensor Type dropdown list.
5. The Data Output Set table allows 10 [sensor value: actual temperature] data pairs to be added to the table. To add a data pair, click Measure in the calibration section to read sensor data and enter this value into the first row of the Marker column. Read the temperature from your thermometer and enter the temperature value into the first row of the Value column.
6. Wait until the air temperature changes and make a second measurement and add the measured sensor data and the temperature value to the table. Click on the + or the – to add more or to remove data fields. Continue adding data to the table until the Data Output Set table is filled in and covers the required temperature range that is required to be measured.
7. Click Save to save the data and the new settings to the device.

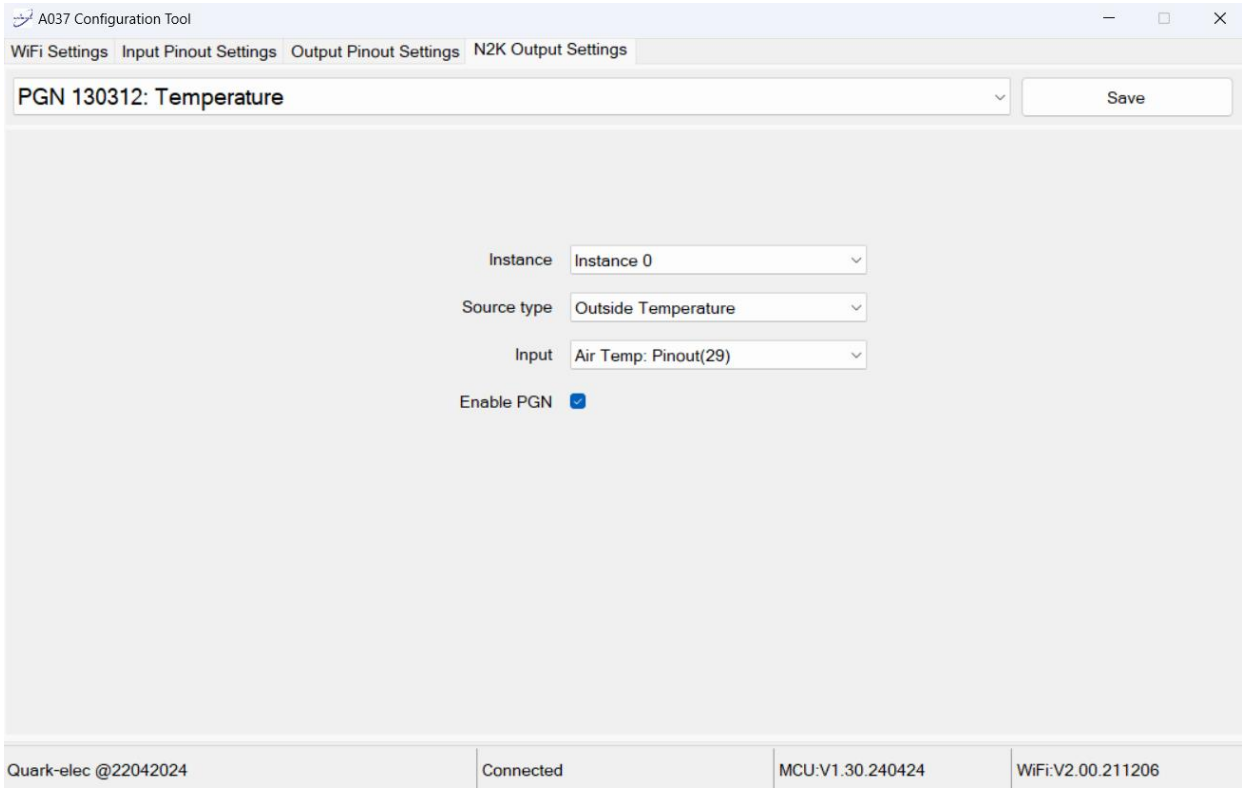

Figure 36 N2K output setting (PGN130312, Temperature)

To set up the N2K output, please follow the steps below:

5. Click on the “N2K Output Settings” and select “PGN 130312: Temperature” from the dropdown list.
6. Select “Instance 0” for Instance if this is the first temperature sensor connected to the A037. If multiple temperature sensors are connected to the A037, the first sensor should have “Instance 0”, the second temperature sensor should have “Instance 1”, etc.
7. Select "Outside Temperature” for Source Type and “Air Temp: Pinout(29)” for Input.
8. Tick the Enable PGN check box and click Save.
9. Repower the A037 to activate the new settings.

12. Oil Pressure R Input

The A037 features an oil pressure sensor input, which allows a resistive oil pressure sensor to be connected to it. The resistive oil pressure sensor’s resistance changes as the pressure of the oil changes. This sensor can be used to monitor the engine oil pressure on a boat.

12.1. Input Pinout Settings

The resistive oil pressure sensor must be connected to Pinout 30 (Oil Pressure R) and Pinout 23 (GND). We recommend that all electrical devices, measuring equipment and sensors should be installed by trained electrical installers, trained marine electronics technicians or engineers only.

12.2. Calibration & N2K Output Settings

The first step is the calibration of the sensor. The calibration of the oil pressure sensor can be done with the sensor connected to the A037. We would suggest setting up the oil pressure sensor based on the characteristic table or characteristic curve published by the manufacturer. Usually this can be found in the installation manual or on the data sheet. The sensor’s characteristic table contains the resistance values of the sensor in relation to the different oil pressure values.

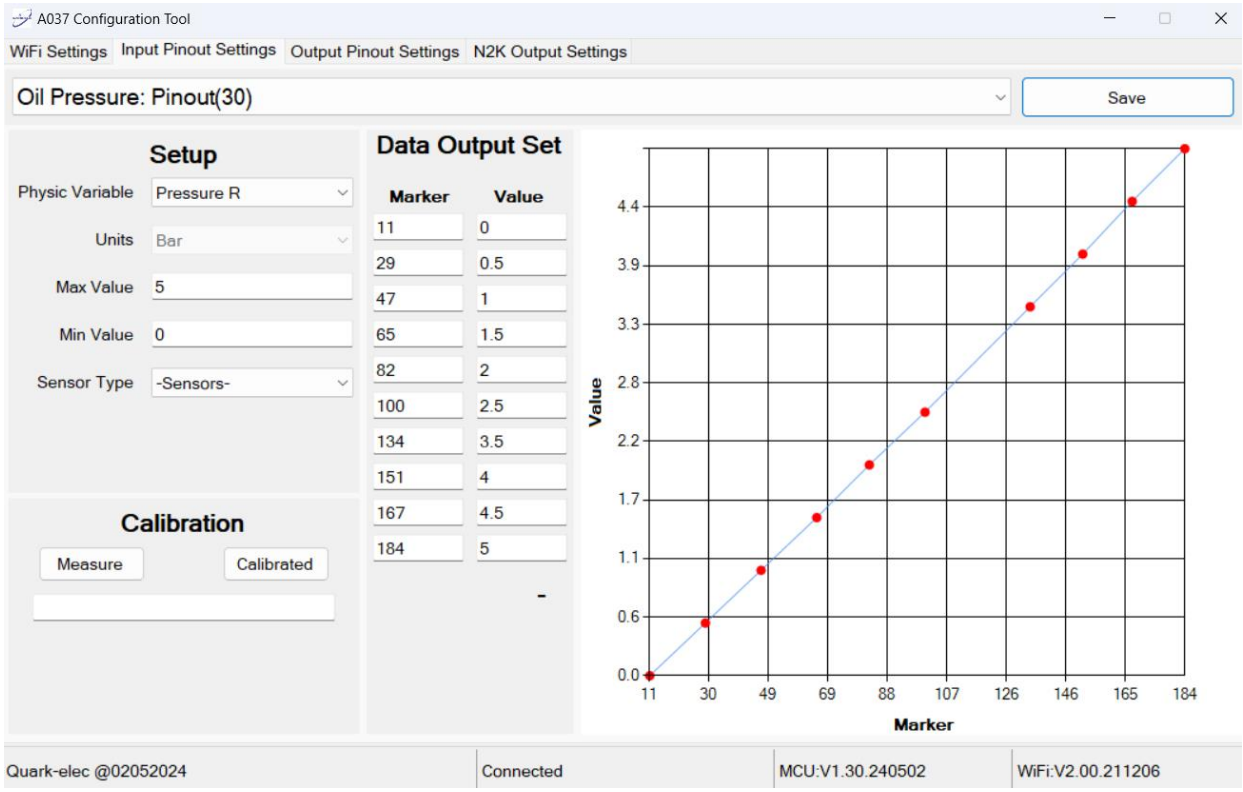

Figure 37 Oil pressure input settings

Please follow the steps below to set up the oil pressure sensor:

1. Click on Input Pinout Settings tab and select “Oil Pressure: Pinout(30)” from the dropdown list.
2. Select “Pressure R” for the Physic Variable.
3. The Unit field will be automatically filled in with “Bar”.
4. Enter the maximum and minimum pressure values.
5. Select “-Sensors” from the Sensor Type dropdown list.
6. The Data Output Set table allows a maximum of 10 [sensor value: actual oil pressure] data pairs to be added to the table. To add a data pair, read the sensor value and the pressure value corresponding to the sensor value from the sensor’s characteristic diagram. Enter the sensor value into the Marker column and the pressure value into the Value column. Start from the lowest value and proceed towards the highest value. Try to spread out the data pairs evenly between the lowest and highest values.
7. Click Save to save the data and the new settings to the device and repower the A037.

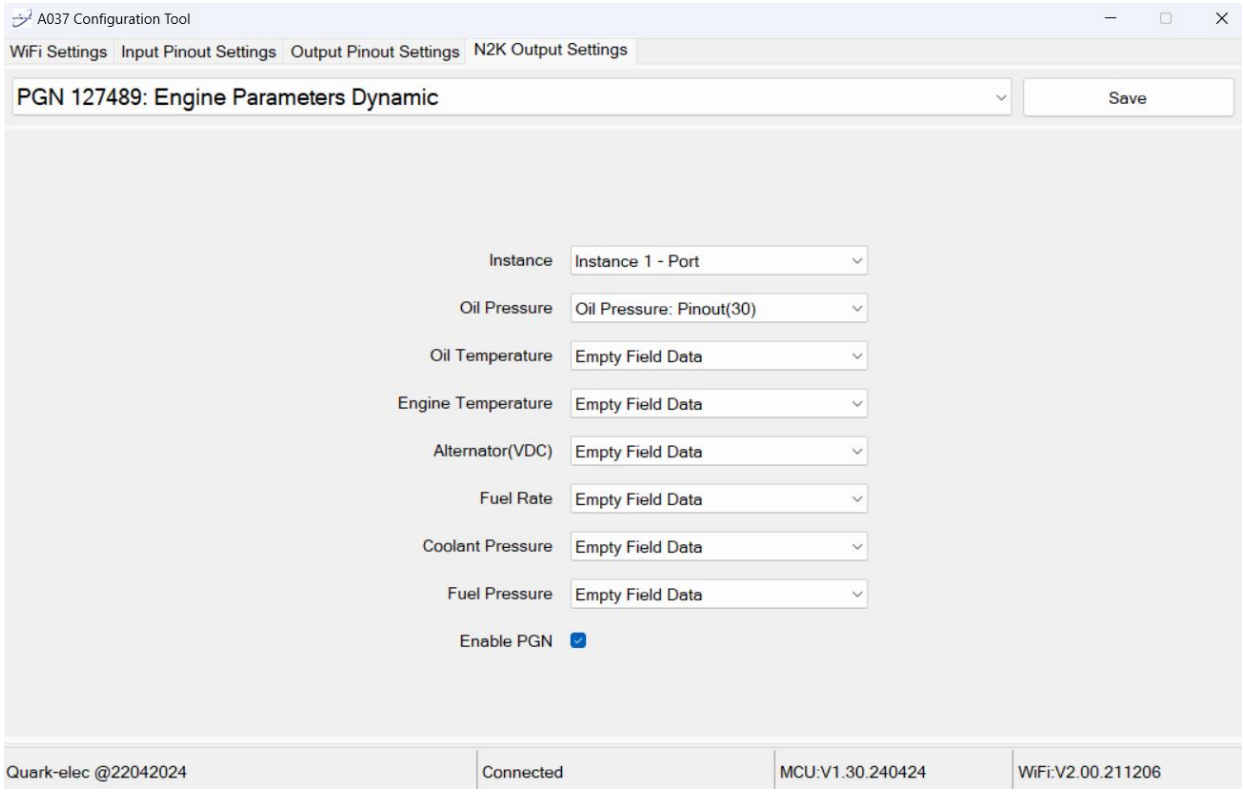

Figure 38 N2K output settings(PGN127489)

To set up the N2K PGN output, please follow the steps below:

1. Click on the “N2K Output Settings” tab and select “PGN 127489: Engine Parameters Dynamic” from the dropdown list.
2. Select “Instance 1 - Port” for Instance if this is the first oil pressure sensor connected to the A037. If multiple oil pressure sensors are connected to the A037, the first sensor should have “Instance 1”, the second pressure sensor should have “Instance 2”, etc.
3. Select "Oil Pressure: Pinout(30)” from the “Oil Pressure” dropdown list.
4. Tick the Enable PGN check box and click Save.
5. Repower the A037 to activate the new settings.

13. Monitor the N2K Output via WiFi

After any setup changes, the A037 needs to be power cycled for the changes to take affect. From time to time, the user may wish to monitor the output raw data. Monitoring software (e.g., SSCOM) can be used if required to check the data stream output by the A037, to ensure that the required PGN is part of the data stream.
For this, connect your computer to the A037’s WiFi network. Launch the monitoring software on your computer. Enter the A037’s IP address and port number into the data monitoring software and click Connect to start monitoring the data stream output by your device.

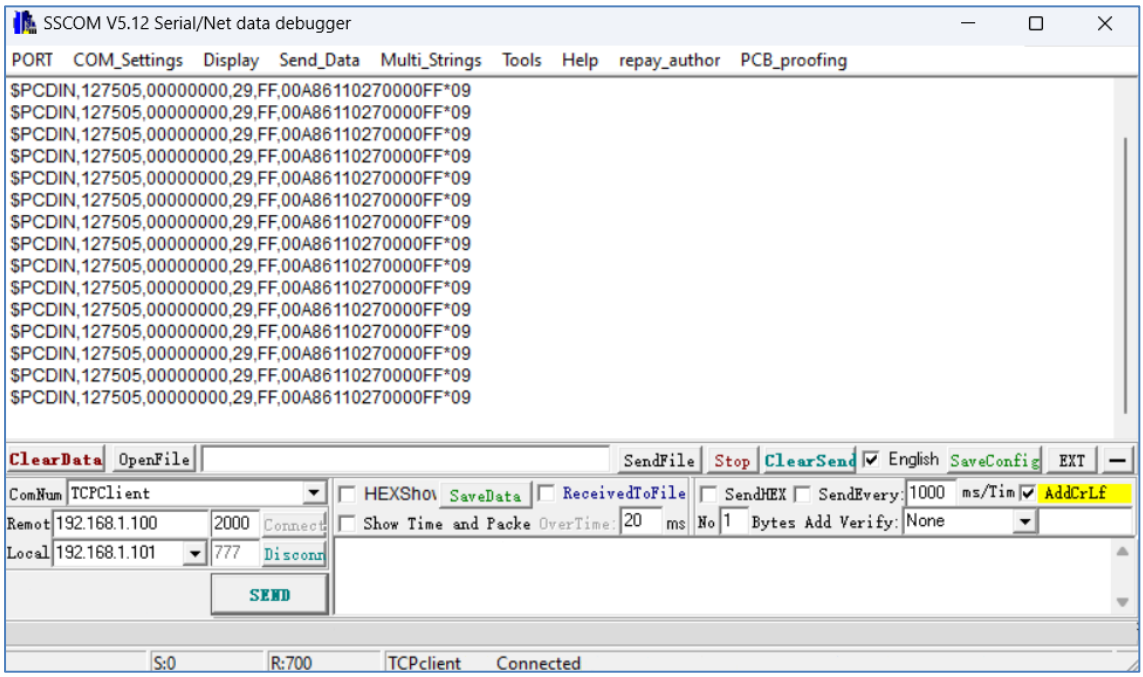

Figure 39 Monitor the output PGNs via WiFi

14. Configuration (via USB)

14.1. WiFi Settings

The A037 allows sensor data to be broadcasted to a laptop, smartphone, or tablet via WiFi in PCDIN format. This is a very helpful feature when marine electronics technicians, engineers and installers are required to do data monitoring, troubleshooting or faultfinding work. The A037 supports the following three WiFi working modes: Ad-hoc, Station and Standby(disabled).

- In Ad-hoc mode, wireless devices can be directly connected to the A037's WiFi network (peer to peer) without a router or access point.
- In Station mode, wireless devices communicate through an access point (AP) such as a router that serves as a bridge to other networks (such as the Internet or LAN). This allows your router to handle the data and traffic from your A037. This data can then be picked up through your router anywhere on your local area network. It is similar to connecting the device directly to the router, but using wireless technology. This way, the mobile devices can receive both the sensor data from the A037 and other AP connections such as Internet.
- In Standby mode, the WiFi connection is disabled.

The A037 is set to Ad-hoc mode as a default setting but can be easily set up to Station or Standby mode through the configuration tool.
To check or to modify the WiFi settings, power up your A037 and connect it to your Windows computer via USB. Download the A037 configuration tool from our website and launch it on your computer. The A037 should automatically connect to the configuration tool and the "Connected" status message together with the device firmware should be displayed at the bottom of the configuration tool window. To view the actual settings of the A037's WiFi adapter, click on the "WiFi Settings" tab and click "Refresh".

14.1.1. WiFi ad-hoc Mode

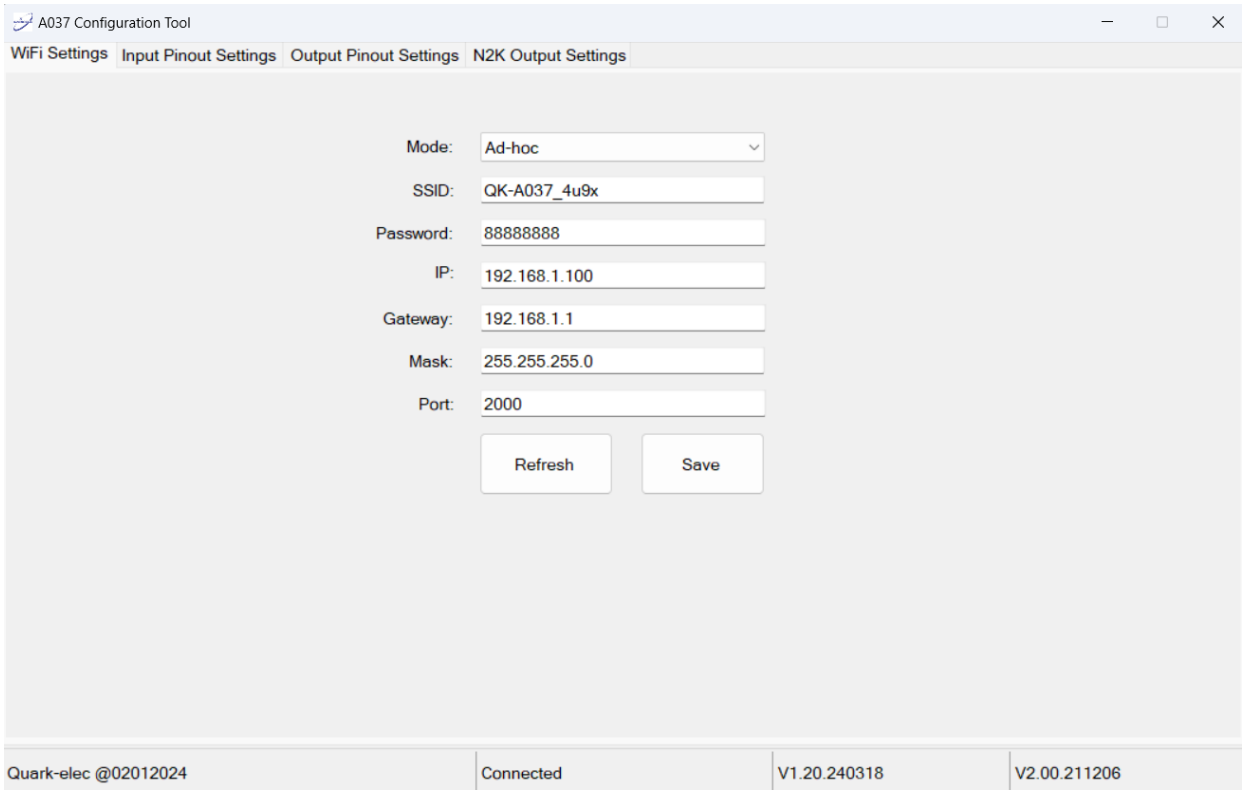

Figure 40 WiFi Settings(Ad-hoc)

To set the A037's WiFi adapter to Ad-hoc mode, select "Ad-hoc" from the Mode dropdown menu. Fill in the rest of the data fields as indicated below:

- SSID: enter the A037's WiFi network name here, e.g., QK-A037_xxxx.
- Password: enter a password here for the A037's WiFi network, this should be between 8 to 12 alphanumeric characters long.
- IP: enter the A037's own IP address here, default IP address is 192.168.1.100.
- Gateway: in Ad-hoc mode filling this field in is not important, the default value is 192.168.1.1.
- Mask: enter 255.255.255.0 here.
- Port: by default, the port number is 2000.

Click Save to save the new settings to the A037 and repower your device. Wait for 10-15 seconds for the A037 to boot up and on your laptop or mobile device scan for a WiFi network with an SSID of QK-A037_xxxx or the new SSID you have entered. Enter the default password of 88888888 or the password you have set and click or tap connect for your device to connect to the A037's WiFi network. A network monitoring software (e.g., TCP/IP Net Assistant) can then be used to view or monitor the PCDIN data stream broadcasted by the A037, by using the IP address and port number defined earlier.

14.1.2. WiFi Station Mode

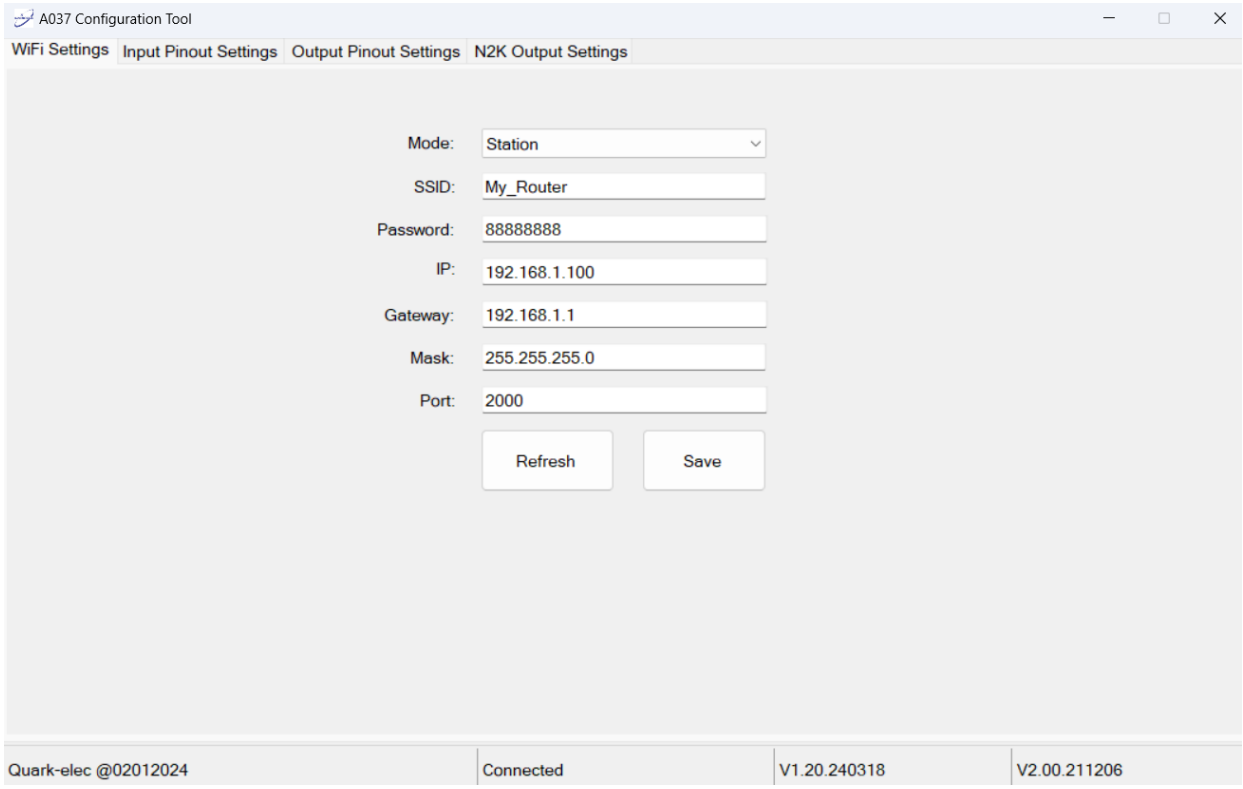

Figure 41 WiFi Settings (Station)

To set the A037's WiFi adapter to Station mode, select "Station" from the Mode dropdown menu. Fill in the rest of the data fields as indicated below:

- SSID: enter your router's WiFi network name here.
- Password: enter the router's WiFi network password here.
- IP: enter the A037's own IP address here, default IP address is 192.168.1.100.
- Gateway: enter the router's IP address here, this can be found usually on a label on the back of the router or in the user manual of your router
- Mask: enter 255.255.255.0 here.
- Port: by default, the port number is 2000.

Click Save to save the new settings to the A037 and repower your device. Wait for 10-15 seconds for the A037 to boot up and on your laptop or mobile device scan for your router's WiFi network and connect to the network using the router's password. A network monitoring software (e.g., TCP/IP Net Assistant) can then be used to view or monitor the PCDIN data stream broadcasted by the A037 to the router by using the A037's IP address and port number.

14.1.3. WiFi Standby Mode

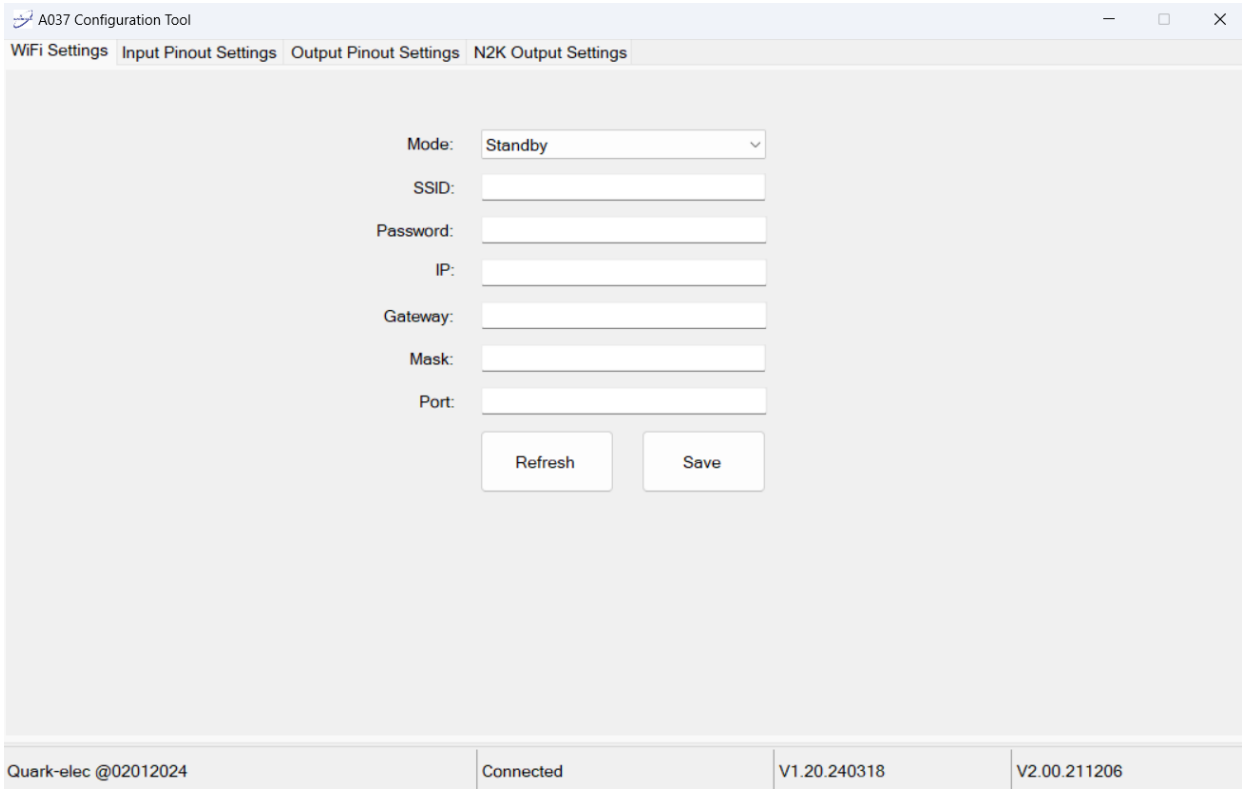

Figure 42 WiFi settings (Standby)

To set the A037's WiFi adapter to Standby mode, select "Standby" from the Mode dropdown menu. Click Save to disable the A037's WiFi adapter and repower your device.

14.2. Input Pinout Settings

To ensure optimal functionality and accurate data transmission on the NMEA 2000 data bus, it is necessary to configure the input sensors properly. This involves accessing and adjusting the settings in the "Input Pinout Settings" and "N2K Output Settings" sections. Additionally, if alarm or alert functions are required for specific input sensors, appropriate configurations must be made in the "Output Pinout Settings".

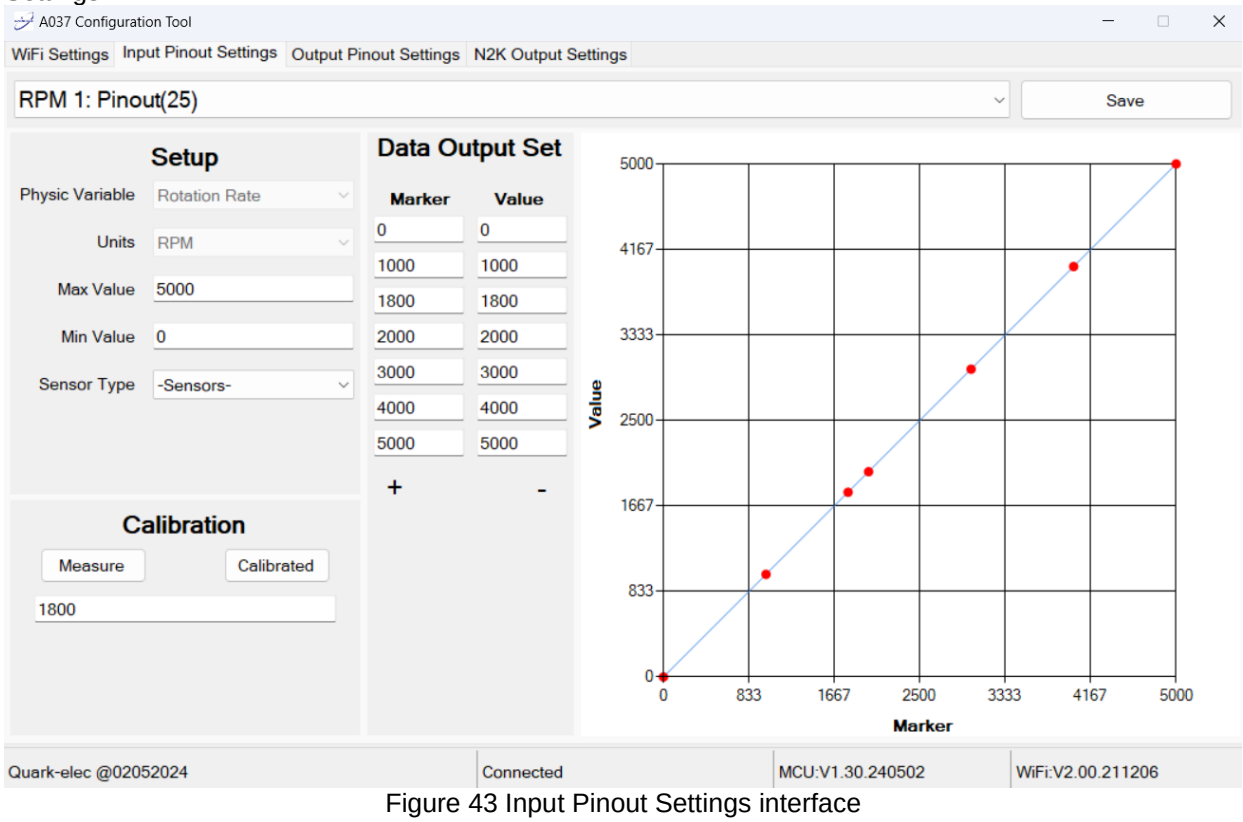

Figure 43 Input Pinout Settings interface

All input pinouts are conveniently listed in the drop-down tab, with detailed setup instructions available in the corresponding sections (Section 4 to Section 11) of the manual for each input sensor. Click “Save” and restart A037 to get the new setting active.

14.3. Output Pinout Settings ---Alarm/Alert Settings

The A037 has two external alarm output and two relay output connectors. All these output pinouts can be connected to various alert devices (e.g. warning light, speaker) or relays. The only difference is the alarm output supports up to 12V interface devices, while relay only works with 5V.

The A037 can be configured to trigger an external alert or alarm devices which can be accessed from the configuration tool, by choosing Output Pinout Settings.

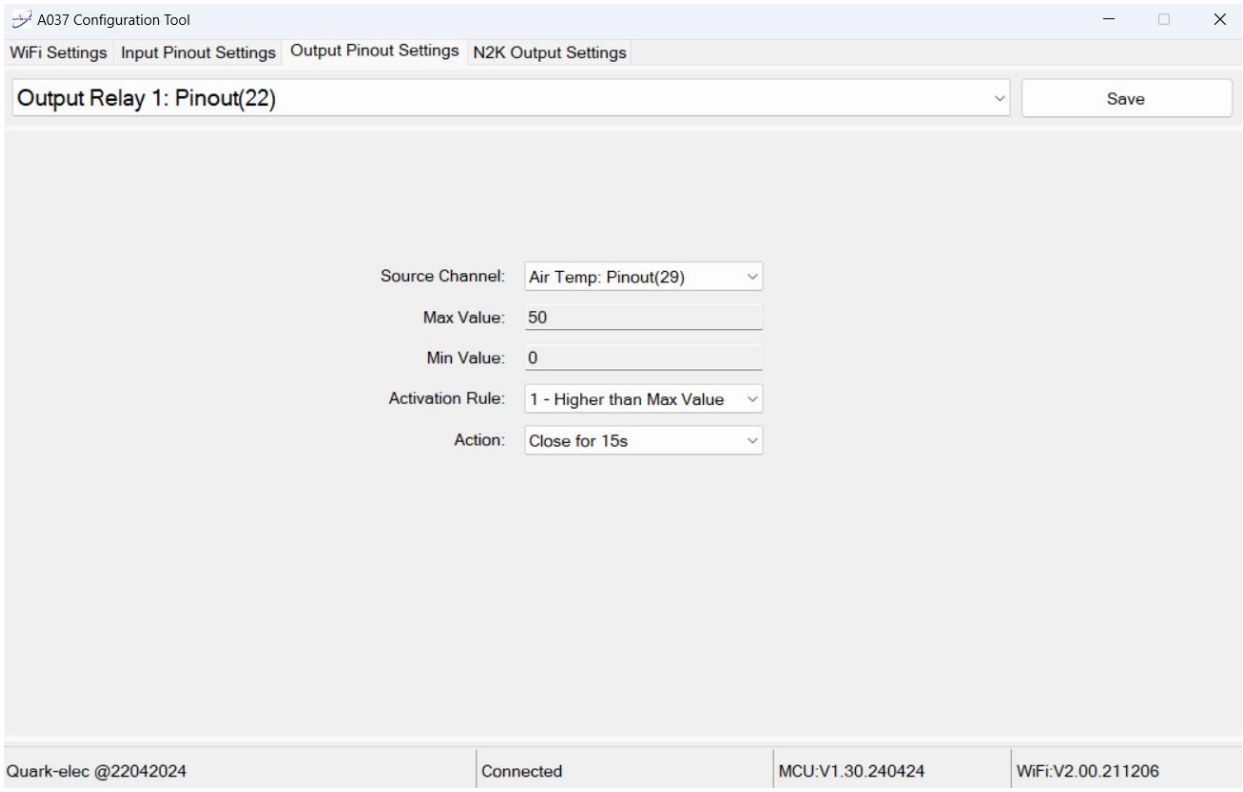

Figure 44 Output pinout settings

With the right settings, the A037 can monitor its inputs and trigger external alerting devices based on different pre-set conditions.

1. The first step in setting up a relay or alarm output is to ensure that the required Input Pinout setting has been set up correctly. This can be done as shown in chapters 4 to 12.
2. The next step is to click on the Output Pinout Settings Tab and select the required alarm or relay pinout from the dropdown list. In our example this is “Output Relay 1: Pinout(22)”.
3. Select one of the available options from the Source Channel list. We have selected “Air Temp: Pinout(29)”. The following inputs can be selected from the screen:

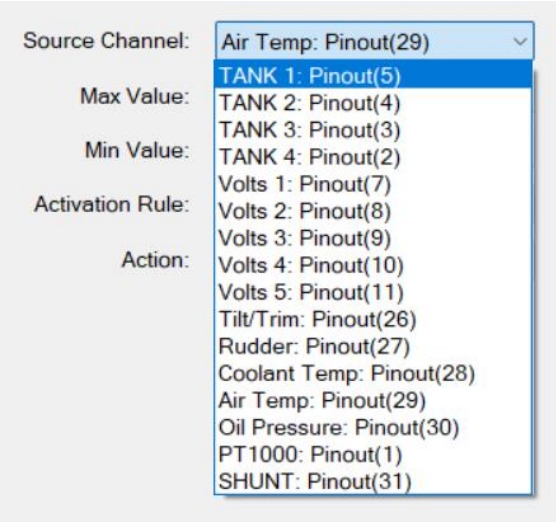

Figure 45 Output pinout settings (Source Channel)

4. The maximum and minimum values will be filled in automatically based on the Input Pinout Settings configuration of the chosen input.
5. Next, choose the required Activation Rule from the dropdown list:

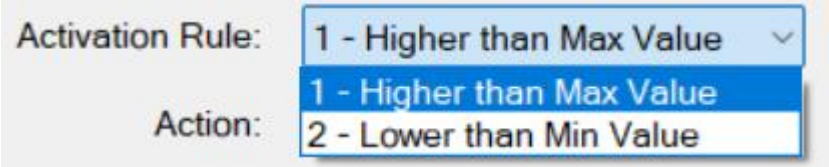

Figure 46 Output pinout settings (Activation rule)

In our example “Higher than Max Value” has been selected. In this case, if the air temperature reading reaches the maximum value or goes above the maximum value, the relay will be activated.

6. The last step is to select one of the available options for Action. These are the following:

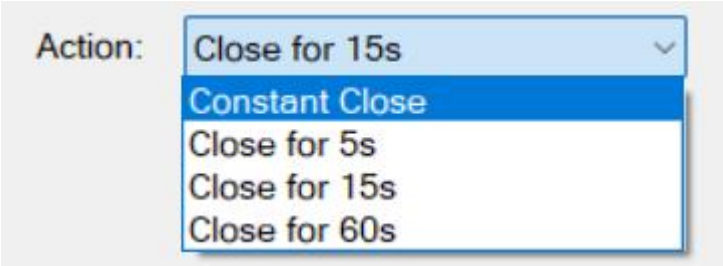

Figure 47 Output pinout settings (Action type)

7. Click Save to save the new settings to your device and repower the A037.

14.4. N2K Output Pinout

The A037 outputs the following PGNs when a related sensor connected and proper configured.

NMEA 2000 PGN	HEX code	Function
127245	1F10D	Rudder Angle
127488	1F200	Engine Parameters, Rapid Update (RPM, Boost pressure, Tilt/trim)
127489	1F201	Engine Parameters, Dynamic (Oil pressure & Temperature, Engine Temperature, Alternator potential, Fuel rate, Coolant pressure, Fuel pressure)
127505	1F211	Fluid Level (Fresh Water, Fuel, Oil, Wastewater, Live well, Black water)
127508	1F214	Battery Status - Battery Current, voltage, case temperature
130312	1FD08	Temperature
130313	1FD09	Humidity

130314	1FD0A	Pressure

To enable the A037 to output data via the NMEA 2000 network, you must ensure that the “N2K Output Settings” have been configured correctly.
All supported N2K PGNs are listed in the drop-down tab, with detailed setup instructions available in the related input sensor sections (Section 4 to Section 11).

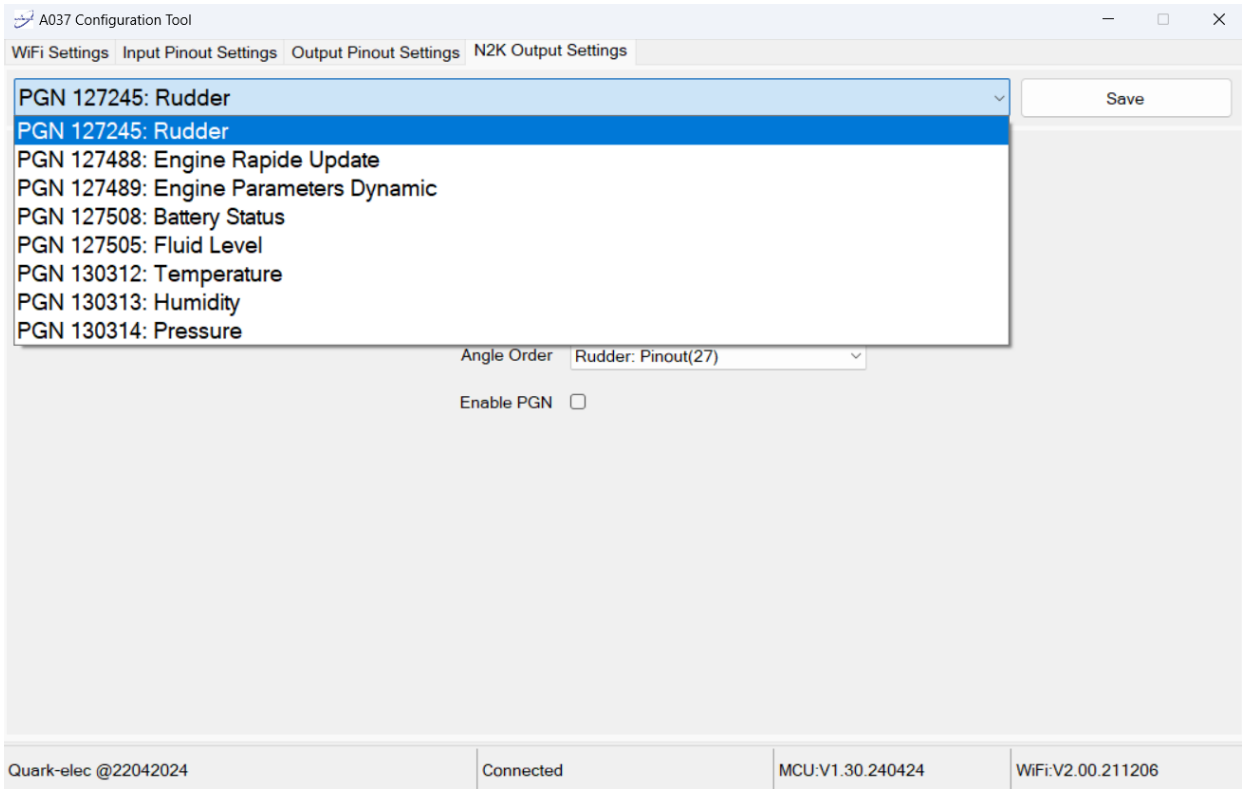

Figure 48 N2K output pinout settings(PGN type)

After settings have been chosen, click “Save” and restart A037 to enable the changes to take place.

15. Upgrading Firmware

The current firmware version can be verified through the configuration tool (When connected, the firmware version will show in the bottom of the Configuration software window).
The A037 operates with two firmware versions: one for the main board and an additional for the WiFi module. Upgrade the main board firmware (MCU) to access the latest features. The WiFi Module must be updated **ONLY** when instructed to do so by Quark-elec.

The user must take great care to ensure the correct firmware version is being applied to the appropriate module. Improper operation may result in the module freezing. In such cases, the A037 will need to be returned to us for repair to restore functionality.

To upgrade the MCU firmware,
1. Power up your A037 and then connect it to a Windows computer via USB.
2. Run the Configuration software.
3. Ensure the configuration tool is connected to the A037, and then press Ctrl+F7.
4. The following message will pop up on your screen:

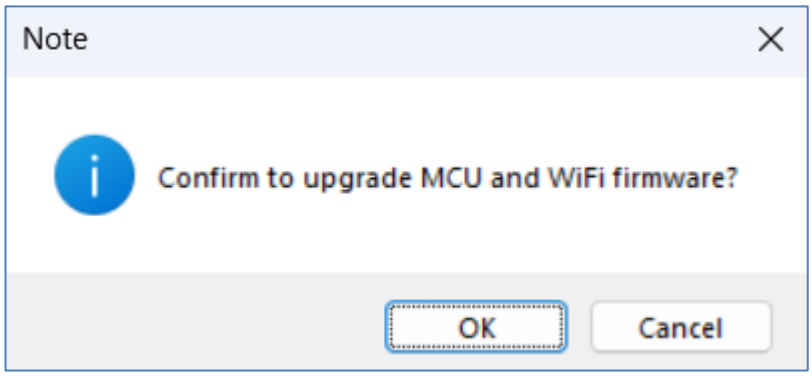

Figure 49 Upgrading firmware

Click OK to continue with the firmware update.

5. Two new windows will pop up with a disk drive named “STM32(APP)” and the other called STM32(WiFi) or similar. Copy the firmware into STM32(APP) drive and wait around 10 seconds to make sure the full file has been copied. In no circumstances must you copy to STM32(WiFi) as this could leads to freezing the product.
6. Close the window and the Configuration software.
7. Re-power the A037, and the new firmware will be active.

16. Factory Reset

Due to different reasons, it might be required to restore the A037 to its factory settings. This might be required if the A037 is transferred to another boat equipped with different type of sensors or if the boat is being refitted with a new set of sensors and devices. In these cases, the CTRL+F5 key combination can be used to delete all settings, instead of having to reset all settings manually.

To restore the A037 to its factory settings, please follow the steps below:

1. Connect your A037 to your computer via USB and power up your device.
2. Launch the configuration tool on your computer.
3. Ensure that the “Connected” status message is being displayed by the configuration tool, together with the actual firmware version of the A037.
4. Press CTRL+F5 (on laptops CTRL+Fn+F5 key combination will have to be pressed).
5. A message will pop up on your screen asking if you would like to restore your device to its factory settings. Please confirm.
6. Wait for a few seconds, a new message will pop up on the screen confirming that your device has been restored to its factory settings.
7. Repower your A037.

Your device should now be restored to its factory settings.

17. Specification

Item	Specification
DC supply	9V to 35V
Operating temperature	-5°C to +55°C
Storage temperature	-25°C to +70°C
DC supply	9V to 35V
Resistance input	0 to 600 Ω
Voltage input	+/-36V
Resistance & Voltage input accuracy	≤ 1%
Tacho input impedance	≥100 Kohm
Tacho input pulse range	4 to 20kHz

Tacho accuracy	≤ 1%
Alarm/Relay output	Open Collector(OC) output
Maximum supply current	145mA
NMEA data format	ITU/ NMEA 0183 format
Shunt input	100mV current shunt
WiFi mode	Ad-hoc and Station modes on 802.11 b/g/n
Security	WPA/WPA2
Equivalent load	3 LEN as per NMEA 2000
Environmental Protection	IP20

18. 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.

19. Disclaimer

This product is designed to enable the user to monitor engine data and safety parameters and should not be used as a sole solution and must be paired with physical checks. The user must ensure routine safety checks and procedures are upheld. 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 user or their estate for any accident, loss, injury or damage caused by use of this unit.

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.

20. Document History

Issue	Date	Changes / Comments
1.0	20-04-2024	Initial release

21. Glossary

IP: internet protocol (ipv4, ipv6).
IP Address: is a numerical label assigned to each device connected to a computer network.
NMEA 0183: is a combined electrical and data specification for communication between marine electronics, where data transfer is one-directional. Devices communicate through talker ports being connected to listener ports.
NMEA 2000: is a combined electrical and data specification for networked communication between marine electronics, where data transfer is one-directional. All NMEA 2000 devices must be connected to a powered NMEA 2000 backbone. Devices communicate both ways with other connected NMEA 2000 devices. NMEA 2000 is also known as N2K.
ADC: Analogue-to-Digital Converter
Router: A router is a networking device that forwards data packets between computer networks. Routers perform the traffic directing functions on the Internet.
WiFi - Ad-hoc mode: devices communicate directly with each other without a router.
WiFi - Station mode: devices communicate by going through an Access Point (AP) or router.
PGN: Parameter Group Number – refers to numerical IDs used to define different data groups used by NMEA 2000 devices to communicate.
MFD: Multi-function Display – integrates and can control various marine electronic devices including chart plotters, radars, fish finders, GPS receivers, AIS receivers or transponders, etc.
RPM: revolutions per minute is a unit for rotational speed.
PT1000: is a type of resistance temperature sensor.
DS18B20: is a digital temperature sensor. It is widely used due to its simplicity and accuracy.
DHT11: is a digital temperature and humidity sensor used for environmental monitoring.
LED: a light-emitting diode is a semiconductor device that can emit light when electric current flows through it.
SHUNT: a shunt is an electrical device that allows the measurement of electrical current in a circuit.

22. 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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