Actisense®

# NGW-1

NMEA 2000 to NMEA 0183 Gateway

# User Manual

For all variants:
NGW-1-ISO, Rev A to C
NGW-1-ISO-AIS, Rev A to C
NGW-1-STNG, Rev A to C
NGW-1-USB, Rev A to B

Issue 2.00

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The **Actisense** NMEA 2000 to NMEA 0183 Gateway (**NGW-1** and its variants) are intended for use in a marine environment, primarily for below deck use. If an **NGW-1** unit is to be used in a more severe environment, such use may be considered misuse under the seller's guarantee.

The **NGW-1** has been certified to comply with the European directive for Electromagnetic Compatibility (EN60945), and is appropriately CE marked. Operation of the unit should be in conjunction with appropriate CE approved shielded connectors and cabling used in accordance with the CE directive EN60945. Any EMC related issues should be reported to **Active Research Limited** immediately to allow the company to rectify or resolve EMC related problems in accordance with its obligations under EN60945.

**When using this document, please note the following:**

The products described in this manual and the specifications thereof may be changed without prior notice. To obtain up-to-date information and/or specifications, contact **Active Research Limited** or visit the **Actisense website (www.actisense.com)**.

**Active Research Limited** will not be liable for infringement of copyright, industrial property right, or other rights of a third party caused by the use of information or drawings described in this manual.

**Active Research Limited** will not be held responsible for any damage to the user that may result from an accident during operation of this unit when used in accordance with this document.

# The NGW-1 Product Range

The **NGW-1** range allows NMEA 0183 electronic equipment to be connected to a vessel's NMEA 2000 network. This will allow equipment installers to adopt the NMEA 2000 network early, whilst connecting any existing NMEA 0183 devices to the new bus standard.

The NMEA Gateway can transfer data from an NMEA 0183 source and place that data on the NMEA 2000 bus, or it can take NMEA 2000 data from the NMEA 2000 bus and make it available to the NMEA 0183 instrument.

Full information on the complete **Actisense** product range and supporting software packages can be found on the **Actisense website (www.actisense.com)**.

# Software Updates

The **NGW-1** units have built-in firmware which is held in "flash" memory, allowing quick and easy upgrades using the latest **NGW-1 ActiPatch**.

It is highly recommended that the firmware is updated to the latest version, which can be found at **www.actisense.com/NGW-1/Downloads.php**. Supporting software may also be available for your device.

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# Connecting to the NMEA 2000 Network

**Actisense** supplies a pre-fitted four-core screened cable for the NMEA 2000 connection, fitted with a male micro-fit connector. Simply connect the cable to the network backbone using a T-peice connector.

### NMEA 2000 Networks

NMEA 2000 devices will only communication with each other when connected to a powered and correctly terminated NMEA 2000 network. It is not enough to simply connect two NMEA 2000 devices directly together.

All networks need to be powered and terminated correctly to allow data to be transmitted on the network. T-Peices are needed to connect each device to the network. Additional cable lengths can be used between any of the connectors to extend the length of the network.

### NMEA 2000 Minimum Network Requirements

All NMEA 2000 networks require 12 VDC to be supplied.

- 1 x Power-T
- 2 x Terminating Resistors
- 2 x T-Peices (one per connected device)

All the required network parts are supplied by **Actisense** **www.actisense.com/A2K**.

**Note:** Refer to **"Status LEDs" on page 10** for LED behaviour.

# Connecting to a SeatalkNG Network

The **NGW-1-STNG** is a standard **NGW-1-ISO** unit with the addition of a Seatalk$^{NG}$ to NMEA 2000 adapter cable supplied in the box. Connect the adapter between the NMEA 2000 cable of the **NGW-1** and the Seatalk$^{NG}$ backbone. Seatalk$^{NG}$, like NMEA 2000, requires a fully functional network to connect devices together. It is not possible to connect the **NGW-1** directly to a Seatalk$^{NG}$ device without a powered and terminated network being present. Refer to your Raymarine® product manual for instructions on creating your Seatalk$^{NG}$ network.

# Connecting to a USB Port

Simply connect the USB cable on the **NGW-1** to the PC port and install the drivers. A USB to serial converter cable can be used to connect the non USB variants to a PC USB port. For wiring the converter cable refer to **"Connecting to an RS232 (PC) Port" on page 7**.

**Note:** Refer to **"Status LEDs" on page 10** for LED behaviour.

### USB Driver Installation

Windows 7 will automatically install the drivers from Windows Update (an active Internet connection is required). If the PC is not connected to the Internet, the '**Update Driver Software**' option in Device Manager will need to be used to install the USB drivers manually.

Windows versions that use the '**Found New Hardware Wizard**' should be directed to automatically search for the best driver. Include '**Search Windows Update**' or ensure the Actisense CD is inserted.

For other operating systems and step-by-step guides refer to the 'USB Install Manual' at **www.actisense.com/NGW-1/Downloads.php**.

### Windows Port Number Configuration

The port number for the **NGW-1** can be found in Windows '**Control Panel->System->Device Manager**' under '**Ports (COM & LPT)**'. Find the **NGW-1** in the list for the USB variant. When using a USB to serial converter cable you will see the name of the converter cable with no reference to the **NGW-1**. If you have connected to an RS232 port on the PC this will be listed as a 'Communications Port', again with no reference to the **NGW-1**.

To change this number, double click the **NGW-1** and select the '**Port Settings**' tab. Click the '**Advanced**' button and change the port number to the one required.

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# Connecting a Standard NMEA 0183 Device

**Actisense** supplies a pre-fitted four-core screened cable for connecting devices that comply to the NMEA 0183 specification. **Actisense** ISO-Drive output circuitry and OPTO input circuitry allows many different types of device to be connected without the need for configuration. Voltage levels are managed automatically as well as accepting both differential and ground referenced connections safely.

The standard wiring connection can be seen in **"Figure 1 - NMEA 0183 Connections"**.

**Note:** Refer to **"Status LEDs" on page 10** for LED behaviour.

| Wire Colour | NMEA 0183 | PCB Label |
|---|---|---|
| Shield/Screen | Ground | ISO GND |
| Blue | ISO Out B / - | OUT B / - |
| White | ISO Out A / + | OUT A / + |
| Black | Opto In B / - | IN B / - |
| Red | Opto In A / + | OUT A / + |

**Table 1 - NMEA 0183 Connections**

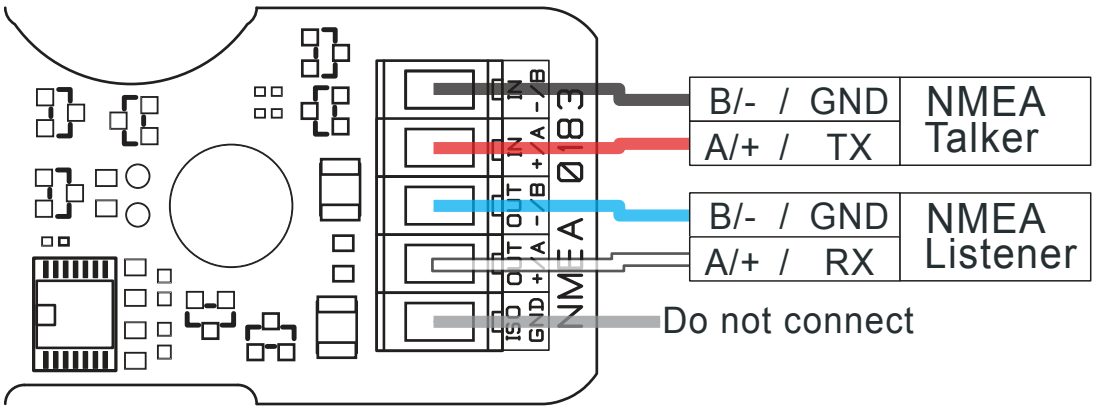



**Figure 1 - NMEA 0183 Connections**

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# Connecting to an RS232 (PC) Port

The **NGW-1** can be connected to a PC communications (RS232) port using the supplied cable and a connector with the following specification:

**1.** A minimum of 3-cores are required in a shielded cable. Higher quality cable will naturally yield higher performance/ higher Signal-to-Noise Ratio (SNR). Most typical cables have two twisted pairs inside. In this case, use one pair for the **TX** line and one for the **RX** line. Use the spare wire in each pair as ground, and connect the cable shield to ground only at the computer end.

**2.** A DB9 (9 pin D-type) type female (socket) connector for the PC end of the cable.

**3.** The **OUT +/A** of the NGW-1 should be connected to the **RX** of the computer (standard 9 pin D-type, pin 2) and the NGW-1 **IN +/A** should be connected to the **TX** of the computer (standard 9 pin D-type, pin 3).

**4.** Connect the **IN -/B** and **OUT -/B** together and connect to the PC's serial port ground (standard 9 pin D-type, pin 5).

**Note:** To change the port number used in Windows refer to **"Windows Port Number Configuration" on page 5**.

**Note:** Refer to **"Status LEDs" on page 10** for LED behaviour.

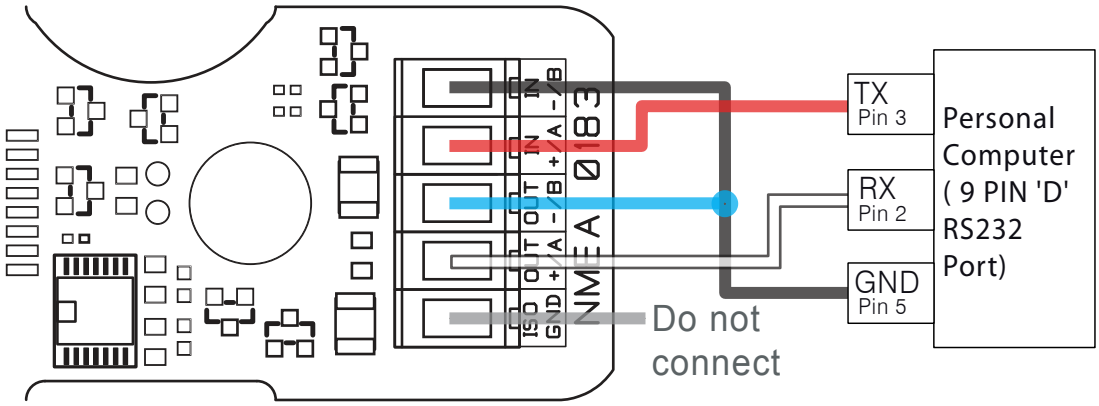



**Figure 2 – PC / RS232 Port Connections**

# Connecting to an RS485 (IEC 61162-2) Listening Device

The ISO-Drive output of the **NGW-1** can be connected to an RS485 Listener that requires differential drive plus a ground connection as shown in **"Figure 3 – RS485 / IEC 61162-2 Port Connections"**.

**Note:** Refer to **"Status LEDs" on page 10** for LED behaviour.

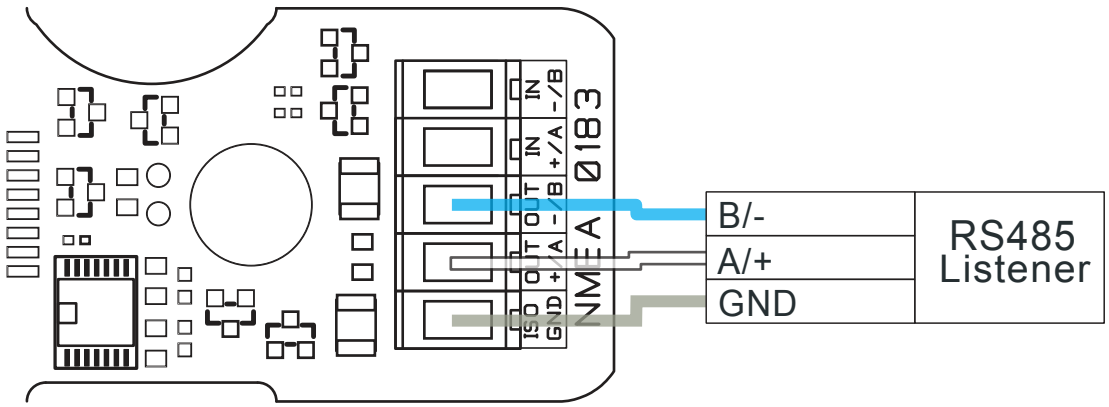



**Figure 3 – RS485 / IEC 61162-2 Port Connections**

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# Connecting a Custom Cable

It is possible to replace the supplied cables with custom cables for different applications. The cables are connected inside the case using screw terminals so that it is easy to swap out the existing cable for one more suited to the installation requirements. A spare cable gland is supplied for strain relief and splash proofing.

## Opening the NGW-1 Case

To open a **NGW-1** case, remove the two screws in the base of the unit, then carefully lift off the top of the case. The cable glands must be slid out from the top of the case in order to access the internal connections. Pulling the lid off too roughly without sliding the glands out may damage to the cable connections. The **NGW-1** circuitry will be left attached to the base of the unit and the two supplied cables attached to their connectors.

**Note:** When opening an **NGW-1** case, be aware that the circuitry inside is not 100% protected against static electricity. Please ensure that you use precautions against static damage by only touching the connector block and by holding the unit by its plastic base.

**Note:** Any damage caused to the unit while the case is open is not covered by the guarantee.

## Custom NMEA 2000 Cable

Replacement NMEA 2000 cable is required to conform in full to the NMEA 2000 specification and be no longer than 6 metres (maximum drop length).

Refer to **"Figure 4 - NMEA 2000 PCB Connections"** and **"Table 2 - NMEA 2000 Connection Table"**.

**Note:** The colours given relate to the supplied **Actisense** cable and the NMEA 2000 standard cable definition.

| Wire Colour | NMEA 2000 | PCB Label |
|---|---|---|
| Shield/Screen | Shield | SHIELD |
| Blue | Net Low | NET LO |
| White | Net High | NET HI |
| Black | Net Common | NET COM |
| Red | Net Supply | NET SUP |

**Table 2 - NMEA 2000 Connection Table**

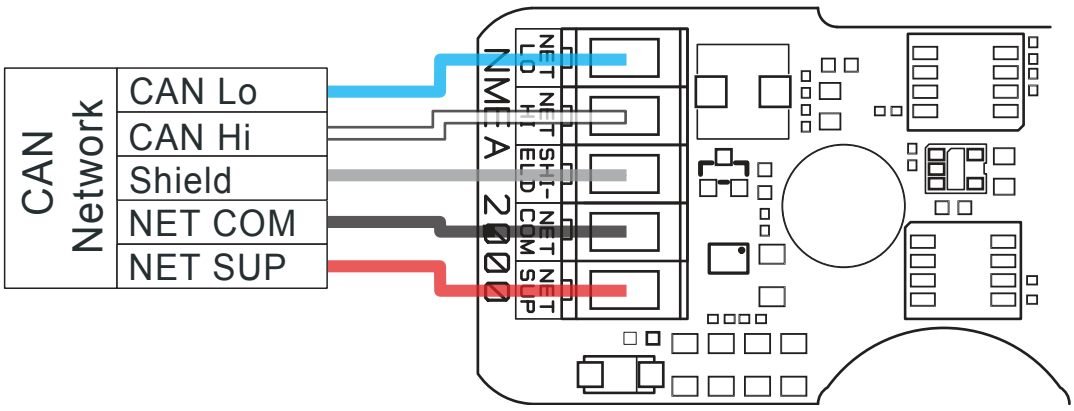



**Figure 4 - NMEA 2000 PCB Connections**

## Custom NMEA 0183 Cable

Ideally the cable should be a shielded twisted pair for both the input and output connections. The maximum length of the cable is dependent on the input/output specifications of the connected NMEA 0183 device and the cable quality. Using an unsuitable cable may result in data loss. For wiring instructions refer to the diagrams for the relevant connection option from those described from **page 6** onwards.

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# Configuring the NGW-1

There are currently only a few configuration options available with the **NGW-1**. All of which are provided in the NMEA Reader software package **www.actisense.com/NGW-1/Downloads.php**.

The configuration options in NMEA Reader are explained in this manual, for more in depth instructions for using the program download the Reader Manual on the link above.

## Configuring using NMEA Reader

### Connecting the NGW-1 to NMEA Reader

Connect the NGW-1 to the PC (by USB cable or RS232 cable depending on variant) and run the NMEA Reader program. Select the port number for the **NGW-1** and select the Baud rate. The default Baud rate for the NGW-1 is 4800 with the standard Firmware and 38400 with the AIS Firmware. NMEA Reader will attempt to communicate with the **NGW-1**. Once successful the '**Hardware Config**' tab will become available and the green LED indicator next to the Baud selection will flash.

**Note:** You must open the port at the Baud rate the **NGW-1** is configured to use, there is no auto Baud feature.

### Changing the Baud rate

At the bottom of the '**Hardware Config**' tab there is a '**Port Config**' section. Under '**Serial Baud Rate**' there are 2 drop down boxes, one of which is disabled. Select the new Baud rate you require for the device and click '**Apply**'. The new setting will be sent to the **NGW-1** which will reboot. NMEA Reader will re-open the connection at the new Baud rate.

**Note:** Do not make any other configuration changes when setting the Baud rate. Some changes may be lost when setting the new Baud rate.

**Note:** Only the USB variant of the **NGW-1** is capable of Baud rates above 115200. Do not change the Baud rate of the other varients to above 115200. Doing so will prevent the NGW-1 from communicating and may require the return of the unit for repair.

### Special ARL P-codes

The **Active Research Ltd** P-codes option turns on or off the special **Actisense** system status sentences from the 0183 output. The default is the '**permanently disabled**' to conserve output bandwidth. Once you have selected the new behaviour click '**Apply**'.

### Selecting PGNs for conversion

You can choose which PGN's are received from or transmitted to the NMEA 2000 bus. Currently all available PGN's are turned on by default in the **NGW-1** so all possible translations will occur. Selecting additional PGNs will have no effect; only conversions seen in the conversion list document **www.actisense.com/NGW-1/Downloads.php** will be converted.

Selecting AIS PGN's in an NGW-1 running standard firmware will not enable those AIS conversions. Instead, the firmware in the NGW-1 must be changed to the AIS firmware which will automatically set the PGN Enable lists up and set the baud rate to the AIS default of 38400 baud.

The conversions are chosen by ticking the enable box in the relevant list and then clicking the '**Apply**' button. You can revert to the default list for the installed Firmware by clicking the '**Apply defaults to hardware**' button, there is no need to click the '**Apply**' button when restoring the defaults.

Turning off PGN 127251 from the Rx list will stop ROT sentences appearing on the NMEA 0183 side of the NGW. However, turning off PGN 128267 from the Rx list will stop both DPT and DBT sentences appearing on the NMEA 0183 side of the **NGW-1**.

There is currently no way of choosing DPT or DBT, you get both or neither by editing the Rx PGN list.

The Tx list works in a similar way, DBT and DPT are used to generate PGN 128267 you cannot choose data from one sentences and not the other.

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# Troubleshooting Guide

This guide will concentrate on all relevant troubleshooting issues, that may arise on your **NGW-1**. Therefore, the cables between the **NGW-1** hardware and any other devices should be checked as a matter of course, before continuing with this guide.

## Status LEDs

The **NGW-1** hardware has two bright LEDs that can be seen through the case to indicate when data is received from either the NMEA 0183 device or an NMEA 2000 network connection. It is an important point to note that these two LEDs can only show when their respective data is **RECEIVED**; it is not possible to show both transmit and receive simultaneously on a single colour LED.

The NMEA 2000 LED indicates that messages in the Rx Enable list are being received from the NMEA 2000 bus.
The NMEA 0183 LED indicates that valid NMEA 0183 data is being received. Note that this data may not be in the Tx enable list, so it is possible for the NMEA 0183 LED to flash without any data being transmitted to the NMEA 2000 bus. The purpose of this LED is to assist with Baud rate detection and the correct wiring of the device.

These LEDs can be used to debug potential problems.

| Behaviour | Solution |
|---|---|
| USB only: The LEDs do not light | The USB driver has not been installed correctly, refer to **"USB Driver Installation" on page 5** |
| The NMEA 2000 LED does not flash when the NMEA 2000 network is active | Check that the **NGW-1** is connected to the NMEA 2000 network and that the NMEA 2000 network is operational refer to **"Connecting to the NMEA 2000 Network" on page 5**.<br>Confirm that the PGN messages are available on the network (using an **Actisense NGT-1** or similar device) and that the required PGNs are enabled in the 'Rx PGN Enable List' shown in **NMEA Reader** (refer to **"Configuring using NMEA Reader" on page 9**. |
| The NMEA 0183 LED does not flash when connected to an NMEA 0183 Talker | Check that the **NGW-1** is connected correctly to the NMEA 0183 device and that the same Baud rate has been set on both devices. Refer to the relevant connection option from those described on **page 6** onwards. |
| Both LEDs flash together, once every 10 seconds | Indicates that the **NGW-1** is powered but no data is received from either connection. If valid data should be present and converted by the NGW-1 on one or both inputs, refer to the two rows above. |
| The LEDs flash alternatively very fast (4 times per second). This sequence repeats continuously | Indicates that the **NGW-1** has lost its Firmware, please connect the unit to the latest **NGW-1 Actipatch** and re-install the Firmware. The latest Firmware can be found at **www.actisense.com/NGW-1/Downloads.php**. |

**Table 3 – Diagnostic LED**

## Technical Support and the Returns Procedure

If following the troubleshooting guide did not resolve the problem and an error persists, please contact **Actisense** technical support to help trace the issue before considering the return of the product. If **Actisense** support concludes that the **NGW-1** unit should be returned to **Actisense** (refer to the **"Company Information" on page 12**), a Returns Number will be issued by the support engineer.

The Returns Number must be clearly visible on both the external packaging and any documentation returned with the product. Any returns sent without a Returns Number will incur a delay in being processed.

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# Specifications

| | |
|---|---|
| **Power Supply (ISO, ISO-AIS & STNG Variants)** | |
| Supply Voltage (NMEA 2000 port) | 10 to 35 VDC |
| Supply Current (NMEA 2000 port) | 35 mA @ 12 VDC |
| LEN | 1 |
| **Power Supply (USB Variants)** | |
| Supply Voltage (NMEA 2000 port) | 10 to 35 VDC |
| Supply Current (USB Host port) | 85 mA @ 5 VDC |
| Supply Current (NMEA 2000 port) | 35 mA @ 12 VDC |
| LEN | 1 |
| **NMEA 2000 Port (All Variants)** | |
| Compatibility | Fully NMEA 2000 Certified |
| Galvanic Isolation | Refer to 'NMEA 0183 Port' or 'USB Port' |
| Speed / Baud Rate | 250 kbps |
| Connectivity | M12 Male (A Polarized) Connector Moulded on Cable |
| Cable Length | 1.5 m |
| **NMEA 0183 Port (ISO, ISO-AIS & STNG Variants)** | |
| Compatibility | Full NMEA 0183, RS232 & RS422 Compatible. RS485 Listener Compatible |
| Galvanic Isolation | 2500 V Input to Ground |
| | 1500 V Output to Ground using ISO-Drive™ |
| Speed | 4800 to 115200 Baud |
| Output Voltage Drive | >= 2.1 V (differential) into 100 Ω |
| Output Current Drive | 20 mA max. |
| Output Protection | Short Circuit and ESD |
| Input Voltage Tolerance | -15 V to +15 V Continious |
| | -35 V to +35 V Short Term (< 1 second) |
| Input Protection | Current Limited and Overdrive Protection to 40 VDC |
| Connectivity | Cable Lengh is Stripped and Tinned (5 mm) |
| Cable Length | 1.5 m |
| **USB Port (USB Variant)** | |
| Compatibility | USB V1.1 and V2.0 |
| Galvanic Isolation | 2500 V Input to Ground |
| Speed / Baud Rate | 4800 to 230400 Baud |
| Connectivity | Male Type A Plug Moulded onto Cable |
| Cable Length | 1.5 m |
| Drivers (Latest OS) | Windows XP, Vista, 7 & MAC OS X supplied on CD and **www.actisense.com/NGW-1/Downloads.php** |
| Drivers (Legacy OS) | Contact Actisense for full details of the legacy OS versions supported **support@actisense.com** |
| **Mechanical** | |
| Housing Material | Polycarbonate |
| Weight NGW-1-ISO & ISO-AIS | 220 g |
| Weight NGW-1-USB | 210 g |
| Weight NGW-1-STNG | 260 g |
| **Approvals and Certifications** | |
| Fully NMEA 2000 Certified | |
| Protection | IP54 |
| Operating Temperature | -20°C to +70°C |
| Recommended humidity | 0 - 80% RH |
| Guarantee | 3 years |

**Table 4 – Specifications**

All specifications are taken with reference to an ambient temperature (TA) of +25°C.

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# NGW-1 Product Order Codes

| Product Code | Product Description |
|---|---|
| **NGW-1-ISO** | NMEA 2000 ↔ Serial Interface with ISO-Drive<br>Serial connection required to connect the NMEA 2000 network to an NMEA 0183 device or computer serial port. Standard Configuration. |
| **NGW-1-ISO-AIS** | NMEA 2000 ↔ Serial Interface with ISO-Drive<br>Serial connection required to connect the NMEA 2000 network to an NMEA 0183 AIS device. Pre-configured for AIS. |
| **NGW-1-STNG** | Raymarine® Seatalk$^{NG}$ ↔ Serial Interface with ISO-Drive<br>Serial connection required to connect the Seatalk$^{NG}$ network to an NMEA 0183 device or computer serial port. Standard Configuration. |
| **NGW-1-USB** | NMEA 2000 ↔ USB Interface<br>Special version required to connect the NMEA 2000 network to the USB port of a computer running NMEA 0183 compatible software. Standard Configuration. |

## Guarantee

The **NGW-1** comes with a 3 year 'return to base' guarantee. If you suspect the unit is faulty please refer to the **"Troubleshooting Guide" on page 10**.

## Product Registration

Please register your product at **www.actisense.com/Registration**. Registration is free and will assist the Actisense team in providing the best support service to customers.

## Company Information

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