

Installation Recommendations

Document Version 1.6

Turtle Tough pH/ORP Sensors are designed specifically for industrial processes. It is the responsibility of the end-user to ensure that the process conditions align with the sensor's specifications to achieve optimal sensor life.

IMPORTANT: Please ensure that you carefully review the specifications to ensure that the product aligns with your specific physical and chemical conditions. While Turtle Tough representatives can provide general product advice, it is crucial to consult with authorized representatives, tradespersons, or engineers of the end user to verify that the product or installation method is suitable for your intended purpose.

Installation Tips

Submersible & Immersion

- Take precautions to prevent moisture ingress through the cable inlet/outlet
- For fully submersible installations, choose appropriate waterproofing options during ordering
- Alternatively, use a fully sealed immersion rod with proper sealing to avoid process liquid contact with the backend of the sensor
- Use stainless steel or suitable metallic immersion rods for grounding, as plastic rods are susceptible to static and provide no grounding
- Avoid suspending the sensor by the cable, as it can damage backend connections. If required, use the cable protection (CP) option for strain relief and environmental protection

Inline Installation

- Select the correct inline method during ordering (twist lock, sanitary, or hot-tap)
- Avoid the use of front-end threaded connections to avoid cable stresses from twisting. Twisting the cable will damage connections within the sensor
- For immersion sensors it is recommended to use our Inline Quick Release fittings when installing inline
- Twist lock and sanitary tri-clamp methods are the minimum recommendation for reliable and quick access, but these do require process line isolation for insertion and removal
- Hot-tap (valve retractable assembly) allows live insertion/removal of the sensor
- Temperature compensation (TC) elements are located at the tip of inline sensors for accurate temperature measurement, but proper protection is needed
- Submersible Sensor are NOT suitable for inline use, they do NOT have TC in the tip
- Avoid plastic pipework if possible, or install sensors in metallic housings for adequate grounding or employ suitable earthing methods

Earthing and Electrical Environment

- **IMPORTANT:** Ground loops are one of the most common problems encountered in new installations. To avoid ground loops please review our documentation on Ground Loops & Electrical interference
- Properly earth all electrical equipment and ensure sensors are installed in adequately grounded environments
- pH/ORP sensors measure small millivolt increments, so any stray current can cause significant shifts in readings
- Install sensors away from high current carrying equipment to avoid stray current and airborne interference.
- Sensors should be installed a minimum of 30cm (12 inches) apart to avoid crosstalk. pH and ORP sensor should be installed at least 60cm (12 inches) from active sensors, such as inductive or current generating devices (ie conductivity, flow etc). This distance can vary and should be tested on a case by case basis.
- **WARNING:** the presence of ground loops will permanently damage a sensor

Position-Sensitive and Position Insensitive Sensors

- pH Sensors should ideally be installed at a 45° angle or vertically down to prevent air bubble entrapment and ensure optimal interaction. At a minimum they **MUST** be 15° above the horizontal plane. They should never be placed horizontal or upside down as the air bubble inside the glass element will rise to measurement tip and cause erroneous readings.
- ORP and Conductivity sensors are position insensitive, but vertical installation is recommended for practical and safety reasons.
- Inverted or upside-down installation of pH or Dissolved Oxygen sensors should be avoided.

Choosing the Correct Waterproofing Option

- Inline, immersion, and submersible installations require appropriate waterproofing options.
- Depending on the level of isolation needed, Cable Protection, Standard Waterproofing, or Extreme Waterproofing can be selected.
- Extreme Waterproofing is typically recommended for submersible installations.
- Ensure proper cable isolation back to the transmitter with the chosen waterproofing option.
- **IMPORTANT:** If there are any doubts regarding the compatibility of the sensor model with the planned installation, it is advisable to contact the manufacturer for further guidance.

Guidelines for Inline, Immersion, and Submersible Installations

Turtle Tough's inline twist-lock sensors and immersion sensors are not designed to withstand continuous exposure to rain or other forms of water on the back of the cable. Such exposure may lead to shorting, resulting in various anomalous failure modes.

Any anomalous failure modes associated with this issue are considered improper installation problems and are therefore not covered under the standard Turtle Tough warranty.

While the sealing on the back of twist-lock and immersion sensors is water-resistant, it is not completely waterproof. The default isolation method on the back of the sensor involves a strain relief grommet. This design allows for slight movement of the sensor and minor water exposure without

causing sensor failure. However, in cases where more aggressive water exposure is expected at the back of the sensor, additional precautions must be taken.

Inline Use - Indoor

When utilizing a standard sensor, such as our immersion or twist-lock sensor series, exclusively for inline installations indoors (with no intention of immersion or submersion), no special precautions are needed, assuming there is no exposure to corrosive gases or process media that could reach the back of the sensor. Additionally, significant water exposure through area washdowns should be avoided.

Inline Use - Outdoor

For outdoor inline installations using a standard sensor (e.g., immersion or twist-lock sensor series), special precautions are generally necessary. The most common approach is to seal the back end of the sensor using conduit to isolate it. This is achieved by applying sufficient TEFLON tape and using an NPT coupling to create the back sensor seal. A rigid or flexible conduit is then used to protect the cable and provide isolation. This ensures the sensor remains protected from outdoor elements, preventing potential damage to the back sensor seal and internal solder joints due to water exposure.

In cases where significant water exposure is expected, a waterproofing option can be added. The least expensive Cable Protection option, using a 3/8"X1/2" vinyl tubing properly installed, is generally sufficient. Alternatively, the more robust Standard waterproofing option may be used. It's essential to note that waterproofing options must be installed at the time of manufacture and cannot be added to already fabricated sensors.

Immersion Use

Immersion use refers to situations where the sensor is partially immersed in the process media, with the back of the sensor remaining above the process media level. To ensure proper operation, immersion installations **always require sealing the back of the sensor** with an appropriate mating coupling (ie either 1" or 3/4" FNPT depending on the sensor type) and running the cable within conduit. The sensor should always be sealed onto the mating coupling with appropriate thread sealant such as Teflon tape. The addition of Cable Protection or Standard waterproofing options can enhance the sensor's lifespan and performance in such immersion setups. However, if meticulous care is taken to seal the back of the sensor using a coupling and conduit back to the transmitter, the standard immersion or twist-lock sensor can be used without adding a waterproofing option.

Submersible Use

Submersible use involves completely immersing the sensor into the process media, with the entire sensor submerged, even at significant depths (e.g., 30cm below the fluid level or deeper). For submersible installations, it is necessary to seal the back of the sensor with a mating NPT coupling and use conduit for the cable run.

For added protection, a Standard waterproofing option can be included if desired or required. If the sensor has a cable length longer than the standard 3 meters, a special surcharge applies to the Cable Protection and Extreme waterproofing options. While it is possible to use a standard immersion or twist-lock sensor for submersible use without adding a waterproofing option, it is strongly recommended to use the Standard or Extreme Waterproofing options, as they significantly enhance the sensor's suitability for submersible installations.

Waterproofing Classifications

The waterproofing options are classified based on their level of isolation, ranging from nominal to extreme, in the following order:

1. Cable Protection
2. Standard Waterproofing
3. Extreme Waterproofing

For most users, the Cable Protection, Standard Waterproofing, or Extreme Waterproofing options will suffice. However, the Extreme Waterproofing option is specifically designed to accommodate environments with oxidizing chemicals and organic solvents, catering to customers with more stringent requirements. Generally, the Extreme Waterproofing option is recommended primarily for submersible installations. Please be aware that **ONLY** the Cable Protection and Extreme Waterproofing options ensure **COMPLETE** cable isolation back to the transmitter.

If you have any uncertainty about whether the specific sensor model you are using is suitable for your intended installation style, we encourage you to reach out to the factory for further assistance and guidance.

Installation of Smart Sensors

TURTLE TOUGH Smart sensors provide unprecedented benefits over conventional analogue sensors. They have an incredible suite of diagnostics, sensor management and improved calibration and maintenance features. To take full advantage of our smart sensor technology it is recommended you consider the following for your installation:

- **Choose an easy installation Method** that facilitates hot swapping. This means you easily retrieve sensors and clean and calibrate them in the laboratory or workshop.
- **The most accessible installation methods include:**
 - Inline Sanitary
 - Inline Twistlock
 - Inline Hot Tap
 - Inline Quick Release Triclover fitting
 - Insertion Rod with Triclover Quick Release fitting
 - Drop Tube Assembly
- **Install the latest HARDWARE:** Where possible deploy the latest and most advanced sensor management hardware. This includes:
 - DSS TOUCHSCREEN series analysers provide the most comprehensive user experience and advanced sensor management tools. This is the most intuitive and complete sensor management tool we have ever created.
 - **HANDHELD FIELD COMMUNICATOR (HFC):** This unique little device is a very powerful communication and configuration tool and is essential for troubleshooting difficult installations, as well as performing cross verification of measurements.
 - **Windows PC Interface Software:** Obtain the latest version of our ULTRA Analyser Sensor Management Software. This is an essential item for advanced sensor diagnostics, calibration and for remote support. If you support from the Turtle Tough team, it is essential that you have this software to interrogate your sensors and send the result to us directly.

IMPORTANT: Note sure what hot swapping is yet? Read our article on how this maintenance technique will reduce your labour component by up to 50%.

Direct Integration of Smart Sensors

TURTLE TOUGH Smart Sensors have a powerful MODBUS RTU output that supports direct integration with data acquisition devices such SCADA, PLC, DCS and industrial computers. For large scale installations this can provide significant financial benefits and immense flexibility for both data and sensor management. There are however a number of considerations that need to be taken into account before choosing self integration as a product solution.

- This deployment is recommended for installations of 10 sensors or more. For installations smaller than this the additional work and manpower involved becomes unfeasible. Additionally, factory support for small scale operations is limited only to the documentation provided on our website, as our engineers do not have the resources to provide custom levels of support for small scale deployments.
- For deployments of less than 10 sensors it is recommended to utilise our turnkey solutions (ie controllers and analysers).
- Where possible, utilise Turtle Tough factory hardware solutions which include such devices as isolation modules, Handheld Field Communicators (HFC), PC Communication interfaces, junction boxes, extension leads, power supplies, quick connectors etc
 - This ecosystem provides a complete solution for reliable connectivity and sensor management.
- Direct integration requires onsite expertise in system integration and should be undertaken by highly experienced individuals. This is commercial grade electronics rather than consumer grade.
- Direct integration offers benefits but also carries a higher degree of risk when integrating with third-party hardware. It should be noted that:
 - Third-party hardware includes devices like PLCs, SCADA systems, DCSs, data loggers, power supplies/isolators, or any other externally sourced interfacing device or component.
 - Turtle Tough provides limited factory support for integrating sensors with third-party hardware, and any issues arising from third-party hardware are not their responsibility.
 - Product support is limited to the information provided in the field implementation notes and guidelines.
 - It is the end-user's responsibility to test and verify the compatibility of Turtle Tough sensors with third-party hardware or software.
 - Turtle Tough and its representatives cannot provide support or troubleshoot third-party hardware as this is outside the scope of our knowledge.
- To successfully integrate the sensor directly with hardware, it is recommended to read the installation and implementation guides, consult the third-party hardware provider.
- For any direct integration project you SHOULD purchase a handheld field communicator (HFC) and Windows PC interface box from Turtle Tough. These devices perform critical sensor configuration functions that are only available via factory supported devices (ie change node address, baud rate, factory reset, calibration reset etc). Without the HFC or Windows Interface

Box (WIB) you will have no way of accessing these functions and we have no way of remotely supporting the product.

- Quick connect plugs on Turtle Tough sensors should **NEVER** be removed or modified as it voids the warranty.
- Only Turtle Tough factory interface leads or panel mount connectors should be used for interfacing with end-user hardware.
- **IMPORTANT:** Never commence the installation or direct integration of a Smart Sensor without thoroughly reviewing our detailed documentation, including sensor implementation guides, field installation guides and supporting documentation. This can be obtained directly from your representative or the website: www.turtletooughsensors.com. Failure to follow these instruction can result in unreliable performance, shortened equipment life and permanent equipment damage.

IMPORTANT INFORMATION REGARDING RECOMMENDATIONS:

All information provided by Turtle Tough, including sensor design or care recommendations, is of a general nature only and intended solely as product information. We do not guarantee that our products are fit for any specific purpose or application. It is the responsibility of the end user to assess the suitability of our products or procedures for their own needs and requirements. When making such recommendations we have not taken into account your individual needs or safety requirements. We shall not be held liable for any damages, losses, or inconveniences arising from the use of our products or reliance on the provided information. The end user is advised to conduct their own evaluations and tests to determine the suitability and performance of our products in their specific circumstances

For clarifications, reach us on +61 3 9872 5055 or email us info@turtletooughsensors.com