



The TOUGH pH & ORP Sensors offer long lasting performance and are extremely resistant to chemical attack. Ideal for most industrial applications.

## TOUGH pH & ORP Sensor

### Features

- Designed for high chemical resistance to suit most industrial applications
- Temperature range: - 5°C to 105°C
- Low maintenance solid state Polypropylene reference
- Tough glass for easy cleaning
- pH range: 0 – 14 pH (*optional -4 to +16*)
- Inbuilt Acid/Fluoride, Sulphide Gas Resistant

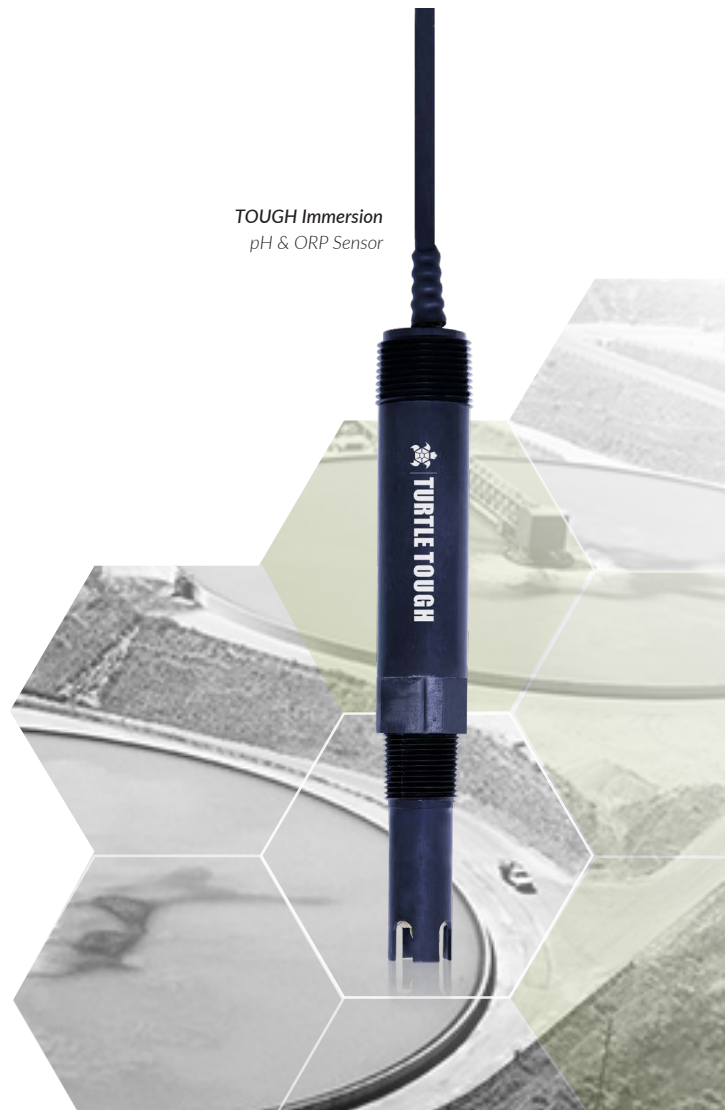
### Output types

- Direct Smart Sensor (MODBUS RTU)
- Proprietary Digital (RS485)
- Analogue

### Installation types

- Immersion & Fully Submersible
- Inline Twist Lock
- Inline Sanitary & Hot Tap

TOUGH Immersion  
pH & ORP Sensor





## TOUGH pH & ORP Sensor



The TOUGH pH & ORP sensors are an excellent choice for most industrial applications. The solid state reference is low maintenance and offers long lasting performance, while the Ryton body plastics are extremely resistant to chemical attack. The tough glass offers excellent performance across a wide pH range and reduces the expense of costly breakages. The TOUGH sensors share a common chemistry and are available in immersion, submersible and inline configurations.

### Solid State Reference

At the heart of our TOUGH range is a polypropylene solid-state reference system. Polypropylene has high chemical resistance and is very economical for industrial applications with temperatures up to 105°C. Unlike conventional sensors, our

solid state reference is formulated with specific salt mixtures, to provide extreme performance in a wide variety of applications. The non-porous attributes of this component make it extremely resistant to process contamination providing long life under harsh chemical conditions.

### Anti-Fouling

Fouling is a common problem with most brands of sensors. Turtle Tough utilise a large open geometry design with coat resistant materials. Our ability to withstand high velocity allows the sensor to be placed in high flow areas to keep the sensor clean and maintain optimal performance of the sensor within the sensibilities of a standard cleaning regime.

### Customise for your process

Our TOUGH sensors are available with the following options that allow you to configure the sensor for your application:

- Back-end waterproofing for fully submersible installation
- Cable Protection
- 12m Cable

### Smart Sensor Technology

Smart Sensors have revolutionised the way our customers manage and maintain sensors. Unlike most other smart sensors, Turtle Tough provide you with the option of a propriety digital signal or an open-source MODBUS RTU signal that is universally accepted. This allows the sensor to be directly connected to your industrial network without the need for proprietary hardware. Turtle Tough also provide state-of-the-art analysers and controllers should you require a sophisticated turnkey control solution. Digital Smart sensors have the added benefit of storing a detailed performance history and diagnostics on-board enabling superior sensor management. Sensors can be cleaned and calibrated offline to facilitate a hot swapping maintenance regime. Need to know more about hot swapping? Ask our team.



pH



ORP



Quick Connect Plugs

### Output types

Code	Technology Output	Description
-DSS	<b>Direct Smart Sensor (MODBUS RTU)</b>	SMART Sensors with DSS output provide a feature rich open source MODBUS RTU output directly from the sensor. This enables the sensor to interface directly with a PLC or compatible data acquisition device and allows for a variety of options for system integration.
-PD	<b>Proprietary Digital (RS485)</b>	SMART Sensors with PD output provide a closed source proprietary digital signal to connect with dedicated Turtle Tough hardware. This dedicated protocol provides a closed environment to ensure the highest level of stability.
-A	<b>Analogue</b>	Analogue Technology

### Sensor installation types

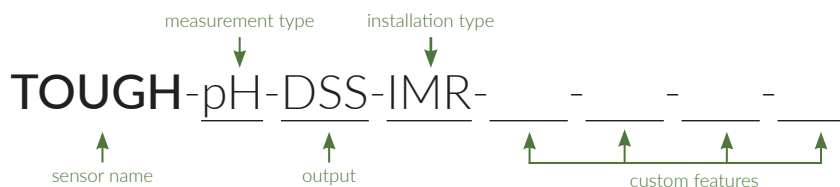
Code	Installation Type	Description
-IMR	<b>Immersion</b>	¾" front-end x 1" back-end MNPT, Ryton body.
-TWL	<b>Inline Twist Lock</b>	Ryton body with double O-Ring seals for Twist Lock interface, 1" MNPT back-end and fast response TC in sensor tip.
-SAN	<b>Inline Sanitary &amp; Hot Tap</b>	Ryton body with double O-Ring seals for Inline Sanitary interface, ¾" MNPT back-end and fast response TC in sensor tip.

### Options

TOUGH sensors can be customised to suit your application. Your Turtle Tough representative will assist you in determining what upgrades might be necessary from the base sensor specification. The following list provides a description of the available upgrades and how they might benefit your application. Some options may incur additional charges.

Code	Features	Description
-SUB	<b>Fully Submersible</b>	Back-end waterproofing for a fully submersible waterproof assembly.
-CPV	<b>Cable Protection Vinyl</b>	4m of vinyl tubing encapsulates the sensor cabling for added protection from harsh environments or strain relief on cable. 60 °C resistant.
-CPN	<b>Cable Protection Norprene</b>	4m of high norprene tubing is used to encapsulate the sensor cabling protecting it from high temperature environments. 135 °C resistant.
-12M	<b>12m Cable</b>	Increase the standard cable length from 6m to 12m.
-PHORP	<b>pH/ORP combination sensor</b>	Combination pH and ORP electrode. Combines both measurement elements into a single electrode. *Requires dual analyser inputs (one for each measurement).

To order add the codes of the features you want to add to your sensor to suit your application:



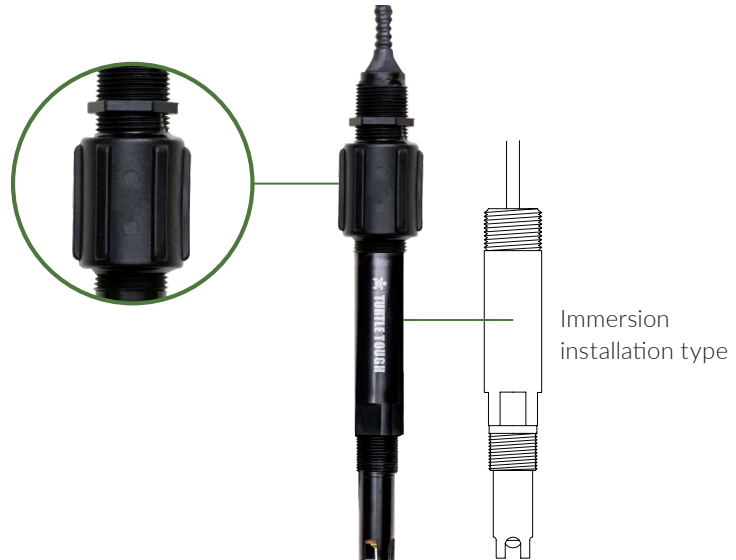
### Fully Submersible

Order code: -SUB

All TOUGH pH & ORP sensors for Immersion, Inline Twist Lock and Inline Sanitary or Hot-Tap are available for fully submersible installations with the use of an immersion rod when a suitable back-end waterproofing sealing option is factory installed. This option must be installed at the time of order and cannot be installed subsequently.

#### Features:

- Provides complete back-end isolation from process for long- life when fully submersed



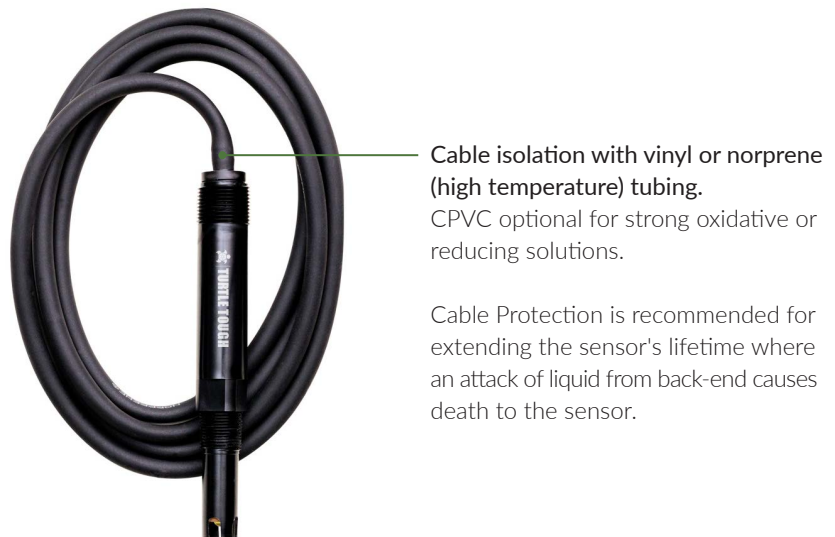
### Cable Protection

Order codes: -CPV or -CPN

This back-end sealing option provides complete cable isolation from the liquid process and protects the cable from damage and process ingress.

#### Features:

- Complete isolation of back-end and protection of cable from corrosion and chemical attack
- Suitable for most applications
- Excellent choice for immersion
- Cost effective waterproofing option
- Not recommended for submersible installations

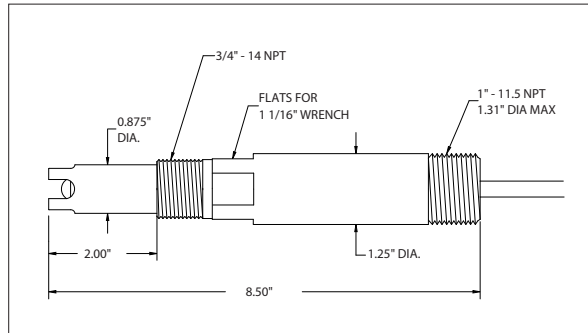


Back-end waterproofing sealing option for a fully submersible waterproof assembly is factory installed. This option must be installed at time of order and cannot be installed subsequently.

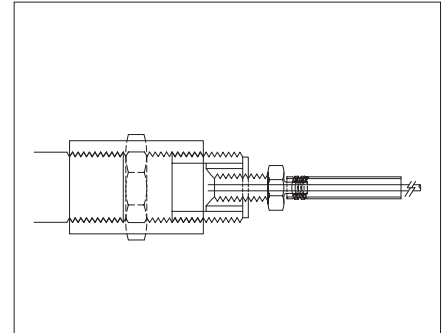


### TOUGH Immersion pH/ORP Sensor

Ordering code: -IMR



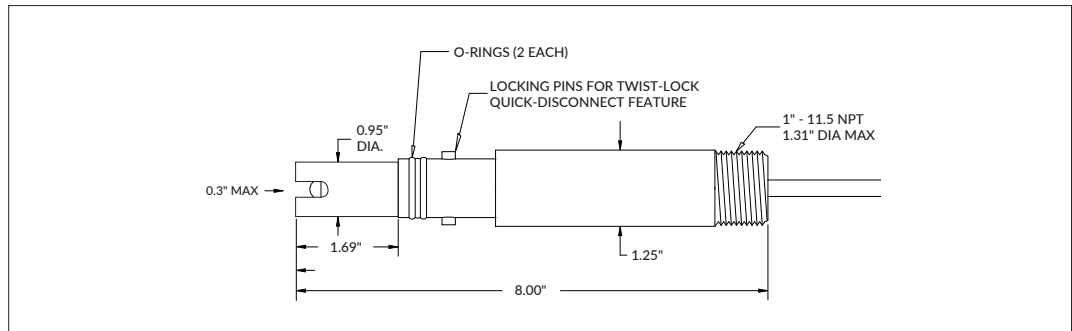
Ryton body, 3/4" front-end x 1" back-end MNPT for immersion interface



**Option:** Back-end waterproofing for a fully submersible assembly. Order code: -SUB

### TOUGH Inline Twist Lock pH/ORP Sensor

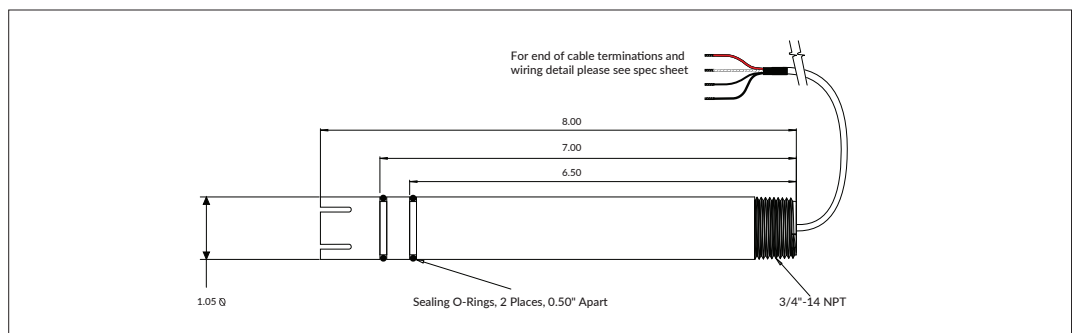
Order code: -TWL



Ryton with double O-Ring seals for twist lock interface, 1" MNPT back-end and fast response TC in sensor tip

### TOUGH Inline Sanitary & Hot Tap pH/ORP Sensor

Order code: -SAN



Ryton with double O-Ring seals for Inline Sanitary interface, 3/4" MNPT back-end and fast response TC in sensor tip



# Specifications

## TOUGH pH & ORP Sensor

Sensor name		TOUGH	
Measuring type		pH (-pH)	ORP (-ORP)
Sensor installation types		Immersion (-IMR), Twist Lock Inline (-TWL), Inline Sanitary & Hot Tap (-SAN)	
Output types	-DSS	<b>Smart sensor:</b> Direct Smart Sensor Technology (-DSS). This open source digital signal output (MODBUS RTU) is compatible with a wide range of devices that can accept a MODBUS signal*.	
	-PD	<b>Smart Digital Sensor:</b> Proprietary Digital technology (RS485) (-PD). This closed source digital signal output is only compatible with select Turtle Tough Analysers*.	
	-A	<b>Analogue sensor:</b> Analogue Technology (-A). Compatible with analysers that support a conventional non-preamplifier analogue*.	
Pressure	Immersion	Sensor rating 150 psi. (6.9 to 1035 kPa)	
	Twist Lock	Sensor rating 150 psi. Kynar Twistlock Fitting: 50 psi. PEEK Twistlock Fitting 100 psi.	
	Sanitary Inline	Sensor rating 150 psi. Triclover Fitting: Max recommended pressure 100 psi. 1 ¼ inch Threaded Socket: 150 psi (200 psi optional with sensor upgrade)	
	Hot Tap	Sensor rating 150 psi. Hot Tap Assembly: Max recommended pressure 100 psi.	
Temperature range		-5°C to 105°C (Optional -35°C to 150°C)	
Junction material		Polypropylene	
Cable length		6m	
Temperature compensation		Pt1000	
Waterproofing		None, unless specified or optioned. Fully Submersible comes standard with full waterproofing option. Cable Protection optional for all sensor configurations	
Connection	-DSS -PD	Quick Connect Plug - 4PIN (NEMA 6P)	
	-A	Tinned Leads	
pH/ORP range		0 to 14 pH	±2,000 mV Absolute
Measuring element type		Proprietary Tough Glass	Platinum ball in low profile configuration
Element dimensions		8.0mm (0.315") Diameter	5.0mm (0.197") Diameter
Initial impedance		<800 M Ohms @ 25°C	N/A
Sodium ion error		< 0.15 pH in saturated Na <sup>+</sup> solutions at pH 14.00	N/A
Acidic errors		< 0.05 pH in HCl solutions at 0.00 pH	N/A
Reference type		Double Junction	
Reference half cell		Ag/AgCl, saturated KCl	
Primary junction		Porous Ceramic, Saturated KCl in Cross-linked polymer, interfaced to secondary junction	
Secondary junction		Solid-state non-porous cross-linked polymer embedded in Kynar support matrix holds excess KCl assuring saturation at all temps for stability and long sensor service life	
Special features		Acid/Fluoride, Ammonia, Chlorine and Sulphide Gas Resistant	
Storage		Keep at room temperature with closed protector cap, filled with storage solution in an upright position	
Warranty		12 month conditional warranty. Go to <a href="https://turtletoughsensors.com/support/warranty-returns">turtletoughsensors.com/support/warranty-returns</a>	

\*For compatibility, please consult with your Turtle Tough representative

\*\* Please note that for most installations, the mating hardware is the limiting factor for the maximum pressure allowance with consideration also being given to operator safety.

**Note:** This specification is subject to variation as per any options applied. Each option indicates how it will alter or impact upon the standard specification.

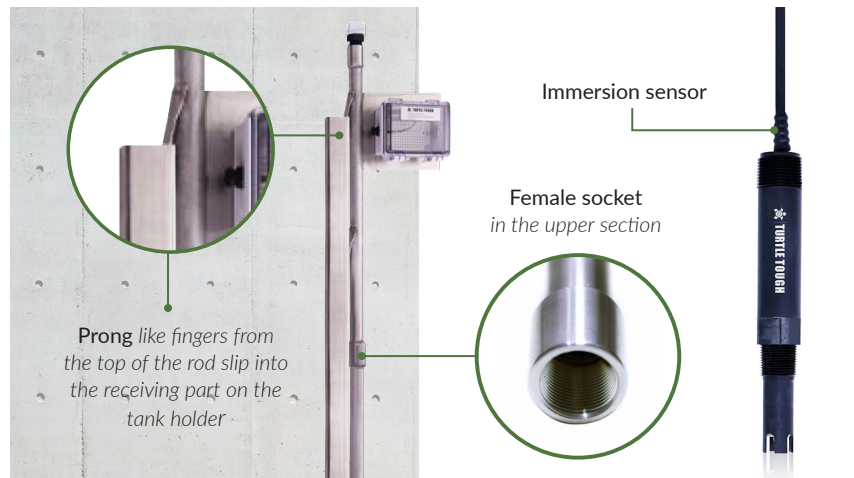
### 3m Immersion Rod

Code: TT-ACC-UNI-IROD-SS-3M

The 3-metre stainless steel immersion rod allows easy access from the top of tanks direct into critical measurement locations. The unique design allows the immersion rod to be held in place without any bolts, screws or fittings allowing for instant insertion and retrieval from the tank without any tools.

#### Features:

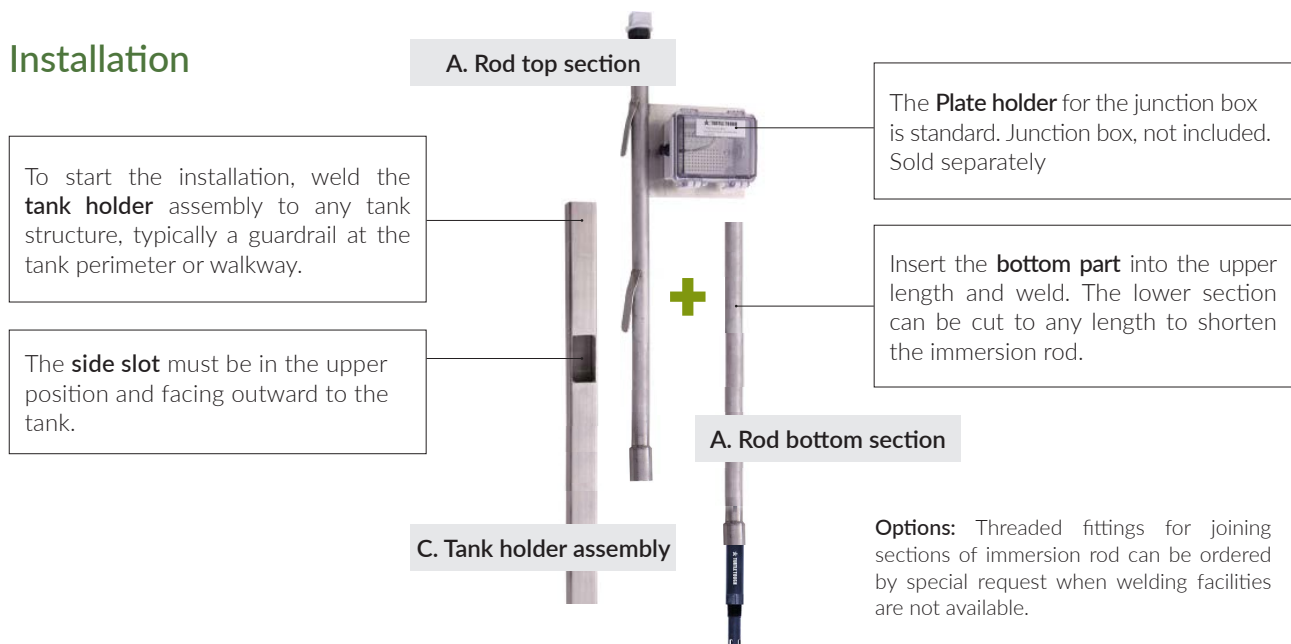
- Allows sensor installation from the top of a tank
- 316 Stainless steel
- 3 metres long
- Supplied as 2 pieces of 1.5m length
  - a) Rod top section
  - b) Rod bottom section
- Comes with:
  - Tank holder assembly
  - Female fittings for sensor attachment
  - Mounting plate for Junction Box\*
  - and cable gland



#### Immersion Rod Parts

<b>Part A</b> Immersion Rod Top x 1	316SS 20NB Sch 40 Pipe 1500mm long
<b>Part B</b> Immersion Rod Bottom x 1	316SS 20NB Sch 40 Pipe 1500mm long with 1" MNPT socket at the bottom for sensor install.
<b>Part C</b> Tank Holder Assembly x 1	316 SS 38mm x 38mm SHS – 900mm in length with a slot cut out on one side.
Guard Rail Clamp (Optional)	Galvanised Clamp for Immersion rod retrieval
Junction Box (Optional)	Single Junction box for mounting at the top

### Installation



Immersion Rods and Junction Boxes are not included and must be purchased separately. Immersion Rods can be ordered in any custom length. Please contact your representative for a quote.

### Hot-Tap Inline

Code: TT-ACC-UNI-HTA

Turtle Tough's Hot Tap assembly allows fast and easy insertion and removal of sensors directly into process tanks or pipes at pressures up to 100 psig.

#### Features:

- 316 Stainless steel
- Flush sensors with cleaning solution before removal from process
- Single or double ball valve available
- Stainless, Duplex or SAF available
- Ball valve assemblies: 2.0" (1.5" available on request)
- Comes with:
  - o Valve
  - o Body with pressure relief valve
  - o Top threaded fitting

Required components for complete assembly (sold separately):

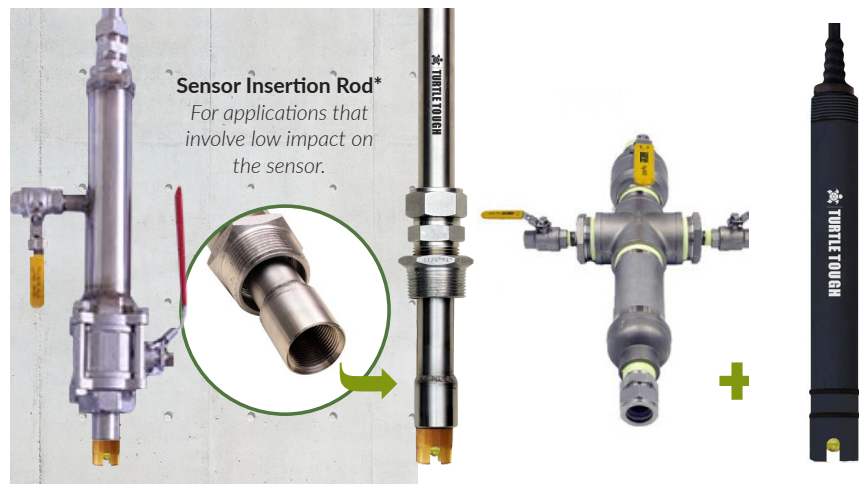
Sensor Holder  
Extension Tube



Hot Tap  
valve retractable assembly



Hot Tap Dual port flush  
purge valve retractable assembly



### Sanitary Tri-clover Inline

Code: TT-ACC-UNI-SSHOLDER

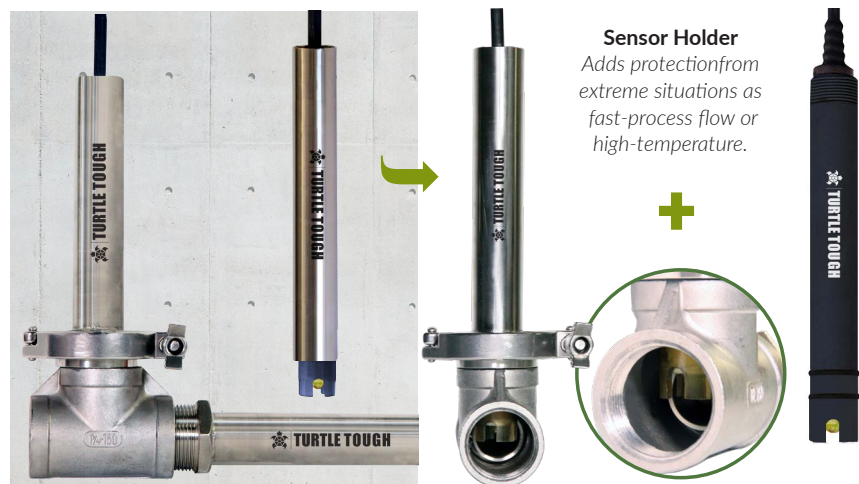
The Turtle Tough Sanitary Sensor holder has been designed for installations with Tri-Clover fittings.

#### Features:

- FDA 3A Grade 316SS Sanitary sensor holder
- Allows accurate sensor insertion
- Custom lengths and sizes available on request

#### Includes:

- Sensor holder stainless steel
- Custom sanitary flange sizes: 1½", 2", 2½",
- Cable gland (IP69K optional)



Hot-Tap and Sanitary Tri-clover inline accessories are not included. Required components for complete assembly as: sensor holder, extension tube, sensor insertion rod are sold separately. Please contact your representative for a quote.





**TURTLE  
TOUGH**

## Installation Hardware

### TOUGH Inline Twist Lock pH & ORP Sensor

#### Twist Lock Receptacles

The twist lock, bayonet style, quick disconnect inline installation assembly, allows for a rapid insertion and removal of the sensor inline applications.

##### Features:

- Fits together with any suitable mating 1" Turtle Tough Twist Lock Sensor
- Designed to interface with a 1" FNPT pipe tee fitting.
- Compatible with Turtle Tough Twist Lock Sensor body
- Allows for easy line installation and removal
- Available in Kynar or PEEK plastic
  - Kynar – 50 psig
  - PEEK – 100 psig
- 1" MNPT male thread for line installation



**KYNAR** for up to 50 psig  
1"MNPT-TWISTLOCK-KYNAR-SS



**PEEK** for up to 100 psig  
1"MNPT-TWISTLOCK-PEEK-HASTC



Twist Lock Receptacles are not included and must be purchased separately. Cable Protection option must be installed at the time of manufacture. It cannot be added once a sensor has been fabricated. Please contact your representative for a quote.