TURTLE TOUGH

The Ultra Tough pH/ORP Smart Sensors are made with the very toughest materials and the latest technology for exceptional performance in highly aggressive environments.

Ultra Tough pH/ORP Smart Sensor

Features

- Designed for aggressive media and extremely tough applications
- Customise chemical attributes to suit any application
- The world's toughest break-resistant glass
- Solid State KYNAR reference extremely resilient to contamination
- Impact and chemically resistant RADEL body plastics
- Temperature range: -5°C to 105°C Standard *(Optional -35°C to 150°C)*
- pH range: 0 – 14 pH *(Optional -4 to +16)*
- Acid/Fluoride, Ammonia, Cyanide, Chlorine and Sulphide Gas Resistance

Sensor output types

- Direct Modbus RTU Output (DSS)
- Proprietary Digital RS485 (PD)

Installation types

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

ULTRA TOUGH
Fully Submersible
pH & ORP Sensor

ULTRA TOUGH pH & ORP Sensor

Fully Submersible & Immersion | *Inline & Hot Tap* | *Inline Twist Lock*

The Ultra Tough series of pH & ORP sensors are made with the very toughest materials and latest technology for exceptional performance in highly aggressive environments. Most importantly they provide accurate and stable measurement at extreme temperatures, and across a wide pH range. This range is available in three different body styles: fully submersible, inline or hot tap and inline twist lock, suiting a wide range of installations.

Break Resistant Glass

The Ultra Tough series features our unique break-resistant glass which is highly resistant to impact and high-velocity solids. Not only will the glass resist abrasion in process, but it's incredible strength means that build-up of solids can be removed through aggressive cleaning without fear of breakage.

Solid State Reference

At the heart of our Ultra Tough range is a Kynar solid-sate reference system. Kynar has high chemical resistance, is extremely resilient to contamination 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 Ultra Tough sensors are available with the following options that allow you to configure the sensor for your application:

- Triple junction
- Extreme dehydration resistant
- Extreme cold resistant
- Organic media resistant
- Sodium resistant
- Zinc resistant
- High HF resistant
- High temperature resistant
- Extreme waterproofing and cable protection

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. 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

Sensor Customisation
ULTRA TOUGH pH/ORP Sensor Series

Output types

Code	Technology Output	Description
DSS	**Direct Smart Sensor (Modbus RTU)**	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.
PD	**Proprietary Digital (RS485)**	SMART Sensors with PD output provide a closed source proprietary digital signal to connect with dedicated Turtle Tough hardware.

Sensor installation types

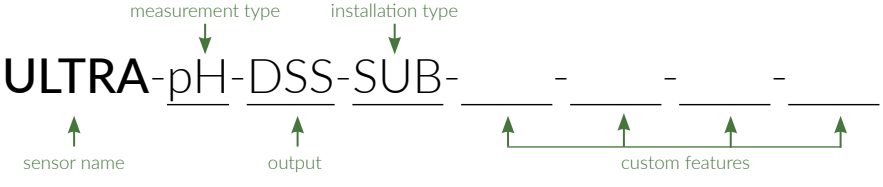
Code	Installation Type	Description
IMR	**Immersion**	¾" x 1" Radel body with fast response TC in sensor tip.
SUB	**Fully Submersible**	¾" x 1" Radel body with back-end waterproofing for a fully submersible waterproof assembly. TC in the sensor body. Not suitable for Inline installations.
TWL	**Inline Twist Lock**	1" Radel Inline Twist Lock body with fast response TC in sensor tip.
INL	**Inline & Hot Tap**	¾" Radel Inline body with fast response TC in sensor tip.

Custom options

ULTRA 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 describes the available upgrades and how they might benefit your application. Some options may incur additional charges.*

Code	Features	Description
TJ	**Triple Junction**	Add another layer of junction protection to the standard double junction sensor.
DR	**Extreme Dehydration Resistance**	A modified reference system capable of being left dry for long periods and subject to intermittent periods of wetness. Changes to sensor specification: Minimum conductivity: 1000 uS/cm Temperature range: –5°C to 105°C.
EC	**Extreme Cold**	A modified reference system, capable of operating down to -15°C and surviving -25°C. Minimum conductivity required 1000uS/cm.
OM	**Organic Media Resistant**	Adds Teflon silicon sealant plus an organic media resistant junction.
TS	**Special Teflon Sealant**	Adds special Teflon silicon sealant only
SR	**Sodium Resistant**	For brine applications with saturated levels of sodium ions this special glass formulation will provide superior measurement performance.
ZR	**Zinc Resistant**	For zinc applications with high levels of zinc ions, this special glass formulation will provide superior measurement performance.
FTC	**Fast Response TC**	Upgrade to Fast Response TC in sensor tip (for IMR or SUB Configurations)
HF	**High HF Resistant Glass**	For applications with high levels of hydrofluoric acid, this special glass formulation will provide superior measurement performance.
HT	**High Temperature**	For high temperature up to 125°C for fully submersible sensor and 135°C for inline sensors. Adds additional resistance to the reference system to prevent premature damage.
CPV	**Cable Protection**	4m of vinyl tubing encapsulates the sensor cabling for added protection from harsh environments or strain relief on cable. Max temperature 60°C.
CPN	**Cable Protection High Temp**	4m of high-temperature norprene tubing encapsulates the sensor cabling for added protection from harsh environments or strain relief on cable. Max temperature 135°C.
PK	**PEEK Body Upgrade**	Upgrade body to PEEK. Required for special applications for resistance to heat and/or certain types of media. Only to be optioned if recommended by Turtle Tough.
12M	**12m Cable Option**	Increase the standard cable length from 6m to 12m.
PHORP	**pH/ORP combination sensor**	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:



Cable Protection

Order codes: CPN or CPV

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
- Prevents nicks and cuts to signal cable
- Excellent choice for immersion
- CPN option prevents high temperature damage (melting) to cable
- Cost effective waterproofing option

Cable Protection (CPN)

4m of high temperature norprene tubing encapsulates the sensor cabling for added protection from harsh environments or strain relief on cable.
Max temperature 135°C.

Cable Protection (CPV)

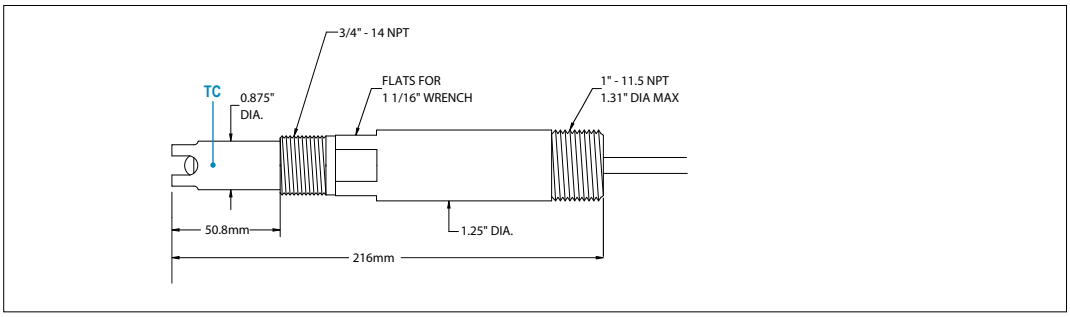
4m of vinyl tubing encapsulates the sensor cabling for added protection from harsh environments or strain relief on cable.
Max temperature 60°C.

CPN	**Cable Protection High Temp**	4m of high temperature norprene tubing encapsulates the sensor cabling for added protection from harsh environments or strain relief on cable. Max temperature 135°C.
CPV	**Cable Protection**	4m of vinyl tubing encapsulates the sensor cabling for added protection from harsh environments or strain relief on cable. Max temperature 60°C.

Installation Types

ULTRA TOUGH Immersion pH/ORP Sensor

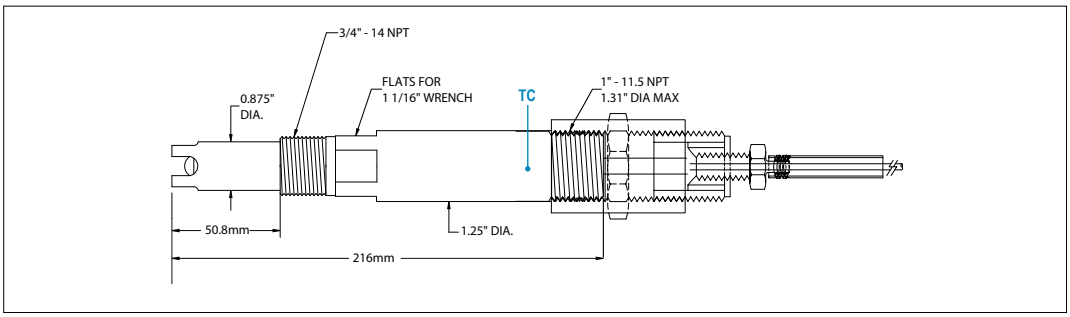
Order code: IMR



¾" x 1" Radel body with fast response TC in sensor tip.

ULTRA TOUGH Fully Submersible pH/ORP Sensor

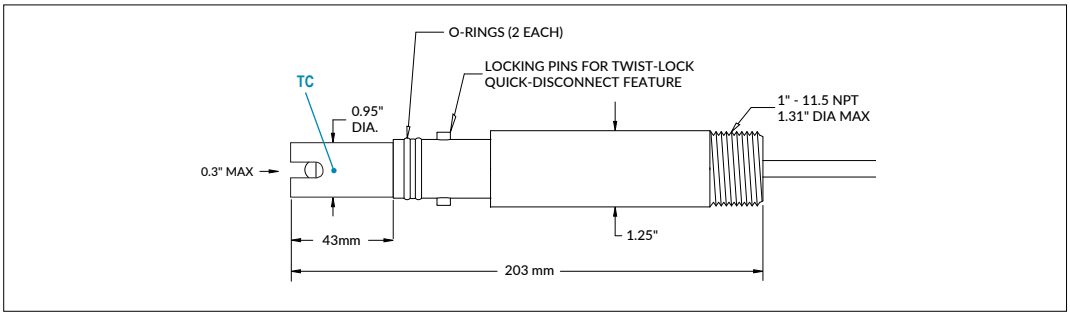
Order code: SUB



¾" x 1" Radel body with back-end waterproofing for a fully submersible waterproof assembly. TC in sensor body.

ULTRA TOUGH Inline Twist Lock pH/ORP Sensor

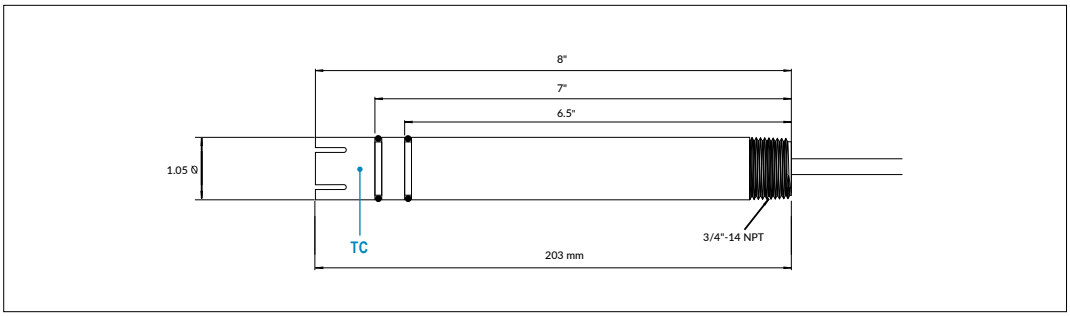
Order code: TWL



1" Radel Inline Twist Lock body with fast response TC in sensor tip.

ULTRA TOUGH Inline & Hot Tap pH/ORP Sensor

Order code: INL



¾" Radel Inline body with fast response TC in sensor tip.

Specifications

Sensor name		ULTRA TOUGH	
Measuring type		pH	ORP
Sensor installation types		Immersion (IMR), Fully Submersible (SUB), Twist Lock Inline (TWL), Inline & Hot Tap (INL)	
Output types	DSS	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	Proprietary Digital technology (RS485) (PD). This closed source digital signal output is only compatible with selected Turtle Tough Analysers*.	
Pressure	Immersion & Fully Submersible	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.	
	Inline	Sensor rating 150 psi. Triclover Fitting: Max recommended pressure 100 psi. 1 ¼ inch Threaded Socket: 150 psi (200 psi optional with senosr 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		Kynar (Poly-Vinylidene-Fluoride)	
Cable length		6m (12m optional)	
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		Quick Connect Plug - 4PIN (NEMA 6P)	
pH/ORP range		0 to 14 pH	±1000 mV Absolute Optional, wide range ±2,000 mV Absolute
Measuring element type		Ultra Tough Break Resistant Glass	Platinum ball in low profile configuration
Element dimensions		8.0mm (0.315") Diameter	5.0mm (0.197") Diameter
Initial impedance		<1,500 M Ohms @ 25°C	N/A
Sodium ion error		< 0.15 pH in saturated Na^+ 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 (Optional: Triple)	
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. Please go to turtletoughsensors.com	

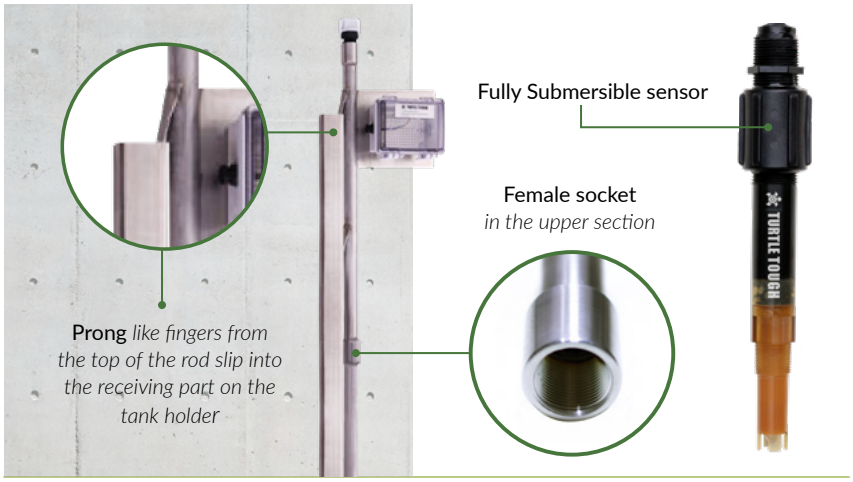
*For compatibility, please consult with your Turtle Tough representative
** Please note that for most installations, the mating hardware is the limiting factor for the maximum pressure allowance with consideration also being given to operator safety.
Note: This specification is subject to variation as per any options applied. Each option indicates how it will alter or impact the standard specification.

3m Immersion Rod

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



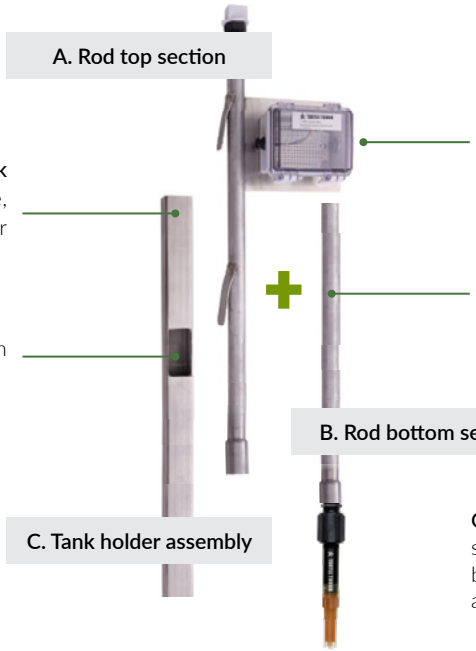
Immersion Rod Parts

Part A Immersion Rod Top x 1	316SS 20NB Sch 40 Pipe 1500mm long
Part B Immersion Rod Bottom x 1	316SS 20NB Sch 40 Pipe 1500mm long with 1" MNPT socket at the bottom for sensor install.
Part C 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

To start the installation, weld the **tank holder** assembly to any tank structure, typically a guardrail at the tank perimeter or walkway.

The **side slot** must be in the upper position and facing outward to the tank.



The **plate holder** for the junction box is standard. Junction box, not included. Sold separately

Insert the **bottom part** into the upper length and weld. The lower section can be cut to any length to shorten the immersion rod.

Options: Threaded fittings for joining sections of immersion rod can be ordered by special request when welding facilities are not available.

Illustrations are installation suggestions only. Please contact your Turtle Tough representative for a quote.

Hot Tap Inline

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.

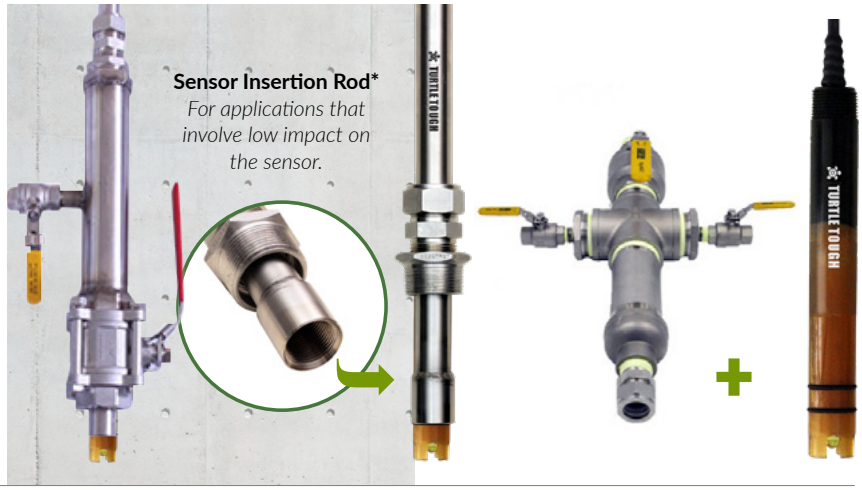
Features:

- 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



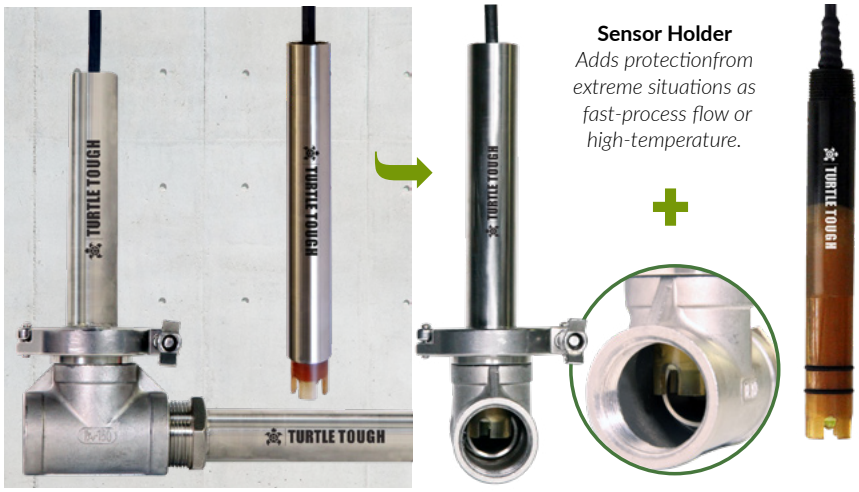
Sanitary Tri-clover Inline

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)



Illustrations are installation suggestions only. Please contact your Turtle Tough representative for a quote.

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 psi
  PEEK – 100 psi
- 1" MNPT male thread for line installation

KYNAR **for up to 50 psi, 1" MNPT**
for general purpose

PEEK **for up to 100 psi, 1" MNPT**
for heavy duty

Illustrations are installation suggestions only. Please contact your Turtle Tough representative for a quote.