

# SmartSeal<sup>®</sup>

Temperature Sensor System

## User Manual



**TIDSMARINE**

# Table Of Contents

System Overview.....	2
Functional Overview.....	2
System Components:	
Main Control Unit.....	3-4
Remote Unit.....	3-4
Shaft Seal Sensor.....	5
External Siren.....	5
System Operation:	
Powering.....	6
Operating.....	6
Operating States:	
Normal State.....	7
Warning State.....	7-8
Critical Alert State.....	8
Causes of Alerts.....	9
Self-Test Function.....	9
Error Indications.....	9
Troubleshooting.....	10

Congratulations on your purchase of the Tides Marine SmartSeal® Temperature Sensor System. This manual will describe how the system works, the various system components and how to operate the system. Detailed information on Installation can be found in the Installation / Specifications Manual.

## System Overview

The SmartSeal Temperature Sensor System is designed to compliment Tides Marine's SureSeal Shaft Seal Systems on vessels with single or twin engines. Its purpose is to detect and warn of various vessel conditions which could potentially lead to shaft seal damage or failure. It is compatible with vessels which utilize the NMEA 2000 communication protocol for connecting marine electronics, sensors and display units to a backbone network for centralized monitoring of various types of vessel information. It is also designed to operate on non-NMEA 2000 equipped vessels as well on vessels with certain other networks via a converter (e.g. NMEA 01830).

## Functional Overview

The SmartSeal System is comprised of a number of components designed to work with a wide range of vessel types and installation needs. At the heart of the system is a Main Control Unit which is located in the engine compartment. Connected to this unit are temperature sensors for each shaft seal in use. Remote Monitoring Units can be connected and placed in other areas of the vessel as can a remote external siren. In operation, temperature status data is displayed on both the Main and Remote unit's control panels. When connected to a vessel's NMEA 2000 onboard network, temperature data is also sent to the main or auxiliary computer display. In the event that the temperature of the shaft seal(s) or the engine compartment exceeds the normal operating range limit, visible and audible alerts are initiated so that corrective action can be taken.

# System Components

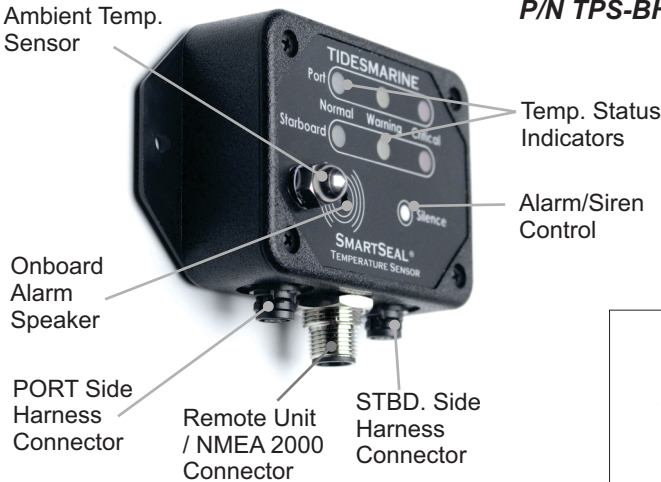
## Main Control Unit (MCU)

Mounted in the engine compartment, the Main Control Unit contains a microprocessor which is responsible for the systems operation. The MCU front panel has an onboard audible alarm and silence control, ambient temperature sensor and LED temperature status indicators. There are single and twin engine models available. Both models are identical in size and have flanges for surface mounting. Units are ideally positioned on vertical surfaces/ bulkheads which are both visually and physically accessible.

Each MCU has two types of connectors on the bottom of its enclosure. The first is used to connect the shaft seal sensor, neutral safety switch and optional remote siren. The second is used for connecting the Remote Monitor Unit and 12VDC power source or to connect the SmartSeal System to a NMEA 2000 network.

Main Control Units are IP66 rated (waterproof for heavy spray and brief submersion)

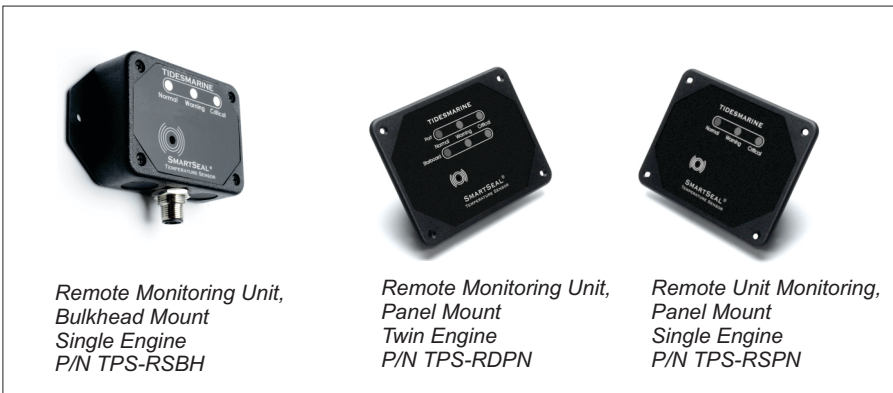
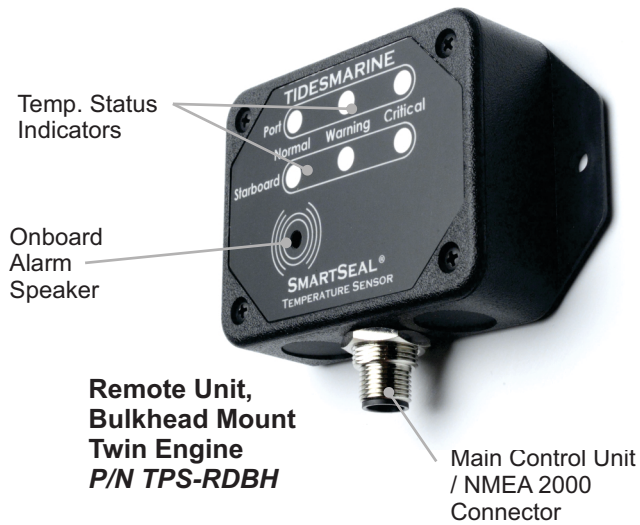
### Main Control Unit, Bulkhead Mount Twin Engine P/N TPS-BH-TE



## Remote Monitoring Units (RMU)

The Remote Monitoring Units are display extensions of the Main Control Unit. On larger vessels, one or more RMUs are typically installed in locations where they can be easily monitored. To afford installation flexibility, two mounting configurations are offered: Surface / Bulkhead mount (identical to the Main Control Unit), and a panel mount design for installing into Consoles or Helm Stations.

The RMU's front panel display will have the same LED indicators and alarm speaker as found on the Main Control Unit.



# System Components

## Cabling

The SmartSeal system uses two types of cabling to connect the various components:

A custom harness is supplied for connecting the Shaft Seal sensor, Neutral Safety Switch and External Siren to the Main control unit.

Standard NMEA network cables and hardware are used to connect the power supply and Remote Monitoring Units to the Main control Unit.



*SmartSeal Harness*



*NMEA Network cable*

## Shaft Seal Sensor

Connected to the Main Control Unit, The Shaft Seal Sensor is attached to the water injection fitting on the SureSeal. It is held in place by a clamp-on connector located just below the blue water pick up line running to the engine.

While it should not require any maintenance after installation, it should be inspected periodically to be sure it is securely attached and in good contact with the injection fitting.



*Sensor and Clamp-on Fitting*



*Sensor Mounted On Shaft Seal Injection Fitting*

## External Siren

The External Siren is an optional component which is typically installed on larger vessels where engine rooms can be quite loud and are located some distance from the main helm station. There are several options for the types of sound the siren will emit which can be selected at the time of installation.



Siren  
*P/N SP-SS-SIREN*

## Operation

### System Power

The SmartSeal system operates on 12VDC (+/-3VDC). The Main Control Unit and Remote Monitoring Units are connected to each other using standard NMEA network hardware components. Use of this hardware allows the SmartSeal system to be easily added to (and be powered by) an existing NMEA 2000 network.

If no existing network is available, a suitable power source must be connected (thus creating a private SmartSeal network). The system is designed such that you can plug or unplug it from its network whether or not it is powered.

### Operating the System

The SmartSeal Temperature Sensor is an autonomous system. It continuously monitors shaft seal temperature(s) and reports results as visual and audible indications on the Main and Remote unit front panels. It also broadcasts shaft seal and engine room temperature measurements on the NMEA 2000 network for display on MFDs, etc.

Proper operation of the system is very simple:

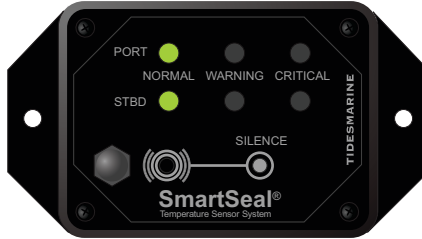
If a WARNING or CRITICAL ALERT occurs, the condition must be immediately resolved.

# System Operation

There are three states of operation: “NORMAL, WARNING and CRITICAL” which are indicated by the LEDs on the front panels of each unit in operation. For twin engine configurations the Port and Starboard states are independent of each other such that one may be normal when the other indicates an overheating condition.

## Normal Operation

Normal state is indicated by the Green LED(s) being illuminated when the engines are running. This indicates that the system is operating with the shaft seal temperature below 50° C (122° F).



*Steady Green LEDs- indicate Normal Operation*

## Warning State

Warning State is indicated by the Yellow LED(s) flashing slowly (every 4 to 5 seconds). The audible alarm will sound with every flash. This indicates that the shaft seal temperature is above 50° C (122° F) but less than 70° C (158° F).



*Slowly Flashing Yellow LEDs with Alarm Sound- indicate WARNING condition*





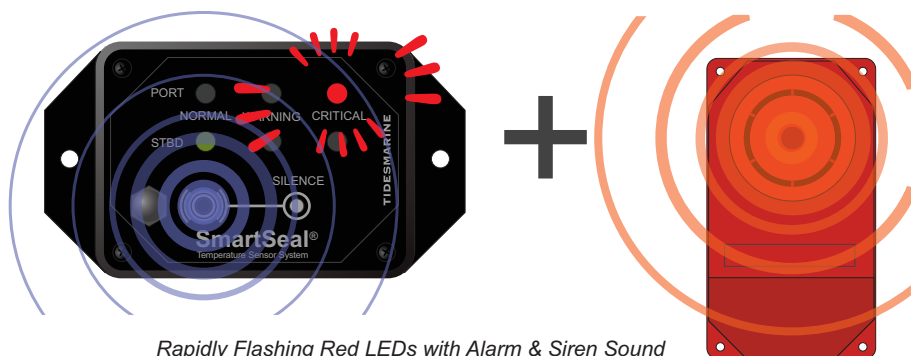
*Silence Alarm / Siren*

The audible onboard alarm may be silenced by pressing the “SILENCE” control on the front panel of the Main Control Unit. **THIS ACTION DOES NOT INDICATE THAT THE ISSUE CAUSING THE ELEVATED TEMPERATURE HAS BEEN FIXED.**

If the shaft seal temperature remains above 50° C (122° F) the yellow LED(s) will continue to flash and the alarm will activate again. After resolving the issue causing the elevated temperature warning, the “NORMAL” green status LED(s) will illuminate.

### Critical Alert State

A Critical Alert is indicated by the Red LED(s) flashing rapidly. The audible alarm and external siren (if equipped) will sound with every flash. This indicates that the shaft seal temperature is above 70° C (158° F), and that **ACTION MUST BE TAKEN IMMEDIATELY TO RESOLVE THE PROBLEM.**



*Rapidly Flashing Red LEDs with Alarm & Siren Sound  
-indicate CRITICAL ALERT condition*

The Critical alert audible alarm and external siren may be silenced via the control on the Main Control Unit front panel. Once the problem has been solved and the shaft seal begins to cool down, the Warning State may temporarily occur. Once the shaft seal temperature goes below 50° C (122° F), the green LED(s) will illuminate and audible alarms will stop.

# System Operation

## Possible Causes of Alerts

In general, the temperature of the shaft seal may become elevated if there is a problem with the cooling water supply to the shaft seal which is necessary. If an alert has occurred, check for the following:

- Twisted, kinked or leaking water pick-up line from engine to shaft seal.
- Water pick-up line has become blocked with debris (sand, rust particulate etc.)
- Crossover water line (twin engine applications) is either kinked or blocked when only one engine is running.
- Water pump malfunction

## System Self Test

The SmartSeal Temperature Sensor system has a built in self-test function. When the system is powered on, both the Main Control and Remote Monitoring units will cycle through each LED color 2-3 times indicating all internal self-tests have passed and the unit is operating correctly. In addition, the Main Control Unit will beep one or two times indicating it is a single or twin engine unit. The Remote will beep once in either a single or twin engine installation.

## Error Indications

If the self test determines that the Smart Seal System is not operating correctly after power up, the following error indications will be displayed

### Red LEDs flashing and audible alarm sounding rapidly.

-Occurs if the system is powered up and there is a problem in one or both of the thermal sensor connections of the Sensor cable.

### All three LED colors are flashing.

-Occurs, while the system is operating, if trouble is detected in one of the thermal sensor connections.

### The Remote Unit(s) have no illuminated LEDs

-This indicates that the Remote unit(s) are either or both not receiving data from the Main Control Unit or power from the network to which it is connected.

# SmartSeal Troubleshooting

<p>Main Control Unit Has No LEDs Illuminated</p>	<ul style="list-style-type: none"><li>● Ensure that the SmartSeal Temperature Sensor is properly connected to the NMEA 2000 network and is getting power.</li><li>● If this is a vessel without a NMEA 2000 network, ensure that the power connector is properly connected to the “private” network and the 12V power source is operating correctly.</li></ul>
<p>Main Control Unit Powers up and the RED LEDs are Blinking and the Audible Alarm is Sounding</p>	<ul style="list-style-type: none"><li>● Verify that the harness cable(s) are properly connected to the Main control unit.</li><li>● Inspect the ring thermistor(s) at the injection fitting(s) for poor connection to the sensor cable. If any problem is found, replace the sensor cable.</li><li>● This condition is due to a failure detected in the Main control unit self-test which occurs on each power up. Other internal issues could cause the self-test to fail. In this case, please contact Technical Support for assistance.</li></ul>
<p>All LED Colors Are Flashing in Unison</p>	<ul style="list-style-type: none"><li>● This is the same indication as the power up flashing Red LEDs above but the error has been detected while the Main control unit is operating (vs powering up as above).</li><li>● Verify that the sensor cable(s) are properly connected to the Main control unit.</li><li>● Inspect the ring thermistor(s) at the injection fitting(s) for poor connection to the sensor cable. If any is found, replace the sensor cable.</li></ul>
<p>Remote LEDs or audible alarm are not functioning</p>	<ul style="list-style-type: none"><li>● Remote units are designed to enter this state if no communication is received from the Main control unit. This condition can also occur if the Remote unit is not receiving power. Ensure the Remote is properly connected to the NMEA 2000 network or the “private” network created on installation and that it is receiving power.</li><li>● Ensure the Main unit is powered and operating.</li></ul>

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