

INTRODUCTION

Marine water cooled exhaust systems are designed to withstand temperatures of up to about 120°C. However the exhaust gases from the engine may reach in excess of 450°C. In order to protect the exhaust system it needs a continuous flow of cooling water from the engine, should this flow be interrupted by debris being sucked into the intake or by a problem with the water pump or simply forgetting to open the seacock then the exhaust temperature will start to rise immediately. Depending on the extent of the blockage the increased temperature can cause seriously damage the exhaust system and water lock. The engine water temperature and/or oil temperature alarms will eventually alert you, however there can be a considerable time lag especially if the engine has been started from cold which means that damage may already have been done.

In order to protect the exhaust components and provide the earliest possible warning you need measure the temperature INSIDE the exhaust. Systems which measure the outside temperature will inevitably be delayed as the heat has to make its way through the exhaust components.

This product uses a quality stainless steel in-exhaust probe containing a platinum wire sensor. The control unit allows the exhaust temperature to be monitored and the alarm point set to a temperature appropriate for your engine.

Note: Exhaust temperature alarms protect the exhaust system components not the engine; you will still need the engine water/oil temperature alarm.

COMPONENTS



52mm (2" gauge)



Button



Alarm Buzzer

Kit Components

(Cables and connectors not shown)

SENSOR INSTALLATION

The sensor has been designed so that it can be fitted without the need to dismantle any of the exhaust system components.

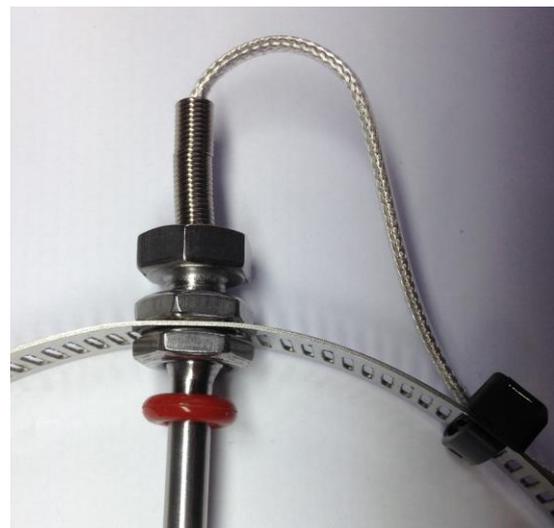
The clamp is suitable for exhaust hoses up to 6" diameter, cut the steel band to size making sure you leave enough overlap. Make sure the cut end has no burrs else it will be difficult to feed through the worm drive.

Assemble the sensor as shown, the shake proof washers should go either side of the steel band, tighten the nuts firmly. No thread should protrude below bottom nut (see picture).

Select a point on the hose about 150mm or more downstream from the water injection point. Drill a 4mm hole avoiding the steel reinforcement rings (If you have a horizontal hose it is preferable to mount the sensor on the top). Push the sensor through the hole into the exhaust pipe and secure firmly.

The sealing O ring should make a good waterproof seal; if in doubt add a little silicon sealant.

Use a cable tie to secure the cable to the hose clamp as shown.



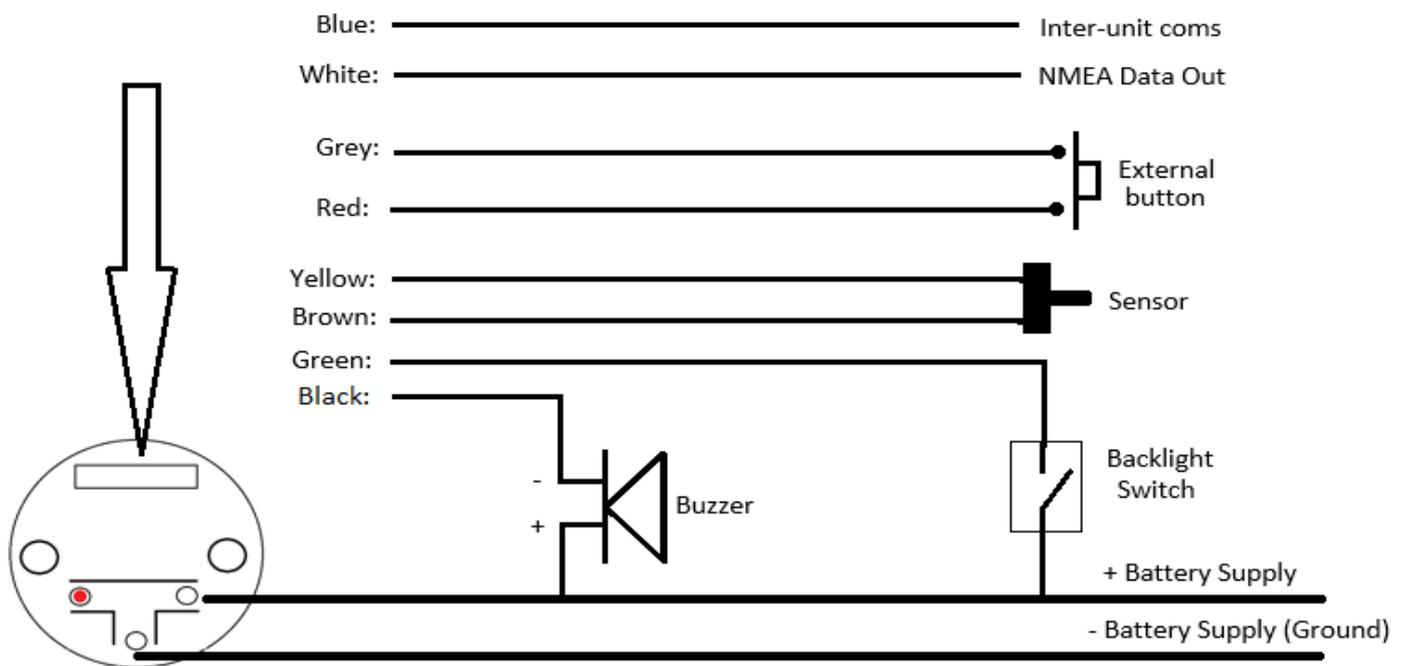
INSTALLATION

8 way cable connections

Yellow: Temperature Sensor
 Brown: Temperature Sensor
 Green: Backlight (connect to +12v)
 White: NMEA Data Out
 Black: Alarm OUT (Buzzer)
 Red: External button
 Grey: External button
 Blue: Inter-unit coms

Blade terminals

+ Battery Supply (+12v)
 - Battery Supply (Ground)



The gauge is standard size and requires a standard 2" (51mm) hole, the external button a 12mm hole.

The 8-way cable attaches to the gauge via a connector, this may be unplugged if it helps with the installation.

The button on the rear of the unit gives you the ability to program the unit, once the gauge has been setup it is unlikely that you will need to access the button again. You may fit an external button which will duplicate the rear button functionality as well as allowing you to temporarily silence the alarm.

If you don't have an external button initially leave the gauge loose so that you can pull it out and access the rear button.

The sensor is connected to the Yellow and Brown wires as shown, it is not important which way round it is wired. A 5m extension cable has been supplied with the kit to extend the sensor wire if required. All connections to the sensor must be soldered as a poor connection will affect the temperature reading.

The buzzer is not waterproof and should therefore be mounted behind the panel, please ensure you observe the +/- polarity. When the alarm sounds the black wire is internally shorted to ground via a 350mA fuse.

Power is connected to the gauge spade terminals using the cable supplied, you may choose to include a fuse in the power line however the gauge includes internal self-resetting fuses on the power line and alarm output.

The back light switch shown on the diagram is not supplied with the kit, the green wire may be connected to wherever the other instruments get their backlight power from or permanently to the +12v terminal to illuminate the gauge whenever the gauge is powered.

The unit has been supplied with screw terminal block which can be used for connecting wires to the gauge, you will also have been supplied heat-shrink tubing. The preferred method of joining the wires is to solder them and slip heat-shrink tubing over the joint.

NMEA data output is available on the White (data) and Grey (ground) wires. If you intend to use the NMEA please read the separate section, otherwise leave these wires are left unconnected.

The blue wire is a data link between gauges, if you have only one gauge then leave this wire unconnected, (further detail found under NMEA and Slave gauge sections below)

INITIAL SYSTEM TESTING

When you power up the unit the gauge will display the current **alarm** temperature, the LED will flash once and then the gauge will go back to zero, after a few more seconds the gauge will read the current exhaust temperature.

The red led should remain off. If the led shows a steady red then it indicates a sensor error and you need to check the sensor wiring. Sensors should show a resistance of about 1100 ohms at 25c.

Assuming the led has remained off you can now test the alarm, this is done by selecting function 4 on menu (see menu section) the alarm will sound and the LED will flash for about 10 seconds indicating an alarm, the unit will then return to normal operation.

If you ever need to check the sensor use an ohm meter or warm water, NEVER USE A FLAME

People are often surprised at how low the exhaust temperature is when the cooling system is working effectively, especially in cold northern waters. It is not uncommon for the gauge to barely move.

Note: 1) When the alarm sounds the temperature needs to drop 5c below the alarm temperature to turn off.
2) Pressing the external button when the alarm is sounding suppresses the alarm for two minutes.
3) In normal operation when the alarm is not sounding the LED will flash briefly every 30 seconds to confirm the gauge is functioning

ADJUSTING THE ALARM TEMPERATURE

Please read the *Function Menu* section to familiarize yourself on how the menu works.

The gauge is supplied with the alarm temperature set to 96c which is ok for most engines, however setting the temperature closer to the actual maximum running temperature is preferred as this will give a quicker response and it can also detect small changes in temperature such as losing an impeller blade. It is recommended that you set the alarm temperature at least 20c above the maximum to prevent false alarms.

When setting the temperature first run the engine until you believe that it is up to its normal working temperature and make a note, the gauge itself keeps a record of the highest recorded temperature since it was turned on.

The alarm temperature is set using button on the rear of the unit (or external button if fitted)

Option '1' will make the gauge display the current alarm temperature.

Option '2' will make the gauge display the maximum recorded temperature since the gauge was turned on.

Option '3' allows you to set the alarm temperature, once this option has been selected, holding the button in will make the gauge slowly sweep from 38c – 120c and then back. When the gauge is displaying the desired alarm temperature release the button. After a few seconds the gauge will return to normal operation and the LED stop flashing. To check that the temperature has been set correctly, wait for the LED to go out then press the button once (option '1') and the gauge will display the alarm temperature.

Function Menu

The gauge has a simple 6 function menu that gives the following options numbered 1 thru 6

1. Displays the current alarm temperature
2. Displays highest recorded temperature
3. Set the alarm temperature
4. Test the alarm
5. Set Port
6. Set Starboard

The menu is accessed using the button on the rear of the unit or an external button if fitted.

When using the external button you will need to initially press it for at least 5 seconds to activate it, this is to prevent accidental usage, otherwise the operation is identical.

To access function '1' press the button once and release, to access function '2' press the button twice, etc.

The LED on the front of the gauge will display the selected function, for example when on function '2' the LED will flash twice followed by a pause. When the required function has been selected hold the button in for about 2 seconds to activate it then release, the LED will now blink rapidly. To exit a function simply wait 10 seconds for the gauge to reset and the LED to go out.

Function '1' displays the current alarm temperature, after a few seconds the gauge will reset.

Function '2' displays the highest recorded temperature since switch on, after a few second the gauge will reset.

Function '3' selects the alarm temperature.

After selecting function '3' the gauge will display the current alarm temperature, to change this hold the button in and the gauge will slowly sweep between 38c to full scale. When the gauge displays the required alarm temperature release the button, to continue adjusting press the button again. When finished wait for 10 seconds for the gauge to reset.

Function '4' Tests the alarm; the alarm will sound, the LED will flash and the gauge will read full scale, after 10 seconds the gauge will reset.

Function '5' selects *Port*, used for NMEA and slave displays, see separate section for details.

Function '6' selects *Starboard*, Used for NMEA and slave displays, see separate section for details.

The gauges output NMEA data containing the current exhaust temperature in centigrade, the data format is as follows:-

\$XDR,C,25.5,C,SM012A,*xx <CR> <LF> where xx is the checksum

4800 baud, No parity, 1 stop

In a twin engine configuration you can make use of the built in NMEA multiplexer to combine the data from the port and starboard gauges, this eliminates the necessity to use two separate inputs on your instrumentation or the need for an external multiplexer.

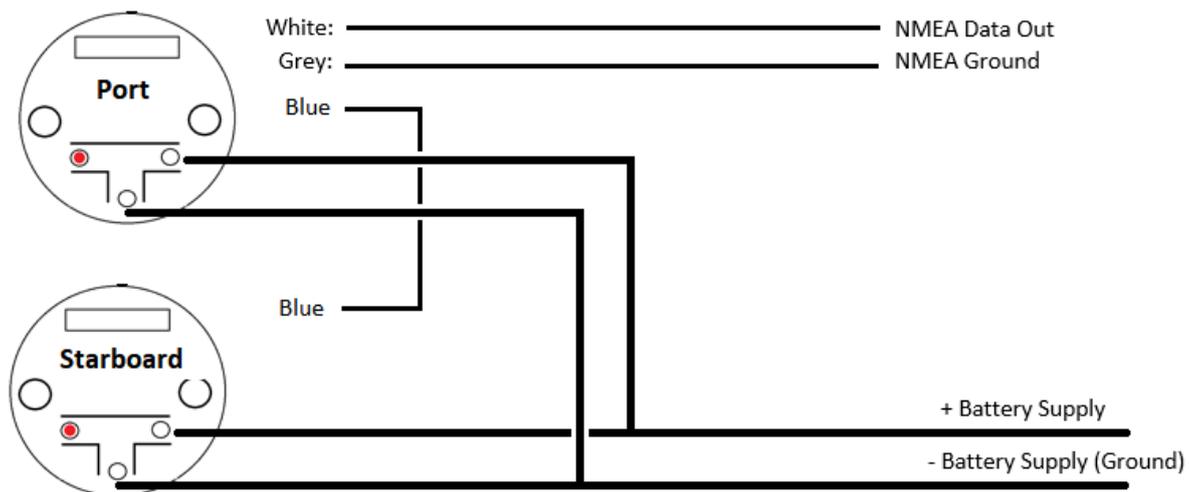
When connecting two units together they should both be connected to the same power supply so that they are on at the same time. It is important that the ground connection (negative battery) for each gauge is tied together and taken from the same point.

Connect the BLUE wire from each gauge together, the NMEA output from the starboard gauge is not used.

In the function menu set the port gauge to 'Port' and the starboard gauge to 'Starboard'

Port engine data will appear as SM012A where Starboard data will be SM012B.

All other connections, alarm, sensor etc. remain the same as described previously



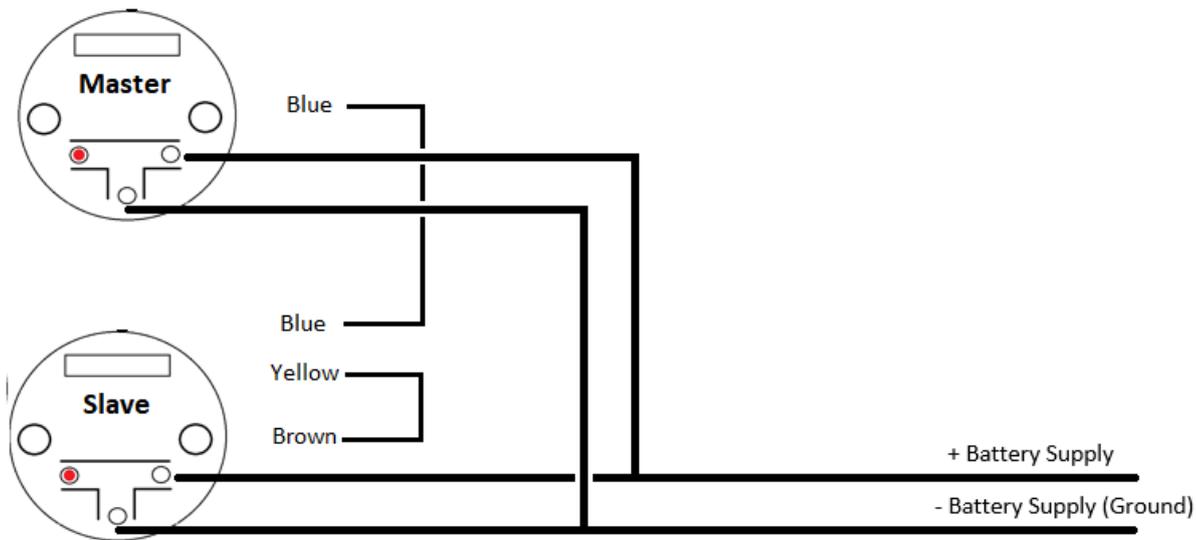
You may connect additional gauges to work as slaves, up on the fly bridge for example. Slave gauges do not directly connect to the temperature sensor but instead get their information from the 'Master' through a data link (blue wire). When wiring a slave gauge use a three core cable to connect the two gauges together, that way they get their power and ground connection from the same point.

The wiring of the external alarm, external button etc. is same as shown in previous diagrams.

A gauge auto-detects if it is a slave or a master by interchanging data and checking if the sensor wire on the slave is shorted, it's important that the yellow and brown sensor wires on the slave are shorted together.

If you are using NMEA this will be available from the 'Master', slaves do not output NMEA.

You may change the alarm temperature using either gauge and the other unit will be updated.



Dual engine slave gauges

If you are using the NMEA and want to make use of the built-in NMEA multiplexer when the blue wires from the port and starboard gauges need to be connected together. You must set either Port or Starboard for all gauges so that the slaves know which data to respond to. NMEA will be available from the PORT 'Master' gauge.



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Specifications

Supply Voltage: 8 – 20v DC, 65mA (no alarm)

Sensor Temperature range: -20 - + 250°C (0-200°C read range)

Temperature probe: A4 Marine grade stainless steel with PT1000 Platinum wire sensor 2.0mtr cable.

NMEA Calibration: +/- 1°C

Gauge Movement +/- 5°C

Alarm range: 38 - 140°C user adjustable

NMEA: NMEA 0183 Integrated Instrumentation standard.

Alarm Output: Ground connection, 350mA max, internal self-resetting fuse

Designed and Manufactured in the United Kingdom

Spares

Part Number	Description
SM0012	Complete Single Marine Exhaust Temperature Alarm Kit
SM006/1	Temperature Sensor
SM006/2	Temperature Sensor Retaining Clip
SM006/3	Illuminated Button
SM012/1	Gauge