

# SIO Shipboard Meteorological Sensor Specifications

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## 1. General information

SIO vessels are equipped with the following Meteorological sensors:

<b>Air Temperature</b>
<b>Barometric Pressure</b>
<b>Relative Humidity/Air Temperature</b>
<b>Wind Speed/Direction</b>
<b>Long Wave Radiation</b>
<b>Short Wave Radiation</b>
<b>Surface PAR</b>
<b>Precipitation</b>

Underway system sensors are:

<b>Sea Surface Temperature</b>
<b>Thermosalinograph</b>
<b>Oxygen</b>
<b>Fluorometer</b>
<b>Flowmeter</b>

Data from the above sensors are acquired, timestamped and stored by the MET acquisition computer along with data from the ship's GPS, Gyrocompass, Echosounder and, if available, the speed log.

The meteorological sensors used on SIO vessels are unmodified from the original manufacturers specifications with the exception of the installation of a common type of connector. This allows the sensors to be interchangeable between all SIO ships so that the sensors can be easily replaced and periodically rotated between ship and shore for maintenance/calibrations.

Depending on the make and model of the sensor the data output may be RS485, RS232 or analog signal out. The mast junction box that is installed on each ship is designed to accommodate sensors of different output types. There are also provisions for expansion to support specific science expedition requirements. MET Sensors are calibrated at a 8-12 months periodicity. Sensor accuracy and calibration specifications are listed in section 2.

Atmospheric sensors plug into a MET Sensor junction box (SEG-8) that utilizes analog to RS485 converters as well as RS232 to RS485 converters. It can accommodate the following number of sensor types.

- 1 RM Young Anemometer connection
- 2 RS485 inputs
- 2 RS232 inputs
- 7 Analog voltage inputs
- 2 Analog 4-20ma inputs

Air Temperature and Humidity sensors are installed in a multi-plate radiation shield (RM Young 41002). The Barometer utilizes a static pressure head – Vaisala SPH-10

## 2. Meteorological Sensors used on SIO vessels

Type	MFG	Model	Range	Accuracy	Output
Air Temperature	RM Young	41342LC	-50.0 to +50.0 C	+/- 0.3 Deg C	4-20 ma
Air Temperature	RM Young	41342VC	-50.0 to +50.0 C	+/- 0.3 Deg C	0 – 1 Volts
Precipitation	RM Young	50202	0-50 mm	+/- 1.0 mm	0 - 5 Volts
Wind	RM Young	05103	Dir 0-360 Deg Spd 0-60 m/s	+/- 3.0 Deg +/- 0.3 m/s	Voltage Out Pulse Count
Wind	Vaisala	WS425	Dir 0-360 Deg Spd 0-65 m/s	+/- 2.0 Deg +/- 0.14 m/s	RS232
Wind	RM Young	85000	Dir 0-360 Deg Spd 0-70 m/s	+/- 2.0 Deg +/- 0.1 m/s	RS232
Humidity/Temp	Rotronics	MP101A	RH 0-100% Tmp -40 to +60 DegC	+/- 1.5% +/- 0.2 Deg C	0 – 1 VDC -0.4 - 0.6 VDC
Humidity/Temp	Vaisala	HMP45A	RH 0-100% Tmp -40 to +60 C	+/-2.0% +/- 0.2 Deg C	0 – 1 VDC 0 – 1 VDC
Humidity/Temp	RM Young	41382VC	RH 0-100% Tmp -50 to +50 C	+/-2.0% +/- 0.3 Deg C	0 – 1 VDC 0 – 1 VDC
Barometer	Air Inc.	DB-2A	800-1060mb	+/- 0.5 mb	RS232
Barometer	Vaisala	PTB100A	800-1060mb	+/- 0.3 mb	0 – 5.0VDC
Barometer	Vaisala	PTB101C	900-1100 mb	+/- 0.3 mb	0 - 2.5VDC
Radiometer Long Wave	Eppley	PIR Pyrgeometer	3.5-50 um 4 uv/W/M2 Response Time 2sec	+/- 1% Linearity	0 – 10mv
Radiometer Short Wave	Eppley	PSP Pyranometer	285-2800nm 9 uv/W/M2 Response Time 1sec	+/- 0.5% Linearity	0 – 100mv
Radiometer Black&White	Eppley	8-48	285-2800nm 10 uv/W/M2	+/- 1% Linearity	0 – 100mv
Radiometer Short Wave	Zipp&Zonen	CM21 Pyranometer	305-2800nm 7-25uv/W/M2 Response Time 5sec	+/- 0.25% Linearity	0 – 100mv
Radiometer Long Wave	Zipp&Zonen	CG4 Pyrgeometer	4.5-42 um 10 uv/W/M2 Response Time 25sec	+/- 1% Linearity	0 – 10mv
Surface PAR	Biospherical	QSR-240P	400-700nm 1.4e-5uE/(cm2-sec) to 0.5uE/(cm2-sec)	Not Specified	0 - 5VDC
Surface PAR	Biospherical	QSR-2200	400-700nm 1.4e-5uE/(cm2-sec) to 0.5uE/(cm2-sec)	Not Specified	0 - 5VDC

All sensor tolerance and accuracy values listed in this section are taken from the manufacturers specification sheets. They are derived under laboratory conditions and do not necessarily indicate the accuracies that may be expected in actual shipboard installations. They do not take into account the effects of ship roll, pitch, sway, solar radiation, shipboard structural interference and thermal radiation effects of the ship itself. These effects will vary from ship to ship. Placing the sensors forward on the ship and as high as possible minimizes some of the ship structural radiation effects. This is the case on R/V Revelle and R/V Melville, each has a bow, mounted MET mast.

### Underway Uncontaminated Seawater System

TYPE	MFG	Model	Range	Accuracy	Output
Thermosalinograph	Seabird	SBE-21	Temp -5 to +35 C Cond 0 to 65 mS/cm	+/- 0.01 Deg C +/- 0.01 mS/cm	RS232
Thermosalinograph	Seabird	SBE-45	Temp -5 to +35 C Cond 0 to 70 mS/cm	+/- 0.002 Deg C +/- 0.003 mS/cm	RS232
Fluorometer	Wetlabs	WetStar	0.03 to 75 ug/l	Not Specified	0 - 5VDC
Water Temperature	Omega	ON-403-PP	Temp -5 to +35 C	+/- 0.02 Deg C	0 - 5VDC
Oxygen	Seabird	SBE-43	120% surf saturation	2%	0 - 5VDC
Hull mounted Sea Surf Temp	STS	SEG-14	Temp -2 to +35 C	+/- 0.1 Deg C	RS232
Flow Meter	Signet	515-PO	0-80 GPM	+/- 1.0% FS	Pulse Count
Flow Meter	FLO-CAT	C-ES45- B002	0.27 – 18.9 LPM	+/- 1.0% FS	Pulse Count
Flow Meter	FLO-CAT	C-ES45- B003	0.38 – 37.9 LPM	+/- 1.0% FS	Pulse Count
Flow Meter	FLO-CAT	C-ES45- B004	0.75 – 75 LPM	+/- 1.0% FS	Pulse Count

### 3. R/V New Horizon

Upper bridge (Forward) 36' above mean water line:

<b>Air Temperature</b>
<b>Barometer</b>
<b>Humidity/Air Temperature</b>
<b>Long Wave Radiation</b>
<b>Short Wave Radiation</b>
<b>Surface PAR</b>

Upper Bridge (Port side)

<b>Wind Speed/Direction</b>
<b>Precipitation</b>

Upper Bridge (Starboard side)

<b>Wind Speed/direction</b>
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**Aft Lab (Port Side):**

<b>Thermosalinograph</b>
<b>Flow Meter</b>
<b>*Fluorometer</b>
<b>*Oxygen Sensor</b>

Installed upon request prior to cruise

Machine shop Compartment (Starboard side)

<b>SEG-14 Sea Surface Temperature</b>
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Shipboard Data feeds to the MET system:

<b>GPS - Furuno GP90</b>
<b>Ship's Gyro Sperry</b>
<b>Heading - Ashtech ADU2</b>
<b>Ship's Speed Log - Furuno DS50</b>
<b>Water Depth – Knudsen BR320</b>
<b>Selected Winch – Meters of wire, Speed MPM, tension</b>
<b>CTD – CTD Depth, Descent rate, Altimeter</b>

#### 4. R/V Sproul

Upper bridge (Port side) 33' above mean water line:

<b>Air Temperature</b>
<b>Barometer</b>
<b>Humidity/Air Temperature</b>
<b>Precipitation</b>
<b>Wind</b>
<b>Long Wave Radiation</b>
<b>Short Wave Radiation</b>
<b>Surface PAR</b>

Main Lab (starboard side):

<b>*Thermosalinograph</b>
<b>*Fluorometer</b>
<b>*Oxygen</b>
<b>*Flow</b>

\*Installed upon request prior to cruise

Engine Rm

<b>SEG-14 Sea Surface Temperature</b>
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Shipboard Data feeds to the MET system:

<b>GPS - Furuno GP90</b>
<b>Ship's Gyro Sperry</b>
<b>Heading - Ashtech ADU2</b>
<b>Water Depth – Knudsen BR320</b>
<b>Selected Winch – Meters of wire, Speed MPM, tension</b>
<b>CTD – CTD Depth, Descent rate, Altimeter</b>

## 5. R/V Revelle

Forward MET Mast - Met platform - 56' above Mean Water Line.

<b>Air Temperature</b>
<b>Barometer</b>
<b>Humidity/Air Temperature</b>
<b>Precipitation</b>
<b>Wind</b>

Forward MET Mast – Top of Met mast - 68' above mean water line

<b>Long Wave Radiation</b>
<b>Short Wave Radiation</b>
<b>Surface PAR</b>

Flow-Thru System – Hydro Lab

<b>Thermosalinograph</b>
<b>Fluorometer</b>
<b>Oxygen</b>
<b>Flow</b>
<b>Water Temperature</b>

Uncontaminated Seawater feeds a vortex debubbler. The output of the debubbler supplies the flo-thru system.

Bow Thruster Room

<b>Thermosalinograph</b>
<b>Flow Meter</b>

The Thermosalinograph is located about 7' from the seawater intake.

An LCD panel in this area provides a local readout for Sea Surface Temperature, Salinity and water flow in the uncontaminated seawater supply.

Shipboard Data feeds to the MET system:

<b>GPS - Furuno GP90</b>
<b>Phins's INS Gyro</b>
<b>Heading - Ashtech ADU2</b>
<b>Water Depth – Simrad EM-120</b>
<b>Water Depth – Knudsen BR320</b>
<b>Phins INS – Pitch Roll Heave</b>
<b>Hydro Winch – Meters of wire, Speed MPM, tension</b>
<b>Trawl Winch - – Meters of wire, Speed MPM, tension</b>
<b>CTD – CTD Depth, Descent rate, Altimeter</b>

## 6. R/V Melville

Forward MET mast on bow - 55' above the mean water line:

<b>Air Temperature</b>
<b>Barometer</b>
<b>Humidity/Air Temperature</b>
<b>Precipitation</b>
<b>Wind</b>
<b>Long Wave Radiation</b>
<b>Short Wave Radiation</b>
<b>Surface PAR</b>

Flow-Thru System – Bioanalytical Lab

<b>Thermosalinograph</b>
<b>Fluorometer</b>
<b>Oxygen</b>
<b>Flow</b>
<b>Water Temperature</b>

Uncontaminated Seawater feeds a vortex debubbler. The output of the debubbler supplies the flo-thru system.

Bow Chamber:

<b>Flow Meter</b>
<b>SEG-14 Sea Surface Temperature Sensors</b>

Shipboard Data feeds to the MET system:

<b>GPS - Furuno GP90</b>
<b>Meridian Gyro</b>
<b>Heading - Ashtech ADU5</b>
<b>Water Depth – Knudsen BR320</b>
<b>Seatex MRU– Pitch Roll Heave</b>
<b>Selected Winch – Meters of wire, Speed MPM, tension</b>
<b>CTD – CTD Depth, Descent rate, Altimeter</b>