SeaKeeper 1000™

AUTOMATED MODULAR TELEMETERING, LOGGING, OCEAN & WEATHER MONITORING SYSTEM

More than 45 systems are installed worldwide on a variety of platforms, all of which are capable of carrying additional FSIS™ compliant sensors.

SeaKeeper 1000™

DEPLOYMENTS

COMMERCIAL SHIPS	CAR FERRIES
CRUISE SHIPS	LIGHTHOUSES
NOAA BUOYS	PIERS
PRIVATE YACHTS	UCSG ICE BREAKER

SeaKeeper 1000™

OCEAN & WEATHER MONITORING SYSTEM

The SeaKeeper 1000™ is an automated modular, telemetering, logging ocean and weather monitoring system, currently deployed on a wide variety of platforms: vessels, piers, buoys, and lighthouses. It can provide customizable real-time displays of environmental conditions on a local computer network, while automatically transmitting to National Weather Services worldwide via satellite on a regular schedule for use in global weather forecasting as part of the Volunteer Observing Ships (VOS) program. High resolution (once a minute) data is written to the hard drive and can be periodically downloaded during service visits. Data is also accessible via the internet or alternate communication methods.

The package includes a NEMA4 enclosure for the computer and INMARSAT C transceiver, an instrument enclosure for the modular oceanographic sensors, and a pair of through-hull valves.

The base SeaKeeper 1000™ collects UTC time, the sampling position and, in case of a vessel, its course and speed over the ground via the GPS from the Sat C transceiver. These data are critical to complementing any environmental or scientific measurements providing the *where* and *when* for each parameter. All logged data are time stamped using UTC time from the GPS clock.

Variable	Units	Range	Accuracy	Resolution
Date	HH:MM:SS	0 to 24 hours	± 0.013 sec	0.001 sec
UTC time	HH:MM:SS	0 to 24 hours	± 0.013 sec	0.001 sec
Latitude	Degrees	-90 to +90	< ± 0.001min	0.0001 min
Longitude	Degrees	-180 to +180	< ± 0.001min	0.0001 min
Course over ground*	Degrees	0 to 359 Degree	± 3 degrees	1 Degree
Speed over ground*	Knots	0 to 100 knots	± 0.5 knot	0.1 knot

** for Vessels*

BUOY AND PIER APPLICATIONS

NOAA/NDBC 3 meter buoy equipped with low power instrument box

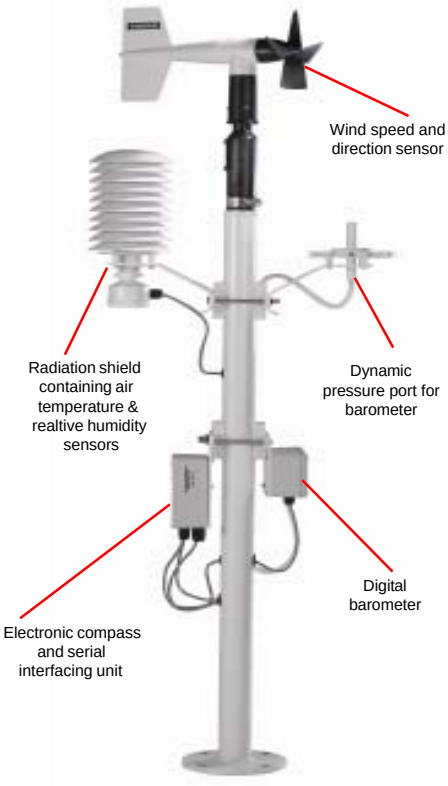
Although originally designed to operate in a shipboard environment, the SeaKeeper 1000™ has now been demostrated to work successfully *both* on buoys and piers. On buoys and remote piers where there is only limited power available, typically from solar panels, the pump will be scheduled to start and stop upon demand to collect discreet samples rather than running continuously. For buoy applications SAIC, under contract to NOAA, developed micro-processor based low power controller. On Piers and buoys requiring a lift of more than several feet, a submerged pump will be employed with a lift capacity of about 2 gpm (8 l/m) to heights that may exceed 100 feet.

A custom housing for the submerged pump co-locates a Platinum thermometer and an electrical Anti Fouling Device (AFD) at the inlet to the pump. For buoy applications requiring a modest lift like the SeaKeeper 1000™ self priming 3 gpm (12 l/m) diaphragm pump is used in conjunction with a custom pickup arm with a thermometer and anti fouling device at the inlet.

METEOROLOGICAL STATION

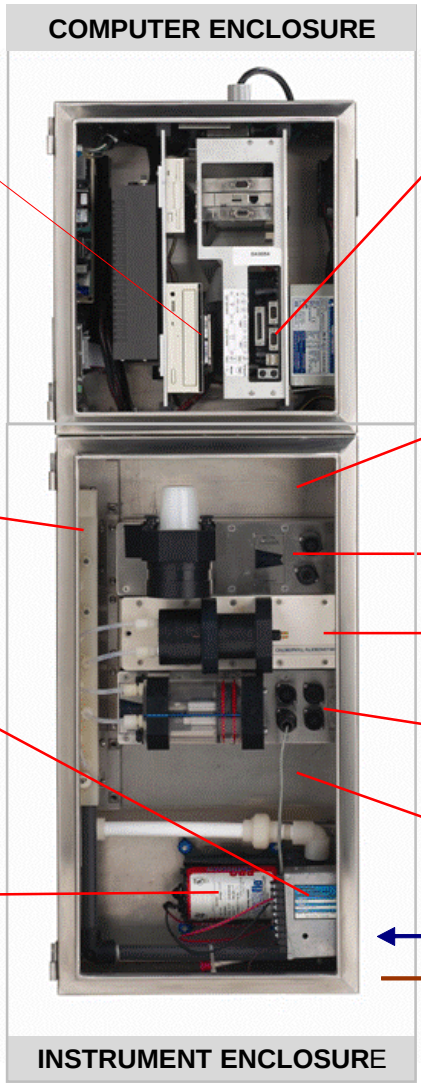
In many deployments of the SeaKeeper 1000™ flow through monitoring systems, a standard meteorological station is included as a component. The photo below shows a mast with a sensor suite from R.M. Young. Generating, storing, and transmitting atmospheric data simultaneously with seawater data has clear scientific advantages in terms of correlating events interactions and relationships. The meteorological data is typically split from the transmitted ocean data and submitted to the GTS system providing National Weather Services worldwide important additional sources of near-real-time weather information. Currently work is underway with JCOMMS to transmit all of the collected data through the GTS in BUFR format so that it will be available for the Global Ocean Surface Underway Database archived at IFREMER, France and MEDS Canada.

Meteorological Station



SeaKeeper 1000™

OCEAN MONITORING SYSTEM (doors open)



COMPUTER & INSTRUMENT ENCLOSURES

The *computer enclosure* houses a standard PC computer, the communications transceiver and dedicated power supplies.

The *Instrument enclosure* contains a pump, a water distribution manifold and five bays for various sensor packages.

The enclosures may be mounted together vertically, or may be separated with a cable run between them. At the bottom right of the lower enclosure the inlet and outlet water pipes are held in a stainless steel clamp.

For pier applications, an unventilated computer enclosure is supplied for operation outdoors in exposed areas.

Computer Enclosure	
Dimensions:	18 x 16 x 10 inches (460 x 410 x 260 mm)
Weight:	80 lbs (36 Kg)
Power Requirements:	110 or 240 Volts, selectable 500 watts
Max Operating Temperature:	135° F(55° C)

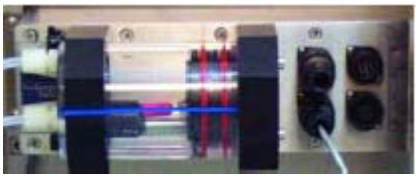
Instrument Enclosure	
Dimensions:	30 x 16 x 10 inches (770 x 410 x 260 mm)
Weight:	87 lbs (40 Kg)
Water Through-put:	approx. 4 gallons (16 liters) per minute

SEAKEEPER 1000™

FSIS™ (FERRYBOX SENSOR INTERFACE STANDARD)

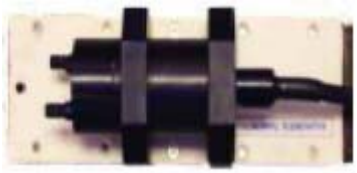
A key design feature of the SeaKeeper 1000™ system is interchangeable modular sensors. This standardized system known as the FSIS™ is being used by an increasing group of sensor manufacturers, in some cases repackaging in-situ devices for this flow-through architecture. The FSIS™ specifications include the physical mounting template, as well as water flow rates, tubing specs, electrical and data connectors. Any interested manufacturer is encouraged to contact SeaKeepers for more information. Scientists and managers, please contact us for *specific need* sensors as there are a number in development by a variety of manufacturers, some of which are mentioned below.

EXISTING FLOW THROUGH SENSORS



IDRONAUT
6 Parameter Sensor
Measures Conductivity, Temperature, Pressure, O_2, pH, & Redox

SEABIRD ELECTRONICS
Thermosalinograph
Utilizing SBE electrode cell



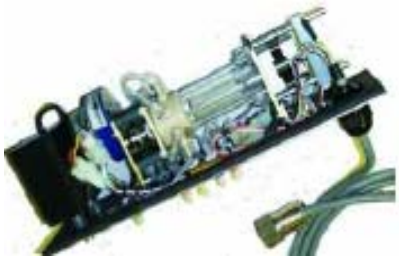
SEAPOINT SENSORS, INC.
Fluorometer
Measures Chlorophyll "A" concentration

FSIS™ MOUNTING MODULE

SATLANTIC
ISUS Nitrate Sensor
Measures absorption spectra

GENERAL OCEANICS, Inc
pCO_2 System
Idronaut 7P-CTD (top) and pCO_2 with Equilibrator (bottom)

IDRONAUT/CABE
Trace Metals Sensor



ENVIROTECH
Nutrient Analysis Sensor
Uses Reagents in IV Bags

Sensors In Development

as of first quarter 2006

Falmouth Scientific, Inc.
Thermosalinograph based upon inductive conductivity cell.

Mote Marine Laboratory
Optical sensor for HAB's ("Red Tide phenomenon".)

Pro-Oceanus Systems Inc.
pCO_2 sensor utilizing gas tension technique.

Turner Desings Inc.
Cyclops 7 fluorometer.

WET Labs
Optical hyperspectral flow through sensors.

SEAKEEPER 1000™

VESSEL'S WATER INTAKE & ANTIFOULING DEVICE

The through-hull assembly, for uncontaminated water sampling, must be installed forward of any grey, black or heated water discharges and approximately 2 meters below the water line.

The containment vessel is part of the gate valve and through-hull assembly. It contains a computer activated rotary valve which will be closed in conjunction with the pump being stopped in the event of unexplained water being detected in the instrument enclosure.

External to the gate valve is the water intake scoop, which stabilizes the end of the sampling probe away from direct contact with the hull and provides the seat for the external thermometer. It is designed to provide positive pressure when the vessel is moving to help prevent bubble formation in the sample lines.

An electro-chemical ***antifouling device*** (AFD) is installed within the scoop (or in the external housing of the submersible pumps for fixed platform installations) and is activated for a few minutes every twenty-four hours to reduce the effects of biological fouling.

Containment vessel with emergency shut off solenoid valve

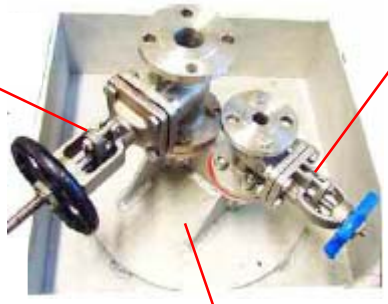
Stainless steel braided Teflon discharge hose

DIMENSIONS
Diameter: 9 inches (230 mm)
Height: 25 inches (640 mm)

Through-hull gate valves, intake (black handle) and discharge (blue handle), in optional doubler configuration

1 ½ " Lloyds certified, guillotine, inlet gate valve

DIMENSIONS
Height: 6.5 in. (165 mm)
Max Dim: 15 in. (380 mm)



¾" Lloyds certified discharge gate valve

DIMENSIONS
Height: 4.5 in. (115 mm)
Max Dim: 10 in. (255 mm)

Platinum thermometer and *antifouling device* external to hull.

INQUIRY FAX FORM

Fax this form to +1-954-252-4595 or fill out online at www.seakeepers.org/inquiry

Name:_____ Position/title: _____

Organization:_____

Address: _____

City:_____ State: _____ Zipcode: _____-_____ Country: _____

E-mail address: _____@_____

Phone: _____ Best time to call: _____

I am interested in:

- ❒ Possible purchase of the SeaKeeper 1000™ monitoring system(s).
- ❒ Developing sensors utilizing the FSIS™ interface standard for use in the SeaKeeper 1000™ systems or other flow through devices.
- ❒ Other: _____

4101 Ravenswood Road #128 ◆ Fort Lauderdale ◆ FL 33312 ◆ Tel. 954.766.7100

THE INTERNATIONAL SEAKEEPERS SOCIETY

SeaKeeper 1000™

SAMPLE DEPLOYMENTS TO DATE

Demonstrating collaboration between NGO's, government organizations, private companies, and academia.

AMERICAN PRESIDENTIAL LINES

Three APL vessels are currently carrying a modified SeaKeeper 1000™ on their transpacific routes to supply better data to assist in marine forecasting South of the Aleutian islands in winter.

CARNIVAL CRUISE LINES (including Holland America Lines)

Five Carnival Cruise Lines cruise ships are carrying systems on trans Panama, Caribbean, Hawaiian, and Alaskan routes.

METALNAVE, BRAZIL

Metalnave, in conjunction with scientists at Sao Paulo University, have equipped a liquefied gas carrier that travels the coastal waters of Brazil.

METROSTAR MANAGEMENT, GREECE

Metrostar management of Greece are purchasing a system to equip a newbuild bulk carrier with a SeaKeeper 1000™ system.

NOAA MARINE SANCTUARIES PROGRAM

At least one of the current newbuild series of vessels will carry a SeaKeeper 1000™ system.

NOAA NATIONAL DATA BUOY CENTER

After extensive testing and evaluation, several NDBC buoys and C-Man stations are using the SeaKeeper 1000™ Ocean Sensing Module (OSM) to add surface oceanographic observations to the traditional meteorological data gathered by these buoys. This program will expand as the NDBC buoys become part of the federally supported backbone of the 11 Coastal Ocean Observing Systems around the United States, Hawaii, US Virgin Islands, and Puerto Rico.

OCEANCO YACHTS OF MONACO AND ALBLASSERDAM, NETHERLANDS

Having equipped one luxury yacht last year, oceAnco is now purchasing systems to equip three vessels presently under construction. The shipyard has also committed to similarly equip all new vessels that they construct.

ROYAL CARIBBEAN CRUISE LINES

RCCL Explorer of the Seas carries a SeaKeeper 1000™ system as part of a very sophisticated monitoring system maintained in conjunction with the University of Miami Rosentiel School of Marine and Atmospheric Sciences.

SCCOOS (SOUTHERN CALIFORNIA COASTAL OCEAN OBSERVING SYSTEM)

SeaKeepers is running a demonstration project on Scripps Pier in La Jolla, California, where a Satlantic ISUS Nitrate sensor and a SeaBird SeaKeepers TSG (thermosalinograph) are currently being evaluated. Future plans include the evaluation of a Brooke Techologies Laser Optical Plankton Counter, a Pro-Oceanus gas tension pCO_2 sensor and a General Oceanics pCO_2 sensor. It is also planned to start another test site at Huntingdon Beach in the near future.

SNCM FERRIES OF FRANCE

Le Mediterranee, a car ferry traveling between Marseilles and North Africa, carries a SeaKeeper 1000™ system equipped with a Turner "Cyclops" fluorometer. This data is processed by IFREMER in Toulon as a part of the CIESM (Commission Internationale pour l'Exploration de la Mer) Mediterranean countries joint research effort.

The International SeaKeepers Society welcomes inquiries from sensor manufacturer's and those interested in obtaining and/or deploying our systems. For more information, please contact Geoff Morrison, Technical Director at 786.325.3733 or at morrison@seakeepers.org.

THE INTERNATIONAL SEAKEEPERS SOCIETY

An organization of international leaders who promote synergy among citizens, governments, educational institutions and corporations to restore and protect the world's oceans.

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The International SeaKeepers Society is a nonprofit organization.