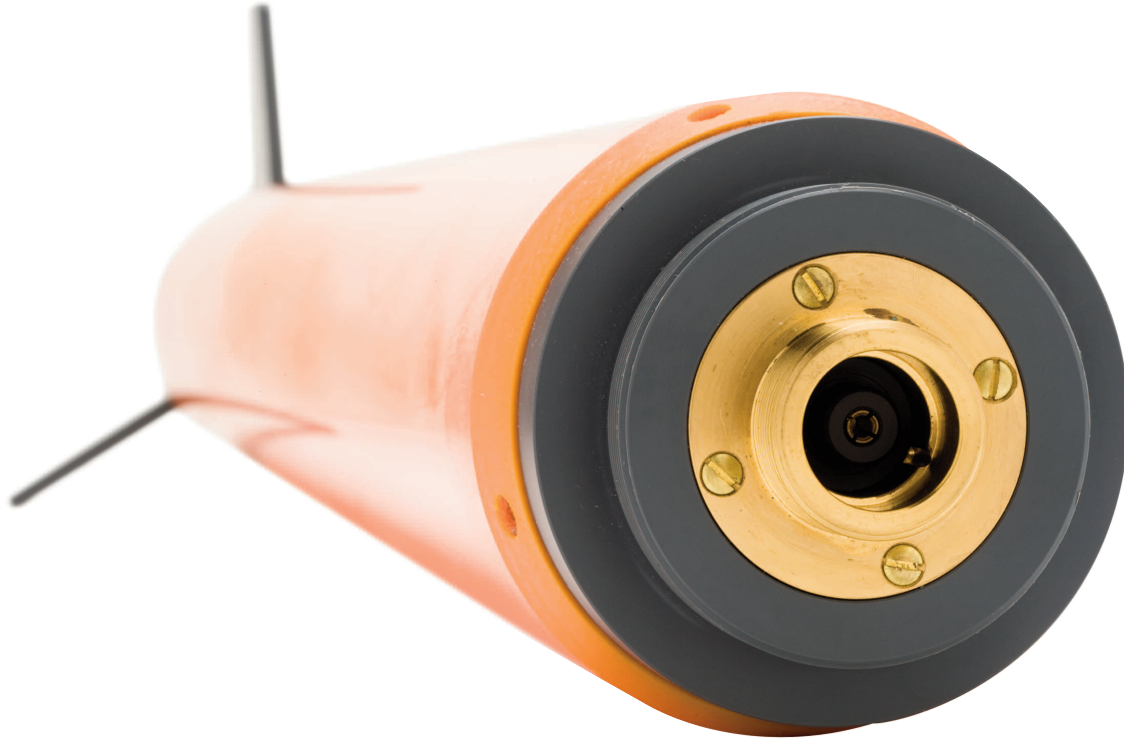


# SeaSPY

## Marine Magnetometer



**Marine Magnetics is the only marine magnetometer company in the world that can produce stable Overhauser sensors that do not degrade with time.**

SeaSPY, the product we launched over 10 years ago, was designed to pick up where traditional marine magnetometers left off. Initial research and our sales since then tell the same story: surveyors want a mag they can rely on. SeaSPY's mandate was to help surveyors save time, money, and energy by taking the realities of working in the field into account.

### **Rugged**

#### *Smart connector*

The SeaSPY connector is a custom brass underwater connector that supports a tonne of towing force. A PVC nose cone protects it from side impacts, while maintaining a streamlined tow body. We have never lost a SeaSPY from the connector, except for the time someone threw one overboard without connecting it to the cable. While there's some human error no mag can account for, the story has a happy ending: the customer went back a year later and found their SeaSPY in working condition.

### **Sleek Design**

SeaSPY's sleek design resists snags. The inexpensive and field replaceable tailfins are the only protruding element, and they are designed to snap off should they ever get snagged on rocky outcroppings.

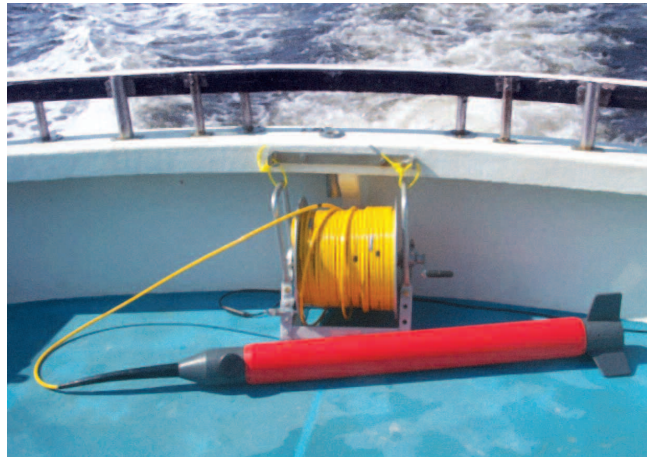
### **Reliability**

The SeaSPY towfish is made of ¼" super strong fiberglass coated with a 'bumper' layer of polyurethane for extra shock absorption.

Should even a drop of water penetrate the towfish, a leak detector warning appears on your screen to inform you. Call us over-protective, but in the event of a breach, SeaSPY's electronics module is encased in a polycarbonate housing with 'O' ring seals for another layer of security.

The sensor itself is suspended on shock mounts to ensure the quality of your data isn't influenced even if you drag SeaSPY along the sea floor.

A quick glance self diagnostic LED system on our isolation transceiver can save you hours of frustration. If all your connections are hooked up properly, a status LED will glow green. If there's a problem with one of the connections, it will glow yellow. If there's a short somewhere, it will glow red, and the transceiver will safely shut down the output power in microseconds. A blue LED flashes with every mag reading.



### Versatility

All innovations are backward compatible. Everything we do to improve our products applies to the ones in the field.

### Better Data

#### *Worldwide Operation with No Restrictions*

SeaSPY will collect accurate data no matter where you are or in which direction you are surveying. This is not the case with optically pumped magnetometers which have dead zones and must be oriented at a specific angle relative to the earth's magnetic field. This issue can be particularly problematic in equatorial regions where you cannot collect data in every direction.

### Highest Absolute Accuracy

SeaSPY Overhauser sensors have the highest absolute accuracy of any magnetometer: 0.1nT.

The repeatability between SeaSPY sensors is also unmatched at better than 0.01nT.

### Proven Sensitivity Specs

A world authority belonging to INTER-MAGNET has independently tested and confirmed our specifications: 0.01nT/Hz; counter sensitivity is 0.001nT.

### Eliminate Shifts In Your Data

'Heading error' is a noticeable offset in the magnetometer output caused by changing the heading of the magnetometer within the Earth's magnetic field.

Since SeaSPY's Overhauser technology does not display heading error, no matter how the sensor is oriented in the Earth's magnetic field, successive survey lines taken in opposite directions will match up perfectly.

#### *The benefits to the user are four-fold*

1. Targets will not be missed because they fall between mismatched survey lines.
2. Reduces post-processing. Competing technologies require the user to collect tie lines in order to level the data set (match-up inaccurate survey lines).
3. There will be no variation introduced in the data by slight course changes during a survey line.
4. A magnetic map of an area will look the same, regardless of direction in which the survey lines were conducted.

### Stable Time

The clock used in the SeaSPY electronics module is accurate to 1ppm throughout the entire temperature range, (as opposed to 100ppm found in competing magnetometer systems) so it will be accurately time stamped to sync with diurnal correction (base station) information.

### Maintenance Free Sensors

SeaSPY sensors don't degrade with time, so you'll get the same quality data after 10 years of use as you did the first time you used it.

In addition SeaSPY sensors contain no consumable parts, so you won't have to replace anything, like the expensive lamps that wear out in optically pumped mags.

### Overhauser Effect

SeaSPY is a pulsed Overhauser magnetometer that measures the ambient magnetic field using a specialized branch of nuclear Magnetic Resonance technology, applied specifically to hydrogen nuclei.

*Please see our Application Guide for details.*

### Ease of Use

#### *Ultra Low Power Consumption*

A SeaSPY system only requires 1W standby and 3W maximum. As a result, SeaSPY can run for days directly from a 12V or 24V vehicle battery.

#### *No temperature effect on accuracy*

SeaSPY works equally well in cold, deep waters as tropical waters, starting instantly on power-up without requiring warm up. And data collected at  $-40^{\circ}\text{C}$  will be identical to data recorded at  $+60^{\circ}\text{C}$ .

#### *Integrate with side scans and other platforms*

An easy all in one solution to integrate SeaSPY with side scans. A single 10m tow cable is terminated with everything you need. No modifications to your magnetometer or gradiometer are required. Simply swap out your tow cable for the integration cable and you are ready to go. Best of all, your accessories, including power supply, are still compatible.

The integration maintains the basic system integrity of each product, ensuring they can both run independently as well as together.

# Gradiometer Configurations

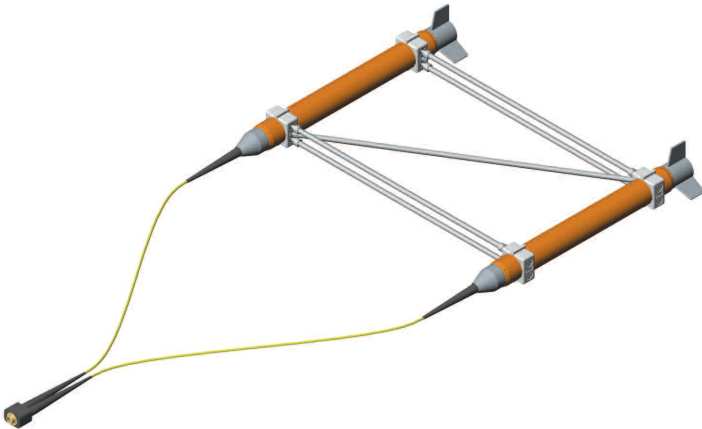
SeaSPY sensors are highly accurate and repeatable, making them ideal for gradiometers

**A magnetic gradiometer measures magnetic gradient in one dimension by subtracting the difference between two independent magnetic sensors. Since the Earth's magnetic field is three dimensional, up to three independent gradient directions can be measured – vertical, horizontal (across-track) and longitudinal (along-track).**

**Marine Magnetics offers each of these gradiometer configurations. In addition, all SeaSPY magnetometers are compatible, enabling existing SeaSPY customers to upgrade their magnetometer to the gradiometer configuration of their choice, as they need to.**

## Horizontal or Vertical Transverse Gradiometer

Marine Magnetics' transverse gradiometers provide a rigid 2m structure linking the sensors, and are well suited for close-in precision surveys for small ferrous targets where short sensor separation is needed.



### Applications

**Cable and Pipeline Survey** – A horizontal transverse gradiometer can be used to track cables, or pipelines in real time from relatively high towing altitudes.

**Detection of Small Ferrous Targets** – Short baseline gradient measurement in any direction (longitudinal, horizontal, or vertical) is useful for eliminating geological interference and diurnal variation.

## Longitudinal Gradiometer

Longitudinal gradiometers provide the largest variation in available baselines, from 1.5m to 500m+. Again, Marine Magnetics' communication transceiver technology is unmatched in its ability to support extremely long distances between the two towfish. Long baselines provide superior gradient measurement sensitivity and increased detection range. Longitudinal gradiometers are also extremely hydrodynamically stable when deployed.

### Applications

**Shipwreck, Search and Salvage** – Medium baseline longitudinal gradient measurement can eliminate interference by geological bodies, while highlighting massive magnetic sources like steel hulls, boilers or engines. Smaller sources such as anchors or cannons will require a shorter baseline, and lower towing altitude.

**Environmental Survey** – Medium baseline measurement with a longitudinal gradiometer can highlight shallow magnetic sediments, while eliminating deeper geological influences. The baseline should be on the order of magnitude of the expected towing altitude.



**Exploration Geophysics** – Long-baseline measurement with a longitudinal gradiometer is ideal since the bodies of interest are often far from the sensor, and produce very small gradients. The baseline should be on the order of magnitude of expected depth-to-source.

# Specifications

## SeaSPY system consists of:

### SeaSPY Towfish includes

- Depth rating 1000m (1500psi), 3000m (5000psi), 6000m (9000psi) customer specified.
- Overhauser Sensor
- Electronics module containing all of the driving electronics and Larmour counter
- Leak detector to let you know if even a drop of water penetrates the towfish
- 4 lead weights to increase the weight of the towfish and to prevent it from rotating. To adjust the weight you can remove or add additional weights in the field.
- SeaLINK data acquisition and GPS logging software for Windows. See our SeaLINK brochure for more information.

### Tow Cable

The cable is made up of one twisted pair of conductors, a Vectran strength member, water block and yellow polyurethane jacket. Length determined by customer.

### Isolation Transceiver

Dimensions: 11 x 6 x 3 cm (4 x 2 x 1") Weight: 130 g (0.28 lbs)

### RS-232 cable

### Battery Clip Cable or Power Supply

The power supply accepts any AC line power, from 100-240VAC and 50/60 Hz to provide conditioned and clean 24V DC power. Weight 165g (0.36lbs)

### Options

- Pressure Sensor
- Altimeter
- Transponder
- SideScan integration
- Depth options: 3000m, 6000m
- Extension cables
- Change the weight of the towfish with additional weights
- Deck cable
- Termination kit
- Winches

**Operating Zones**  
SeaSPY will perform exactly according to spec throughout the entire range.

|                              |                           |
|------------------------------|---------------------------|
| <b>Absolute Accuracy</b>     | 0.1nT                     |
| <b>Sensor Sensitivity</b>    | 0.01nT                    |
| <b>Counter Sensitivity</b>   | 0.001nT                   |
| <b>Resolution</b>            | 0.001nT                   |
| <b>Dead Zone</b>             | NONE                      |
| <b>Heading Error</b>         | NONE                      |
| <b>Temperature Drift</b>     | NONE                      |
| <b>Power Consumption</b>     | 1W standby, 3W maximum    |
| <b>Timebase stability</b>    | 1ppm, -45°C to +60°C      |
| <b>Range</b>                 | 18,000nT to 120,000nT     |
| <b>Gradient Tolerance</b>    | Over 10,000nT/m           |
| <b>Sampling Range</b>        | 4Hz – 0.1Hz               |
| <b>External Trigger</b>      | By RS-232                 |
| <b>Communications</b>        | RS-232, 9600bps           |
| <b>Power Supply</b>          | 15VDC-35VDC or 100-240VAC |
| <b>Operating Temperature</b> | -45°C to +60°C            |
| <b>Temperature Sensor</b>    | -45°C to +60°C, 0.1 step  |

### Towfish

|                                |                    |
|--------------------------------|--------------------|
| <b>Towfish Length</b>          | 124 cm (49 inches) |
| <b>Towfish Diameter</b>        | 12.7 cm (5 inches) |
| <b>Towfish Weight in Air</b>   | 16 kg (35 lbs)     |
| <b>Towfish Weight in Water</b> | 2 kg (4.4 lbs)     |

### Tow Cable

|                          |                          |
|--------------------------|--------------------------|
| <b>Conductors</b>        | Twisted pair             |
| <b>Strength Member</b>   | Vectran                  |
| <b>Breaking Strength</b> | 2,500 kg (5,500 lbs)     |
| <b>Outer Diameter</b>    | 1 cm (0.4 inches)        |
| <b>Bending Diameter</b>  | 16.5 cm (6.5 inches)     |
| <b>Weight in Air</b>     | 125 g/m (84 lb/1000 ft)  |
| <b>Weight in Water</b>   | 44 g/m (29.5 lb/1000 ft) |
| <b>Outer Jacket</b>      | Yellow Polyurethane      |
| <b>Cable Termination</b> | Field Replaceable        |

### Floating Cable

|                          |                             |
|--------------------------|-----------------------------|
| <b>Conductors</b>        | Twisted pair                |
| <b>Strength Member</b>   | Vectran                     |
| <b>Max Working Load</b>  | 2,500 kg (5,500 lbs)        |
| <b>Outer Diameter</b>    | 1.9 cm (0.74 inches)        |
| <b>Bending Diameter</b>  | 25 cm (10 inches)           |
| <b>Weight in Air</b>     | 272 g/m (183 lbs/1000 ft)   |
| <b>Weight in Water</b>   | -20 g/m (-13.5 lbs/1000 ft) |
| <b>Outer Jacket</b>      | Orange Polyurethane         |
| <b>Cable Termination</b> | Field Replaceable           |

**“We have now completed the first full Antarctic season using our SeaSPY magnetometer and can report that we are delighted with its performance.**

**It has proved to be very robust and trouble free in operation and has delivered consistently good data. There is no doubt that we chose the right instrument.”**

*Peter Morris*

*British Antarctic Survey*