Magnetometers

In the summer of 1754, the VOC ship Geldermalsen, on her way from Nanking to Batavia, sailed into a coral reef in the South China Sea and sank immediately. The ship was loaded with 343 tonnes of tea, 239,000 pieces of precious Chinese earthware and more than 45 kilograms of gold. The china replaced the normal ballast of bricks and stones.

In 1985, treasure hunter Michael Hatcher, assisted by the Swiss geophysicist Max de Rham started searching for the wreck in an area of some 260 km2, littered with hundreds of coral reefs. Following a dense search pattern with side scan sonar and magnetometer, they finally located the wreck at a depth of 40 meter. Thanks to the fact that both the on-board gold and two large iron cannons gave a clear indication on the magnetometer that something 'was there', the treasure hunters were able to recover, gold, artefacts and all the undamaged blue and white china, hand-decorated with Chinese bridges, river landscapes, fisherman, farmers and ornate fences. Half the treasure was sold at Christies in Amsterdam in 1986 for some 15 million Dollars.

Hundreds of ship wrecks from bygone era's are still buried or locked in coral reefs, completely overgrown and hidden from multi beam, side scan sonar or sub bottom profiler systems. Only magnetometer may be able to locate these wrecks due to on-board metallic material….

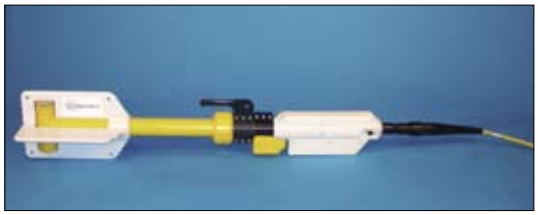
When was the marine magnetometer system developed? We could locate it's 'birth date' to 1955, when the Survey Ship Pioneer surveyed the U.S. West Coast from San Diego to Cape Flattery.. Shortly into the project, the Scripps Institution of Oceanography requested that it be allowed to tow a newly developed marine magnetometer from the Pioneer. Permission was granted, leading to what the great marine geologist H.W. Menard called "one of the most significant geophysical surveys ever made". The Pioneer Survey, as it came to be called, discovered long, linear magnetic stripes on the sea floor. Ultimately, this striping led to the ability to date the age of the sea floor, as well as to compare magnetic patterns across fracture zones and from one side of an oceanic ridge to another. Because of these factors, the recognizable magnetic patterns associated with the sea floor were a major element in formulating the Theory of Plate Tectonics.

For surveyors, the magnetometer has maybe been an instrument of doubtful reputation. It does not give us a clear picture, like an echo sounder or side scan sonar. Only some readings and funny spikes on the recorder are the only visible output of the device. But properly used, specially in combination with sidescan sonar and Subbottom profiler systems the magnetometer can provide a useful tool for all kinds of detection surveys and developments of the various types of magnetometer systems have given it a well earned place in the range of offshore hydrographic survey tools.

We would like to thank the manufacturers who contributed to this Product Survey and responded to the Questions about their products. ■

Company	Geometrics, Inc
Name of product	G-882
Price of product (within range of 10k euro)	US$20,000
Year of development	2002
Performance	
What is the type of sensor (Cesium, Overhauser, Potassium, Proton)	Cesium
Is the sensor a gradiometer?	Optional configuration
What is the sensors´: Accuracy (nT)	+ - 0.5
Resolution (nT)	0.001
Range (nT - nT)	20,000 - 100,000
Gradient tolerance (nT/m)	>5000
Sensitivity (nT)	0,004
Sampling rate (Hz)	up to 50Hz
External trigger by…	TTL pulse
Operating temperature	-35 to +50°C
Are there limits to the geographic operating zones?	System is operational world wide
Is the sensor directional sensitive, which directions?	Proper sensor orientation results in world wide operation
What are the power requirements	28VDC 1 amp
What are the fish dimensions (cm)	137 x 7
Towfish body material	Fiberglass
What is the fish weight under water (kg)	9
What is the fish weight in air (kg)	18
What is the depth range (m)	2,700 (4,000 psi)
Maximum tow speed (knots)	12
With what sensors can the sytem be integrated	Side Scan Sonar
Calibration before use (Y/N) ?	Not required
Recommended maintenance intervals (xxx hours) ?	Not required
Towcable	
Number of conductors	5 or coax
Type of cable and diameter	Kevlar, 1.8cm od
Weight per meter in air/water	134g / 44.6g
Max cable lenght	800m kevlar, 6km coax
Breaking strenght	2000kg
Type of termination	Epoxy - aluminum
Data communication	
Visual read-out available?	Yes on PC
Analog output format	None
Digital output format	Serial RS-232
Digital data formats supported:	Serial RS-232
Software	
Data logging software	MagLog Lite
Diurnal magnetism variation filtering software (Y/N ?, real-time/post-processing ?)	Yes, post processing
Magnetic anomalies mapping software (Y/N ?, real-time/post-processing ?)	Yes, real time and post processing
Application	
What is the typical application for your system? (max 30 words)	Mapping all sizes of ferrous objects including pipelines, munitions (Unexploded Ordnance), anchors, chains, cables, archaeological targets, shipwrecks, aircraft. They system's high sample, rate is particularly suited for small object search. Other applications include geologic mapping for oil/gas and mineral deposits, cable and pipeline route surveys and basic research.

N/A Not Applicable
❑ No information received



IXSEA	JW Fishers Mfg. Inc.	JW Fishers Mfg. Inc.
MAGIS	Proton 4	Diver Mag 1
€23,000 (US$29,635)	US$10,495	US$7,495
2002	2001	2004
Overhauser Magnetic Nuclear Resonance	Proton	Proton
No	No	No
0,5	1	1
0,01	1	1
25000 / 75000	23,000 to 67,000	23,000 to 67,000
800		
0,0035 nT / Hz1/2	1	1
10Hz	2 seconds	2 seconds
Software	No	No
-20 to +40°C		
No	No	No
No	No	No
18 to 36 VDC, 100 to 240 VAC, 10 W	24VDC	12 Volts
175 x 13	132 x 15.2	112 x 15.2
RFG covered by a shock absorbing coating	PVC	PVC
4.3	13.6	Neutral
23	21.8	15.9
300 (standard), 1500 and 6000 available	152	61
Up to 12	6	6
Synthetic Aperture Sonar, Side-scan Sonar	altimeter	underwater earphone
No	No	No
No maintenance	No routine maintenance required	No routine maintenance required
1 (Coaxial)	8 conductor	
"Double insulated polyurethane Kevlar armored coaxial cable (9,6mm dia)"	2 wires encased in polypropylene rope	
113g / 18g	304g	
10km	305m	
1000daN for 300m cable	227kg	
Proprietary connector, Bend restrictor included to prevent tow cable damage		
Yes	Yes	Yes
None	0 - 5 volts	
Proprietary	RS232	
Proprietary	RS232	
Yes	Fishers Tracker II software	
Yes, real-time		
Yes, real-time	No	
Earth science geological mapping, wreck and buried object detection / location / identification, unexploded ordnance detection, dredgging clearance …	Fishers Proton 4 magnetometer is in use worldwide by professional treasure hunters, commercial diving companies, law enforcement agencies, and military units to detect sunken ships, pipelines, weapons, and unexploded ordnance.	Fishers Diver Mag 1 hand-held magnetometer is in use worldwide by professional treasure hunters, commercial diving companies, law enforcement agencies, and military units to detect sunken ships, pipelines, weapons, and unexploded ordnance.