



OCEAN INERTIAL SENSOR BROCHURE

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PRODUCT ADVANTAGES

High Accuracy

The products can achieve robust and high-performance north finding measurement, heading measurement, and attitude measurement even during irregular movements, horizontal acceleration, and large amplitude surges.

Affordable/Easy to use

High performance in all conditions at affordable prices set our products apart from the competition..

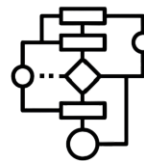
Our MEMS small and lightweight products offer flexible cable options, easy installation, and can be easily integrated into your system.

How to achieve this?



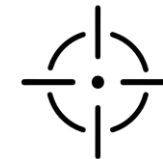
The tech-progress of advanced MEMS inertial chips, fiber optic gyroscopes, and quartz accelerometers has enabled new products developed with higher cost-effectiveness advantages

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Sensor Fusion Algorithms
Our unique advanced sensor fusion algorithm can fully utilize the existing best sensors and provide excellent results in practical situations

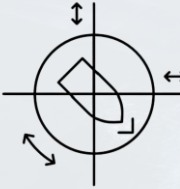
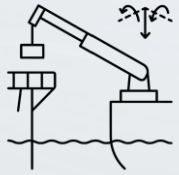
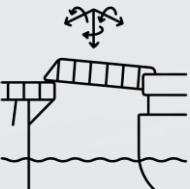
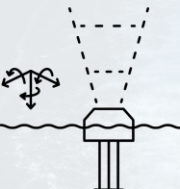
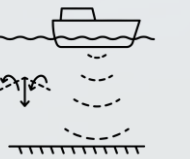
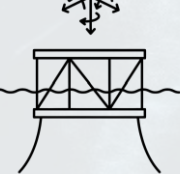
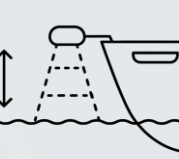
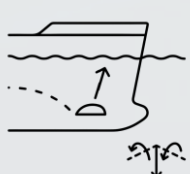
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The Result: Under real sea conditions, INS and MRU sensors with higher cost-effectiveness advantages were manufactured

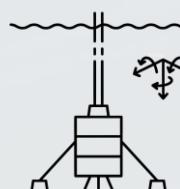
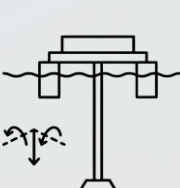
APPLICATION SCENARIO

1. Offshore Operation

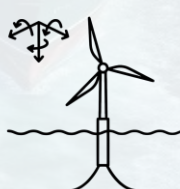
	<i>Ships monitoring and Navigation</i> Prevent Cargo damage and Container loss. Add accurate ship motion measurements for safe and optimal vessel operations.		<i>Dynamic positioning</i> Motion compensation of GNSS antenna and other position reference systems. Easy MRU retrofit and no recalibration.		<i>Active Heave compensation</i> Heave compensation of cranes, LARS and winches requires accurate heave measurements in Real sea conditions.
	<i>Gangway</i> 3D motion compensated gangways require accurate 6DoF motion measurements at all times in Real sea conditions.		<i>Buoys</i> High quality wind data requires accurate heave, roll and pitch measurements in Real sea conditions.		<i>Helideck monitoring</i> Accurate Heave velocity and roll and pitch measurements in Real sea conditions. No recalibration and flawless operation in any temperature.
	<i>Hydrography</i> Accurate motion compensation of Sonars, eco-sounders, etc ensuring high-quality seafloor maps.		<i>Offshore fish farms</i> Condition monitoring of Offshore fish farms. Reduce risk with Accurate motion measurements.		<i>Wave radar</i> Accurate heave measurements to compensate downward looking wave radars. Compact and no recalibration required.
	<i>Stabilizing fins</i> Roll damping systems and Stabilizing fins need accurate and affordable roll measurements in Real sea conditions.		<i>Offshore oil drilling platform</i> Monitoring the stable state of offshore oil drilling platforms through precise motion monitoring compensation		

APPLICATION SCENARIO

2. Subsea

	Subsea surveys Precise subsea tilt (roll & pitch) measurements at affordable prices.
	ROV/AUV Reliable and accurate motion measurements for navigation and payload sensor compensation.
	BOP monitoring Accurate 6DoF motion and vibration measurements to monitor BOP and other subsea structures.
	Riser monitoring Topside motion sensors as input to the riser digital twin or subsea sensors attached to the riser.

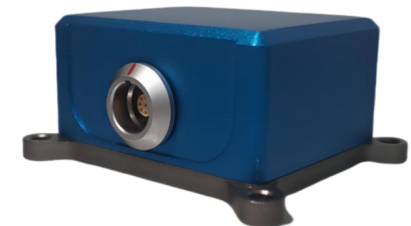
3. Wind Energy

	Bottom fixed offshore wind Turbine tower roll & pitch measurements as input to a wind tower digital twin model. Ultra-low-noise accelerometer for structural monitoring.
	Floating wind turbine control Accurate MRU measurements used in active pitch control to limit wave induced motions.
	Floating wind base motion monitoring Structural monitoring of the floating wind base and mooring system using MRUs and Ultra-low-noise accelerometers.



MEMS INS/MRU Introduction

***M2300
MEMS-INS/MRU***





Introduction

The M2300 adopts MEMS gyroscope and accelerometer chips, designed and manufactured using our unique algorithm, and can output various information such as attitude, heave, and navigation for users. It has the characteristics of high precision, small size, easy installation, and high cost-effectiveness.

Features

- Real time output of stable attitude/heave/heading
- Small size, easy to install
- Affordable price with good quality

Application

- Navigation and attitude control of small and medium-sized ships and unmanned equipment
- Attitude control for other types of offshore operations

MAIN PARAMETERS

	Product type	M2300-A	M2300-B
System Accuracy	Category	MEMS-INS+GNSS	MEMS-MRU
	North-seeking accuracy (RMS, 1 σ)	$\leq 3^\circ \text{sec}\phi$ (Pure inertial 1h)	N/A
	Heading accuracy (RMS, 1 σ)	$\leq 3^\circ$ (Pure inertial) $\leq 0.1^\circ$ (INS+GNSS: 2m baseline) $\leq 0.05^\circ$ (INS+GNSS: 4m baseline)	N/A
	Attitude accuracy (RMS, 1 σ)	$\leq 0.02^\circ$ (Static) $\leq 0.03^\circ$ (Dynamic)	$\leq 0.02^\circ$ (Static) $\leq 0.05^\circ$ (Dynamic)
	Heave (RMS)	$\leq 5\text{cm}$ or 5% Take the bigger value of H (H refer to Heave)	
	Angular velocity range	$\pm 400^\circ/\text{s}$	
	Acceleration range	$\pm 8\text{g}$	
Interface	Output	RS232/RS422/RS485/CAN Optional	
	Input	GNSS	N/A
	Data frequency	0 ~ 200Hz (Configurable)	
	Protocol	Support multiple protocols	
Physical Characteristics	Size	108 x 78 x 51 (mm)	70.5 x 60.5 x 33 (mm)
	Weight	460g	150g
	Voltage	9 ~ 36VDC	
	Power	$\leq 8\text{W}$	$\leq 3\text{W}$
Timing	Starting time	$\leq 3\text{min}$	
Environment	Operation temp	$-40^\circ\text{C} \sim 60^\circ\text{C}$	
	Storage temp	$-40^\circ\text{C} \sim 85^\circ\text{C}$	



FOG Compass/INS Introduction

***M1000
FOG-COMPASS***



***M4000
FOG-INS***



***M5000
FOG-INS***



FOG Compass

Introduction

M1000 adopts advanced fiber optic gyroscope and strapdown calculation technology to autonomously measure the ship's angular motion, and has the ability to continuously provide information such as heading, pitch, and roll of the carrier to the outside world, providing basic information support for ship navigation at sea.

Features

- Long service-life
- Maintenance-free
- Short startup time
- Affordable price with good quality
- No need to replace gyro regularly

Application

Navigation and attitude control of various types of ships and unmanned equipment



System Accuracy	Product type	M1000
	Category	FOG Compass
	Heading accuracy (RMS, 1 σ)	$\leq 0.5^\circ \text{sec}\phi$ (Pure inertial 1h)
	Attitude accuracy (RMS, 1 σ)	$\leq 0.02^\circ$ (Static) $\leq 0.05^\circ$ (Dynamic)
	Heave (RMS)	$\leq 5\text{cm}$ or 5% Take the bigger value of H (H refer to Heave)
Interface	Output	RS232/RS422
	Input	GNSS
	Data frequency	0 ~ 100Hz (Configurable)
	Protocol	NMEA0183/RS422/RS232
Physical Characteristics	Size	177 x 202 x 138 (mm)
	Weight	$\leq 5\text{Kg}$
	Voltage	18 ~ 36VDC
	Power	$\leq 20\text{W}$
Timing	Starting time	$\leq 20\text{min}$
Environment	Operation temp	$-40^\circ\text{C} \sim 60^\circ\text{C}$
	Storage temp	$-50^\circ\text{C} \sim 80^\circ\text{C}$

M4000



Introduction

M4000 is ocean survey-grade FOG INS, manufactured by fiber optic gyroscope and quartz additive, utilizing north finding technology, inertial navigation technology, and integrated navigation technology. It can output various information such as posture, heave, heading, position, and speed for users. Featuring high precision and cost-effectiveness.

Features

- Real time output of high precision attitude, heave, heading
- Integrated design of inertial navigation/DVL
- High accuracy, easy installation, and high cost-effectiveness

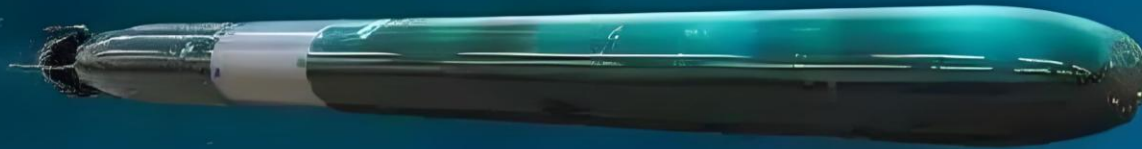
Application

- Navigation, positioning, and attitude control of various ships, unmanned equipment on water, and marine engineering projects, etc

MAIN PARAMETERS

System Accuracy	Product type	M4000-A	M4000-B	M4000-C
	Category	FOG-INS	FOG-INS	FOG-INS
	Heading accuracy (RMS, 1σ)	≤0.2°secϕ (Pure inertial 1h) ≤0.1°secϕ (INS+GNSS)	≤0.3°secϕ (Pure inertial 1h) ≤0.2°secϕ (INS+GNSS)	≤0.4°secϕ (Pure inertial 1h) ≤0.2°secϕ (INS+GNSS)
	Attitude accuracy (RMS, 1σ)	≤0.01°	≤0.02°	
	Heave (RMS)	≤5cm or 5% Take the bigger value of H (H refer to Heave)		
	Angular velocity range	≤300°/s	≤500°/s	
Positioning Accuracy	GNSS Assistance (RMS)	≤0.3%±3m	≤0.3%±5m	
	DVL Assistance	0.6%D	0.8%D	
	Pure inertial	2nm/h	3nm/h	3nm/h
Interface	Output	4xRS232/Ethernet/USB		
	Input	GNSS/DVL		
	Data frequency	0 ~ 200Hz (Configurable)		
	Protocol	NMEA0183/RS422/RS232/Customized		
Physical Characteristics	Size	≤180 x 160 x 205 (mm)		
	Weight	≤6Kg		
	Voltage	12 ~ 36VDC		
	Power	≤20W		
Timing	Starting time	≤5min		
Environment	Operation temp	-20℃ ~ 60℃		
	Storage temp	-30℃ ~ 70℃		

M5000



Introduction

M5000 is an integrated subsea inertial navigation system composed of FOG and quartz sensor. It adopts a pressure resistant watertight compartment shell and using north-seeking, pure inertial navigation, and integrated with GNSS navigation technology. It can output various information such as attitude, heave, heading, position, and speed for users, with high precision and cost-effectiveness.

Features

- Real time output of high precision attitude/heave/heading
- Integrated design of inertial navigation/DVL
- Titanium alloy water pressure resistant compartment/high cost-effectiveness

Application

- Navigation, positioning, and attitude control of various water and underwater vessels, unmanned equipment, and various marine engineering projects

MAIN PARAMETERS

System Accuracy	Product type	M5000-A	M5000-B	M5000-C
	Category	FOG-INS	FOG-INS	FOG-INS
	Heading accuracy (RMS, 1σ)	≤0.2°secφ (Pure inertial 1h) ≤0.1°secφ (INS+GNSS)	≤0.3°secφ (Pure inertial 1h) ≤0.2°secφ (INS+GNSS)	≤0.4°secφ (Pure inertial 1h) ≤0.2°secφ (INS+GNSS)
	Attitude accuracy (RMS, 1σ)	≤0.01°	≤0.02°	
	Heave (RMS)	≤5cm or 5% Take the bigger value of H (H refer to Heave)		
	Angular velocity range	≤300°/s	≤500°/s	
Positioning Accuracy	GNSS Assistance (RMS)	≤0.3%±3m	≤0.3%±5m	
	DVL Assistance	0.6%D	0.8%D	
	Pure inertial	2nm/h	3nm/h	3nm/h
Interface	Output	2xRS232/2xRS422/Ethernet/PPS		
	Input	GNSS/DVL		
	Data frequency	0 ~ 200Hz (Configurable)		
	Protocol	NMEA0183/RS422/RS232/Customized		
Physical Characteristics	Size	≤φ180 x 205 (mm)		
	Weight	≤10Kg		
	Voltage	12 ~ 36VDC		
	Power	≤20W		
Timing	Starting time	≤5min		
Environment	Operation temp	-40℃ ~ 60℃		
	Storage temp	-40℃ ~ 70℃		
	Press resistance grade	Subsea 6000m	Subsea 3000m	



ABOUT US

Micro Magic Inc is a leading inertial sensor design and manufacturer from China. We focus on providing high-quality and competitively priced tactical, marine, and navigation grade inertial sensors, such as IMU, MRU, INS, and north finder, etc. We have multiple independent intellectual property invention patents, rich industry experience and production know-how. Our products have gained great recognition from world-wide customers.

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