

Fiber Optic & Quartz MEMS Solutions for Navigation & Inertial Sensing



Transforming Navigation

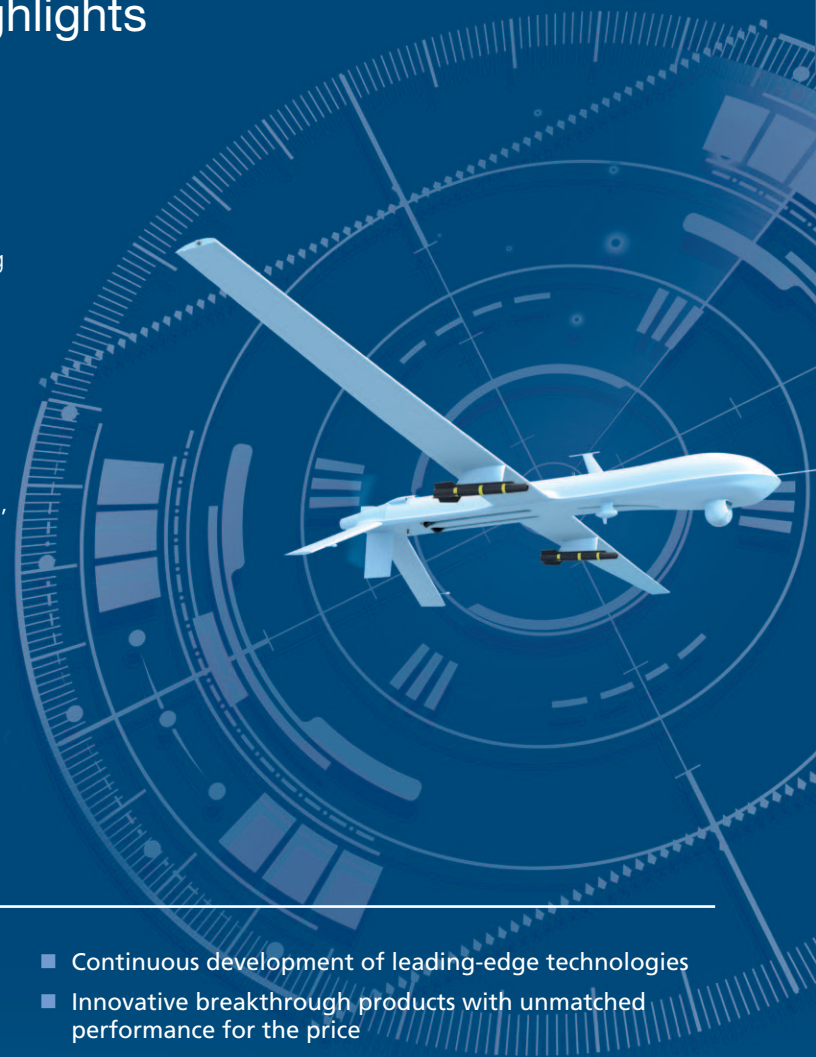
EMCORE's state-of-the-art Fiber Optic Gyroscope (FOG) technology, combined with our Systron Donner Inertial world-leading Quartz MEMS navigation products, achieve higher performance with lower CSWaP than competing units and legacy designs. EMCORE is one of the largest independent inertial navigation providers in the industry offering a broad, complementary suite of ITAR free solutions serving a wide range of tactical and navigation grade applications.

EMCORE Navigation Program Highlights

EMCORE designs and manufactures the world's highest performance Fiber Optic and MEMS Inertial Sensors & Systems. Our single-axis, closed-loop Fiber Optic Gyroscopes (FOG), three-axis FOG Inertial Measurement Units (IMUs) and Inertial Navigation Systems (INS), along with our Systron Donner Inertial world-leading Quartz MEMS (QMEMS) Gyros, Accelerometers, IMUs and GPS/INS products, deliver clear, continuously improving Cost, Size, Weight, and Power (CSWaP) advantages over alternative technologies.

Our navigation solutions feature high bandwidth, high input rate and low noise combined with proprietary integrated optoelectronics and QMEMS technology to provide precise, reliable stabilization, geolocation, guidance, navigation and flight control solutions in critical commercial and defense applications.

EMCORE's Navigation & Inertial Sensing programs have received multiple U.S. patents and have been qualified for several key military programs. Our Fiber Optic and MEMS Gyroscopes, IMUs and INS/GPS products are transforming navigation worldwide.



KEY CUSTOMER VALUE PROPOSITIONS

- Pioneer in the development of Quartz MEMS and closed-loop Fiber Optic Gyroscope technology
- Trusted and reliable partner with more than 40 years of extensive experience
- Vertically-Integrated manufacturing in the USA

Quality and Reliability

- Superior on-time delivery & customer quality index
- Industry-leading reliability under the most demanding conditions
- No known modes of wear-out
- No moving parts or friction (MEMS sensors)
- High Mean Time Between Failure (MTBF) rating
- No recalibration or rebuilding

Fiber Optic Advantages

- Highest performance levels for the most demanding tactical and navigational grade applications
- Bias in-run accuracy to 0.04°/hr
- Angle Random Walk (ARW) noise to 0.015°/√ hr
- Fast, precise gyrocompassing to 1 milliradian
- Digital and analog outputs for the widest variety of installation parameters

- Continuous development of leading-edge technologies
- Innovative breakthrough products with unmatched performance for the price
- Multiple Raytheon Supplier Excellence Award recipient

Tactical & Navigational Grade Applications

- **Civil Aerospace** - Commercial manned aircraft, rotocraft
- **Defense** - UAVs, UUVs, UGVs, missiles, guided bombs, torpedoes, weapons stabilization/targeting and man-portable warfighter applications
- **Industrial OEM** - Camera & antenna stabilization, ROV, robotic control
- **Energy & Infrastructure** - Wind turbine control, platform stabilization
- **Transportation** - Automotive testing, ride control

Quartz MEMS Advantages

- Smaller size and lighter weight
- 1°/hr bias accuracy for tactical applications
- Excellent stability and superior noise level
- No known modes of wear-out, moving parts or friction
- Lower cost and long life



EMCORE Custom Design, Engineering and Manufacturing

EMCORE is a vertically-integrated manufacturer that owns and operates a world-class 7,000 square foot Indium Phosphide (InP) and Lithium Niobate (LiNbO₃) semiconductor wafer fabrication plant at our corporate headquarters in Alhambra, California, and a Quartz MEMS fabrication and manufacturing facility in Concord, California.

Quality and Supply Chain Management

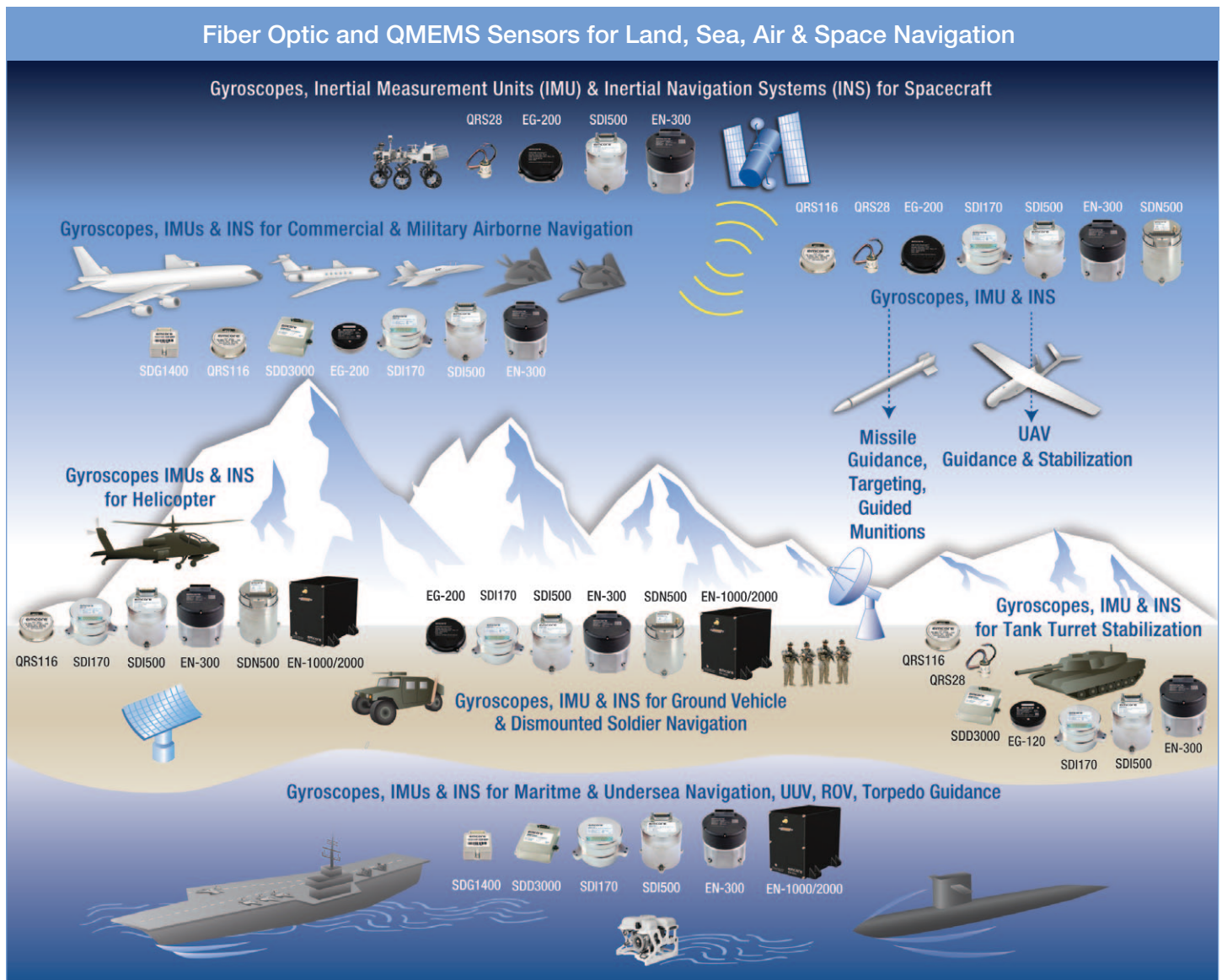
EMCORE is dedicated to the most stringent and demanding quality management systems to achieve the highest levels of on-time delivery and customer satisfaction possible. Our expert product engineering, management and operations teams work in synergy to ensure a smooth and efficient quality assurance process from product development, to supply chain management and inspection, through final assembly and shipping.

We are continuously driving improvement and training our team on systematic thinking and problem solving tools to maintain a culture that designs and builds quality into all our products and processes.

ISO 9001 and AS9100 Certified

Our manufacturing facilities have all acquired and maintain ISO 9001 certification and we are AS9100 aerospace quality certified at our facility in Concord, CA.

EMCORE Aerospace & Defense Navigation Applications





EMCORE's Systron Donner Inertial line of QMEMS Inertial Measurement Units (IMU) and Navigation Systems (INS/GPS) deliver unprecedented performance in their class. They are designed for a wide variety of high-precision Commercial, Industrial, Marine and Defense Applications.



SDI500 Tactical Grade IMU (Non-ITAR)

The SDI500 IMU outperforms other MEMS IMUs and delivers comparable performance to older, costlier optical IMUs in a lower power, smaller, and lighter form factor. With 1°/hr gyro bias, 1 mg accelerometer bias stability and very low 0.02°/√hr Angle Random Walk (ARW) over wide temperature ranges, the SDI500 is designed to achieve the demanding performance levels required in sophisticated systems applications and is well-suited for use by Integrators and OEMs.

Features/Benefits

- Excellent Bias Stability
- Unprecedented Low Angle Random Walk Values
- Superior Vibration Performance
- Miniature, Small Footprint Size (19 cubic inches)
- Solid-State, One-Piece Sensor Design, High MTBF
- Multiple Data Formats/Output Interfaces

Applications

- Missile & Torpedo Guidance, Control & Targeting
- Precision Guided Munitions
- Defense Fixed Wing and Helicopter
- UAVs and UUVs
- Tank Turret Stabilization
- Platform Stabilization



SDI170 Tactical Grade IMU (Non-ITAR)

EMCORE's SDI170 IMU is designed as a performance-compatible inertial system that is form, fit, and functional with a legacy RLG-based IMU product, but with superior overall performance, versatility, and a significantly higher MTBF (Mean Time Before Failure) rating over ruggedized environments. The tactical performance of the SDI170 IMU is based on EMCORE's mature, proven, dependable and accurate quartz MEMS inertial sensor technology in our SDI500 tactical-grade IMU.

Features/Benefits

- 1°/hr Gyro & 1 mg Accel Bias Over Temperature
- 0.02°/√hr Angle Random Walk—5X Better Than RLG-based IMU it is Designed to Replace
- <1 Second Valid Data Start-Up
- <33 Cubic Inch Rugged Size
- 20 Year Lifetime Without Calibration, Greater Than 100,000 hr. MTBF

Applications

- Precision Aircraft Attitude Heading Reference Systems (AHRS)
- GPS-Aided Navigation Systems
- Autonomous & Remotely Operated Vehicles
- Tactical Weapons: Missile & Torpedo Guidance, Control & Targeting



EMCORE QMEMS IMUs VS. COMPETITOR

	EMCORE SDI500 & SDI170		Honeywell HG1700	
Parameter	Gyro Channels	Acceleration Channels	Gyro Channels	Acceleration Channels
Performance				
Bias	1°/hr - 10°/hr	1.0 mg - 2.0 mg	1°/hr - 5°/hr	1.0 mg - 3.0 mg
Bias In-Run Stability	1°/hr - 2°/hr	100 µg - 200 µg	N/A	N/A
Random Walk (Noise)	<0.02°/√hr	100 µg/√Hz	<0.125 - 0.5°/√hr	0.65 FPS/√hr
Data Rates	600 Hz (Control) / 100 Hz (Guidance) - other rates available		600 Hz (Control) / 100 Hz (Guidance)	
Physical & Environmental				
Operating Temperature Range	-55 °C to +85 °C		-54 °C to +85 °C	
Dimensions	SDI500 2.9"D x 2.9"H, SDI170 3.5"D x 2.9"H		HG1700 AG 3.5"D x 2.86"H, HG1700 SG 3.5"D x 2.26"H	
Weight	SDI500 1.3 lbs, SDI170 1.95 lbs		HG1700 AG <2 lbs, HG1700 SG <1.5 lbs	
Volume	SDI500 19 cubic In., SDI170 33 cubic in.		HG1700 AG 33 cubic in., HG1700 SG 27 cubic in.	



QMEMS IMU SPECIFICATIONS

SDI500			SDI170	
Parameter	Gyro Channels	Acceleration Channels	Gyro Channels	Acceleration Channels
Performance				
Bias Over Temperature	1°/hr - 10°/hr	1.0 mg - 2.0 mg	1°/hr - 3°/hr	1.0 mg - 2.0 mg
Bias In-Run Stability	1°/hr - 2°/hr	100-200 µg	1°/hr - 1.5°/hr	100-200 µg
Angle/Velocity Random Walk (Noise)	<0.02°/√hr	100 µg/√Hz - 120 µg/√Hz	<0.02°/√hr	100 µg/√Hz - 120 µg/√Hz
Data Rates	2400, 1200, 600 Hz (Control) 400, 200 100 Hz (Guidance)		600 Hz (Control) / 100 Hz (Guidance) - other rates available	
Physical & Environmental				
Operating Temperature Range	-55 °C to +85 °C		-55 °C to +85 °C	
Dimensions	2.9”D x 2.9”H		3.5”D x 2.9”H	
Weight	1.3 lbs		1.95 lbs	
Volume	19 cubic Inches		33 cubic Inches	

SDN500 INS / GPS Tactical Grade Navigation System (Non-ITAR)

Our most advanced MEMS GPS/INS tactical grade system, the compact SDN500 combines latest generation quartz gyros, quartz accelerometers, high-speed signal processing and a 48-channel Coarse/Acquisition (C/A) code GPS receiver into a powerful, tightly coupled guidance and navigation system. There is also an option to utilize a Selective Availability Anti-Spoofing Module (SAASM) GPS receiver. Our proprietary quartz MEMS inertial sensors maintain position and attitude accuracy in the event of loss of GPS tracking. The low power SDN500 is designed for integrator and OEM use in the latest demanding, smaller, and more scalable system applications.

Features/Benefits

- Adaptable Modular 25 in.³ Compact Size for Packaging Flexibility, Weighs < 1.6 lbs.
- 48-Channel GPS Tracking for Improved Coverage
- Less than 35 Second TTFF from Cold
- Enhanced 100 Hz Position Data
- Customer Programmable Output Data Rates

Applications

- UAVs
- Defense Fixed Wing and Helicopter
- Missile Guidance Control & Targeting
- Precision Guided Munitions
- Platform Stabilization



QMEMS INS/GPS SPECIFICATIONS

Parameter	SDN500 INS/GPS
Performance	
Axes	3
Position (SEP)	3.9 m
Velocity (1 sigma, horiz/vert)	0.1/0.1 m/s
Heading (1 sigma, in motion)	1.5 mrad + d (1) (0.086°)
Pitch and Roll (1 sigma)	1.0 mrad (0.057°)
Shock Tolerance	20 g, 11 ms
Physical & Environmental	
Dimensions	2.9"D x 3.80"H
Weight	<1.6 lbs
Volume	25 cubic inches

QMEMS IMU & INS Program Highlights

- SDI500 Ranked 1st in Systron Donner Inertial 2018 IMU Trade Study and 2021 Military-Commissioned IMU Trade Study
- Approaching 5,000 SDI500 Units Delivered
- SDN500 Achieves Success in Ultra-High-Altitude CAST Navigation Test Simulation of Performance at Over 24,000 meters with Velocities Over 600 m/s
- SDI500 Awarded Contracts for Multiple Weapons Programs:
 - MK 54 & MK 48 Raytheon Torpedos
- SDI300 Awarded IMU Contract for Boeing 777X Integrated Flight Control Electronics (IFCE) Fly-By-Wire (FBW) system

Fiber Optic Gyro (FOG) IMU



EMCORE's Inertial Measurement Units (IMUs) and Inertial Navigation Systems (INS), based on our advanced FOG technology, provide higher performance and superior CSWaP compared to competing systems. They provide customers the flexibility to choose options for full navigation, straightforward IMU operation, or higher performance form, fit and function replacements for legacy systems.

EN-300 Inertial Measurement/Navigation Unit (Non-ITAR)

EMCORE's EN-300 Precision Fiber Optic Inertial Measurement/Navigation Unit is a higher accuracy inertial system that is form, fit and function compatible with a legacy equivalent, but with better performance needed for GPS denied navigation, precise targeting and line-of-sight stabilization. This state-of-the-art design incorporates EMCORE's proprietary integrated optics to enhance accuracy, providing up to ten-times better performance than competing systems.

Features/Benefits

- Three-Axis, Precision Closed-Loop FOG IMU using EMCORE's Proprietary FOG Transceiver
- More than Double the Fiber Length of Legacy IMUs
- Three Precision MEMS Accelerometers with Greater Pendulosity than Legacy Designs
- Factory Programmable I/O with Exceptional Flexibility and Performance Options that can be Tailored to Customer Requirements

Applications

- UAVs
- Dismounted Soldier
- Marine
- Ground Vehicle Navigation
- Aeronautics and Civil Aviation
- Far Target Pointing-Stabilization
- Applications Where GPS Unavailable



EMCORE EN-300 FOG IMU VS. COMPETITOR

	EMCORE EN-300		Northrop Grumman LN-200	
Parameter	Gyro Channels	Acceleration Channels	Gyro Channels	Acceleration Channels
Performance				
Bias	0.1°/hr - 0.4°/hr	300 µg	0.5°/hr - 3°/hr	300 µg - 3.0 mg
Bias In-Run Stability	0.02°/hr - 0.08°/hr	0.1 mg	N/A	N/A
Random Walk (Noise)	<0.008°/√hr - 0.03°/√hr	0.025 m/s/√hr	<0.07°/√hr - 0.15°/√hr	N/A
Bandwidth	≤1800 Hz		N/A	
Physical & Environmental				
Operating Temperature Range	-40 °C to +71 °C		-54 °C to +71 °C	
Dimensions	3.5"D x 3.35"L		3.5"D x 3.35"L	
Weight	<1.8 lbs		<1.65 lbs	
Volume	33 cubic Inches		<35 cubic Inches	

EMCORE-Orion™ Series EN-1000i/2000i Inertial Measurement Units (IMU)

The EMCORE-Orion™ EN-1000i/2000i Inertial Measurement Units (IMU) have been developed primarily for high-precision aerospace and defense applications. EMCORE's advanced technology has enabled the units to provide ultra high-performance comparable or exceeding competing systems at 1/3 the Size, Weight and Power (SWaP).

Features/Benefits

- Three-Axis, Precision Closed-Loop FOG IMU with Proprietary FOG Transceiver
- FOG Sensor Coil Diameters are Optimized for High Precision Navigation
- Three Precision Traditional Mechanical Accelerometers
- Next-Generation FPGA Electronics

Applications

- UAVs, UUVs, UGVs
- Manned Aircraft and Rotorcraft
- Dismounted Soldier Navigation
- Ground Vehicle Navigation
- Applications Where GPS Unavailable

COMING SOON!



Fiber Optic Gyro (FOG) IMU & INS

FIBER OPTIC GYRO IMU SPECIFICATIONS

Parameter	EN-300-3		EN-1000i		EN-2000i	
	Gyro Channels	Acceleration Channels	Gyro Channels	Acceleration Channels	Gyro Channels	Acceleration Channels
Performance						
Bias Over Temperature	0.2°/hr	300 µg	0.05°/hr	100 µg	0.03°/hr	100 µg
Bias In-Run Stability	0.04°/hr	0.1 mg	0.006°/hr	0.75 mg	0.003°/hr	0.75 mg
Random Walk (Noise)	0.015°/√hr	0.025 m/s/√hr	0.002°/√hr	0.01 m/s/√hr	0.0016°/√hr	0.01 m/s/√hr
Scale Factor Accuracy	100 ppm	100 ppm	<100 ppm	<50 ppm	<100 ppm	<50 ppm
Bandwidth	<1000 Hz		<1000 Hz		<1000 Hz	
Physical & Environmental						
Operating Temperature Range	-40 °C to +75 °C		-54 °C to +75 °C		-54 °C to +75 °C	
Dimensions	3.5”D x 3.35”H		6.14”L x 3.78”W x 5.38”H		6.14”L x 3.78”W x 5.38”H	
Weight	<1.8 lbs		7.5 lbs		7.5 lbs	
Volume	33 cubic Inches		125 cubic inches		125 cubic inches	

EMCORE-Orion™ Series EN-1000/2000 Micro Inertial Navigation Systems

The EMCORE-Orion™ series EN-1000/2000, high-precision Micro Inertial Navigation (MINAV) systems can gyrocompass from approximately 0.8 to 1.2 milliradian depending on the model in environments where GPS is unavailable or denied. EMCORE's advanced FOG INS technology has enabled the units to provide performance comparable to traditional RLG INS with 1/3 the SWaP. They are designed to provide customers the flexibility to choose the performance level tailored to their application. The EN-1000/2000 are also capable of being aided by an external GPS for additional flexibility.

Features/Benefits

- Three-Axis, Precision Closed-Loop Proprietary FOG Transceiver
- FOG Sensor Coil Diameters are Optimized for High Precision Navigation
- Three Precision Traditional Mechanical Accelerometers
- Next-Generation FPGA Electronics
- Programmable (factory) I/O with Exceptional Flexibility with Options for IMU, Navigation or Combined Data

Applications

- UAVs, UUVs
- Manned Aircraft and Rotorcraft
- Dismounted Soldier and Ground Vehicle Navigation
- Oil and Gas Exploration
- Aeronautics and Civil Aviation

COMING SOON!



QMEMS Gyros & Multi-Axis Sensors



EMCORE's Systron Donner Inertial line of MEMS Gyroscopes and Multi-Axis Sensors deliver high reliability and low total cost of ownership, with no wear-out modes or calibration intervals required. Customers can select performance levels to match their requirements ranging from 0.5 to 20 degree per hour bias stability with exceptionally low noise, small size, high bandwidth and reliability.



SDD3000 Single-Axis Precision Digital Gyroscope (Non-ITAR)

The SDD3000 is our high-performance, digital, single-axis gyroscope. Incorporating an advanced Quartz MEMS sensing element, it is optimized for applications that require low noise and excellent stability over changes in temperature and vibration. Boasting a small size, light weight and very low power consumption, the SDD3000 is truly a leader in its performance class.

Features/Benefits

- Exceptionally Low Noise $<0.01^\circ/\text{hr}$ (ARW)
- Bias In-Run Stability $<0.5^\circ/\text{hr}$
- Robust Shock & Vibration Tolerance 40g Shock Operating /150g Shock Survival
- RS-232 or RS-422 Digital Output
- Compact 8.0 in.³ Size

Applications

- UUV, UGV and UAV
- Camera and Platform Stabilization
- Tank Turret Stabilization
- Missile Targeting
- Commercial Transport



QRS116 Single-Axis Tactical Grade Analog Gyroscope (Non-ITAR)

The QRS116 utilizes an advanced Quartz MEMS inertial sensing element which delivers ground-breaking levels of low angle random walk, bias stability and vibration performance. The QRS116 is a compact angular rate sensor ideally suited for applications in tactical, aerospace and mission-critical instrumentation. The QRS116 features exceptionally low noise, fast start-up, a simple electrical interface, and no moving parts ensuring long service life and high MTBF.

Features/Benefits

- Exceptional Bias Stability
- Unprecedented Low Angle Random Walk Values
- Superior Vibration Performance
- Compact Industry-Standard Package (Same as QRS11)
- Rugged, Compact Package Integrates easily

Applications

- UAV, UGV and ROV
- Tank Turret Stabilization
- Defense Fixed Wing and Helicopter
- Camera and Platform Stabilization
- Antenna Stabilization



QRS28 Multi-Axis Gyroscope (Non-ITAR)

With one of industry's smallest form factors, QRS28 couples two of our robust quartz MEMS rate sensors for unprecedented capabilities in wide bandwidth, repeatable bias performance over temperature and ruggedness in most environments. It is especially suited for demanding applications that require reliable performance such as missile seeker gimbal stabilization, as well as high volume commercial applications, where small size and low power consumption is required.

Features/Benefits

- Dual Axis Capabilities in Small Form Factor
- Miniature Size: Only 25 gm (1.05" x 0.71" diameter)
- Hermetically Sealed In Stainless Steel Cylinder
- High Reliability
- DC Input/High-Level DC Analog Output

Applications

- Tank Turret Stabilization
- Missile Targeting
- Platform, Antenna and Camera Stabilization
- Spacecraft



QMEMS Gyros & Multi-Axis Sensors

SDG1400 Single-Axis Analog Gyroscope (Non-ITAR)

For the most demanding commercial and aerospace applications, the SDG1400 offers class-leading performance and stability in a small, rugged package. Utilizing an advanced Quartz MEMS inertial sensing element, it provides superior bias stability and repeatability. The SDG1400 has no moving parts and exceptional MTBF performance. A commercial off-the-shelf product, it gives fast start-up, very low noise and high bandwidth, making it ideal for critical commercial and aerospace applications.

Features/Benefits

- Superior Bias Stability and Repeatability
- Miniature Solid-State Package, Small Footprint
- Low Noise
- Wide Operating Temperature Limits
- Internal Temperature Sensors
- RoHS Compliant

Applications

- BizJet
- Commercial Transport
- Platform, Antenna and Camera Stabilization
- UUV and ROV
- Robotic Control



SDG500 Single-Axis Analog Gyroscope (Non-ITAR)

Featuring performance advantages over other gyros in its class, the SDG500 is a completely self-contained angular rate sensor. Utilizing a Quartz MEMS inertial sense element housed in a compact, rugged aluminum case, it provides virtually unlimited life. An on-board temperature sensor allows the user to enhance performance via thermal modeling and correction. With a simple DC input and high-level DC output, the SDG500 will integrate quickly and simply into your designs.

Features/Benefits

- Exceptional Bias Stability
- Superior Vibration Performance
- Low Noise
- Miniature Size, Small Footprint
- DC Input/High-Level DC Output
- RoHS Compliant

Applications

- BizJet
- Commercial Transport
- Ride Control, Automotive Testing
- Robotic Control
- Wind Turbine Control
- UUV and ROV



QRS14 Single-Axis Analog Gyroscope (Non-ITAR)

The QRS14 is an exceptionally capable solid-state gyroscope expressly designed for use in a broad range of applications. Featuring solid-state quartz MEMS technology, this unit combines excellent vibration and noise performance, and virtually unlimited life. Enclosed in a compact housing, the QRS14 provides a DC voltage input, analog DC voltage output proportional to the rotational rate.

Features/Benefits

- Exceptional Rugged Design
- Solid-State MEMS Design, Long Life
- Internal Power Regulation
- High Reliability
- Wide Temperature Range

Applications

- Ride Control
- Wind Turbine Control
- Platform, Antenna and Camera Stabilization
- Robotic Control
- Commercial Transport
- Automotive Testing



Fiber Optic Gyroscopes (FOG)



EMCORE's closed-loop Fiber Optic Gyroscope (FOG) technology is designed for fast, accurate navigation and gyrocompassing, and low noise line-of-sight stabilization. Our long-standing leadership in the development of highly-accurate defense and military grade fiber optic components has paved the way for the development of more accurate and economical FOG components.

EMCORE-Hawkeye™ EG-200 Fiber Optic Gyroscope (Non-ITAR)

The EMCORE-Hawkeye™ EG-200 Fiber Optic Gyro is a superior device in regards to weight and form-factor for tactical applications. It incorporates fully-integrated optics and next-generation Field Programmable Gate Array (FPGA) electronics that deliver higher accuracy, optical drift stability, lower noise, greater efficiency and reliability, combined with low cost. The EG-200 can be calibrated internally for better thermal effect.

Features/Benefits

- Closed-loop Design for Improved Drift Stability, Higher Linearity, and Greater Flexibility
- Digital and Analog Outputs to Accommodate the Widest Variety of Installation Parameters
- Bandwidth to 300 Hz
- More Economical than Competing Systems

Applications

- Platform, Camera and Antenna Stabilization
- Robotic Control
- UAVs
- Ground Vehicle & Dismounted Soldier
- Spacecraft



EMCORE-Hawkeye™ EG-120 Fiber Optic Gyroscope (Non-ITAR)

The EMCORE-Hawkeye™ Series EG-120 FOG module is an ultra-compact, state-of-the-art design that is the smallest, most affordable closed-loop FOG available on the market today. At approximately 1/2 the weight with 1/3 the power requirements of current generation FOGs, the EG-120 delivers the industry's best Size, Weight and Power (SWaP) compared to competing products.

Features/Benefits

- Smallest, Most Affordable Closed-Loop FOG Available
- Closed-Loop Design for Improved Drift Stability, Higher Linearity, and Greater Flexibility
- Fully-Integrated Optics and Next-Generation Field Programmable Gate Array (FPGA) Electronics
- Bandwidth to 250 Hz

Applications

- Platform, Camera, Antenna and Gun Stabilization Systems
- Robotic Control
- UAVs
- Ground Vehicle & Dismounted Soldier
- Spacecraft



EMCORE Hawkeye™ EG-1300 Fiber Optic Gyroscope (FOG)

The EMCORE-Hawkeye™ EG-1300 Fiber Optic Gyro is a superior device in regards to weight and form-factor for navigational-grade applications. Its advanced integrated optics and closed-loop FPGA electronics deliver much higher accuracy, lower noise and greater efficiency than competing technologies. The EG-1300 can be calibrated internally for better thermal effect and has both digital and analog outputs, along with separation of the electronics from the FOG's sensing coil assembly to accommodate the widest variety of installation parameters.

Features/Benefits

- Precise Navigation (1 mile/hour without GPS)
- Fast, Precise Gyrocompassing to 1 Milliradian
- Separate Electronics and Sensor Modules for Greater Installation Flexibility
- Bandwidth to 500 Hz
- More Economical than Competing Systems

Applications

- Navigational-Grade Applications
- Unmanned Aerial Vehicle (UAV) Guidance
- Missile Guidance
- Aeronautics and Aviations



QMEMS & FOG Gyro Specifications

QMEMS GYRO SPECIFICATIONS

Parameter	SDG500	SDG1400	QRS116	SDD3000	QRS28
Performance					
Bias Over Temperature	≤5°/sec	≤1°/sec	20°/hr	1.0°/hr	ZROTC +/- 1.88°/sec
Bias In-Run Stability	<20°/hr	<6°/hr	3°/hr	0.5°/hr	N/A
Output Noise	≤0.005°/sec/√Hz (DC to 100 Hz)	≤0.1°/√hr (<0.0017°/sec/√Hz)	≤0.002°/sec/√Hz	0.01°/√hr	≤0.005°/sec/√hz
Bandwidth	60 Hz ±15 Hz	50 Hz ±10 Hz	>60 Hz	N/A	110 Hz ±10 Hz
Physical & Environmental					
Operating Temperature Range	-40 °C to +85 °C	-55 °C to +85 °C	-55 °C to +85 °C	-20 °C to +60 °C	-55 °C to +85 °C
Dimensions	1.28" x 1.28" x .75"	1.4" x 1.6" x .67"	1.49" x 1.49" x .645"	3.1" x 3.25" x 0.96"	0.71" x 0.71" x 1.05"
Weight	≤25 grams	<60 grams	≤60 grams	<227 grams	25 grams

FIBER OPTIC GYRO SPECIFICATIONS

Parameter	EG-120	EG-200	EG-1300
Performance			
Bias Over Temperature	≤20°/hr	≤20°/hr (<0.8°/hr Compensated)	0.1°/hr (Typical)
Bias In-Run Stability	≤1.0°/hr	≤1.0°/hr	≤0.01°/hr
Angle Random Walk	≤0.04°/√hr	≤0.04°/√hr	≤0.002°/√hr
Bandwidth	250 Hz	300 Hz	500 Hz
Physical & Environmental			
Operating Temperature Range	-40 °C to +75 °C	-40 °C to 75 °C	-40 °C to +70 °C
Dimensions	2.36"D x 0.83"H	3.3" x 3.3" x 0.8"	3.6"D x 1.3"H Sensor 3.3" x 3.3" x 0.8" Electronics
Weight	0.17 lbs, 0.08 kg	0.28 lbs, 0.127 kg	0.83 lbs, 0.38 kg

EMCORE Fiber Optic Gyroscope (FOG) Program Highlights

- 2019 Raytheon Integrated Defense Systems 5-Star Supplier Excellence Award for Performance and Partnership
- Awarded Long-Term Contract by Raytheon to Supply High-Performance Fiber Optic Gyroscopes for Optical Targeting Systems
- Awarded 2017 Raytheon Supplier Excellence Program Premier Winner
- Awarded Contract from BAE for Muxed North Finder/Tracker FOG for Joint Effects Targeting System (JETS)
- Awarded Contracts for MiNAV 1 & 2 Programs by the U.S. Army Research, Development and Engineering Command's, Aviation & Missile Research, Development, and Engineering Center (AMRDEC)

EMCORE & Systron Donner Inertial 40-Year Navigation Heritage

2010 - 2020

emcore®

		AMRDEC Awards EMCORE MINAV 1 Program	EMCORE Introduces EMP-4 FOG	AMRDEC Awards EMCORE MINAV 2 Program		EMCORE Awarded Largest Contract to Supply FOGs for Airborne Navigation Systems	EMCORE Named Raytheon Supplier Excellence Program Premier Award Winner	EMCORE Awarded LTC by Raytheon for FOGs EMCORE Introduces EN-300 IMU and EMCORE-Hawkeye™ Series FOGs	EMCORE Acquires Systron Donner Inertial Introduces EMCORE-Orion™ Series INS	EMCORE Awarded Raytheon 5-Star Excellence Award EN-300 IMU Achieves General Availability Milestone
2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
SDI500 1°/hr IMU for Mk48 & Mk54 Torpedoes	SDN500 1°/hr INS/GPS Replaces Legacy C-MIGITS III System	SDI500 1°/hr IMU for SSAT & FireJet Drones	SDI500 for Mk30 Target SDI500 for Kestrel, Wide Area EO/IR	SDI Awarded MK 48 Heavyweight Torpedo IMU Contract NUWC	SDI500 Awarded for Weapons Programs: MK 54 & MK 48 Torpedo, Spearfish Torpedo 1,000th SDI500 Delivered	QRS28 for Missile Seeker SDI Awarded IMU Contract for SDI300 for Boeing 777X IFCE SDI Awarded Bell Helicopter's H-1 Contract	SDI500 Development for Captive Carry Weapons	2,500th SDI500 Delivered		QMEMS IMU for Hypersonic Weapon (2x)

SYSTRON DONNER
INERTIAL

1980's - 2000's

emcore®

1984-EMCORE Founded		2005-EMCORE Acquisition of Phasebridge 2006-Establishment of Lithium Niobate Foundry 2008-FOG Tx/Rx IOC Development 2009-EMP-1 FOG Introduced
1980's	1990's	2000's
QRS Technology Origin Digital IMU Demonstrated SRAW Missile G&C LEAP & Brilliant Pebbles Programs	Wide adoption for Flight Controls: 777, P-3, C-130, 737, F-22 AGM-65A Maverick AGM-130 Mars Rover	INS/GPS: C-MIGITS F-11, F-18, Hawk Flight Control >25M Gyros delivered 1.0°/Hr QMEMS Gyro SDI500 1°/Hr IMU Introduced

SYSTRON DONNER
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