

iMAR

NAVIGATION & CONTROL



www.imar-navigation.de

... to the limits of physics and technology

The Company

iMAR Navigation GmbH is an independent, privately owned company with a focus on technology. We are in the vanguard of the development and manufacture of inertial navigation and measuring systems for customers around the world.

Our range of applications include, among others, the navigation, localization, stabilization, surveying, guidance, control and automation of moving platforms of all types in industrial, automotive, commercial and military environments.

iMAR Navigation, founded in 1992, has its headquarters in St. Ingbert in southwest Germany.

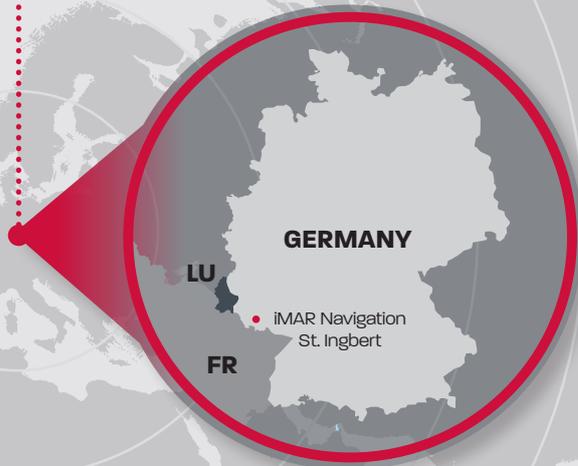
Over the past two decades, iMAR Navigation has consistently expanded its market presence with products and system solutions that set new standards both technologically and in terms of cost-effectiveness. The company has a worldwide presence through its partners, representatives and distributors. This market-led development prompted us to expand our production and development facilities again in 2014 by 750 square meters to their present 2,250 square meters.

The current sales volumes - well into the tens of millions € - are generated with around 70 employees.

Managing Director and sole shareholder of iMAR Navigation GmbH is Dr.-Ing. Edgar L. von Hinüber. Director of Marketing and Sales is Mr. Franz-J. Müller.



Headquarters of iMAR Navigation GmbH in St. Ingbert, southwest Germany.



CEO, owner and founder
Dr.-Ing. Edgar L. v. Hinüber



100% privately owned
**GERMAN
COMPANY**



CUSTOMERS
50% industry,
aviation and automotive
50% defense
and protection

Smart solutions – all kind of sensor technologies

Main Activities & Areas of Competence



iMAR offers inertial measuring and navigation systems for every application...

LAND

VEHICLES
RAILWAY
PIPELINES & DRILLING
UGVS

AIR

FIXED-WING AIRCRAFTS
HELICOPTERS
MULTICOPTERS
UAVS

SEA

SHIPS
SUBMARINES
WORK PLATFORMS
AUVS



... for – but not limited to - the following tasks:

NAVIGATION
STABILIZATION
GUIDANCE & CONTROL
AUTOMATION

ORIENTATION
TRANSFER ALIGNMENT
SURVEYING
TARGET TRACKING

OBSERVATION & POSITIONING
PROTECTION
TARGET ACQUISITION
CALIBRATION

Always on the right track with iMAR

LAND Applications



Whether manned or unmanned, underground or on land, military or civilian - we have what you need when it comes to positioning, navigation, guidance, surveying, localization, orientation, stabilization or control.

Thanks to our extensive experience in the use of all relevant sensor and navigation technologies, we are able to respond to, and effectively solve, nearly any challenge.

In doing so, our systems offer a consistent and easy-to-operate user interface in spite of their high technical complexity and regardless of which sensor technology is employed. We place great importance on making diverse interfaces available simultaneously, minimizing latency and jitter in signal processing and data transfer, and optimizing data synchronization. The latter criterion largely defines the quality of today's hybrid systems and the data fusion that forms the basis of it. The reliability, environmental resistance and robustness of our systems are qualified in accordance with international automotive, aviation, industrial and military (MIL) standards.

HORIZONTAL DIRECTIONAL DRILLING (HDD)

We supply the world's most precise and reliable gyro-based drill head positioning and navigation systems, featuring all, from large to small diameters that also function without external installations.

PIPELINES

After a pipeline is installed it must be surveyed or subsequently inspected. This is accomplished with our iPST - Pipeline Surveying Tools series.

AUTONOMOUS GUIDED VEHICLES (AGVS / UGVs)

Our systems are used successfully in high quantities in container terminals, among other places.

RAILWAY

Applications include highly precise control, localization and track angle identification for normal and specific track measurement trains. Our sophisticated hard-

ware and sensor data fusion software enable our customers to precisely locate damages to infrastructure, gauge clearance or optimize the servicing intervals of the rails.

VEHICLE NAVIGATION

This field of application includes the provision of hybrid Inertial Navigation / Global Navigation Satellite Systems (INS/GNSS) for Advanced Driver Assistance Systems (ADAS), for partially and highly automatized up to autonomous driving (, or for measurements of driving comfort for all leading car manufacturers and function suppliers, and even for to-the-centimeter precision guidance, positioning and orientation of military aircraft and deployment systems with inertial measurement technology, stereo vision, radar, lidar, satellite navigation, and more.



MILITARY VEHICLES

With our iSULONA support and logistics navigation systems, our iCOMBANA combat navigation systems and our iPRENA precision navigation systems, we cover the full range of positioning, orientation and target acquisition. Support and combat vehicles as well as self-propelled ordnance use iMAR's systems for navigation, guidance and orientation.



light - precise - reliable

AVIATION Applications



Whether fixed-wing or rotary-wing aircraft, whether manned or unmanned, balloon or satellite, we have the right systems for navigation, guidance, stabilization, target tracking and more.

Where needed, we take our highly precise inertial measurement systems to the limits of technical feasibility. In addition to standard applications, these are also employed by countless international scientific institutions, in combination with dedicated scientific sensors and assemblies, for challenging tasks such as highly accurate flight surveys of the polar ionosphere or for precise aerogravimetry. Even so, our systems are so light as well as reliable, that an ultralight solar driven aircraft with an one-man crew has in fact circled the entire globe with our systems during 2015/2016. Another success story among many others, is the World Competition in Aerobatic Flight (RedBull AirRace), where the German MD21 team, which used the most accurate and trustable iMAR Navigation measurement data for flight trajectory optimization, became World Champion 2016, with the highest competitive edge ever.

FIXED-WING AIRCRAFT

Our systems are employed for navigation, surveying, stabilization and much more.

Several hundred UAVs from a range of manufacturers fly all over the world with our systems as their primary sensors. They also serve as a highly precise reference for airborne radar systems or for geodetic surveying (lidar, gravimetry etc.).

ROTARY-WING AIRCRAFT

We master challenging maneuvers such as hovering with the use of technologies including inertial measurement systems with gyro compassing capability as well as hybrid systems that use gyro-supported dual-antenna signal analysis to precisely and reliably show both the tilt angle and direction - independent of flight time - with the lightest weight.

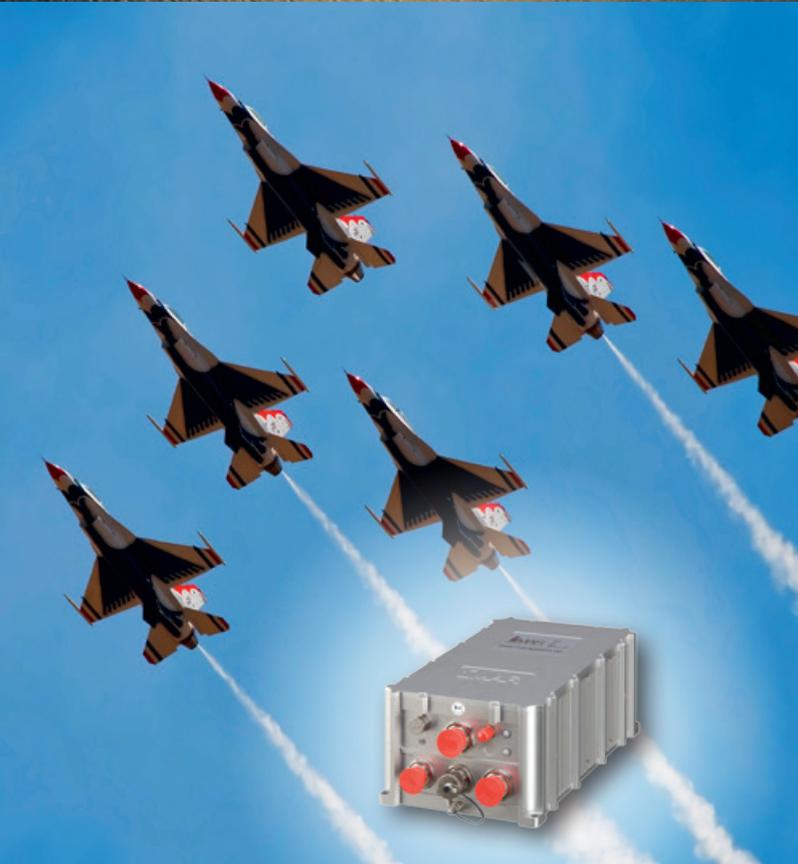
STABILIZED PLATFORMS

Many years of experience in the areas of inertial measurement technology, highly precise drive and control technologies and machine vision, and not least, an abundant store of field-tested solutions, form the basis for our stabilized platforms of type iIPSC, which can be adapted as needed to the individual requirements of our customers.

The design is primarily related to each customer's specific payloads, to precision, dynamics, absolute positioning, or to additional functions such as optical tracking or in-field calibration.

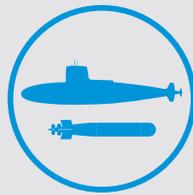
SATELLITES

We furthermore offer complex, customized solutions for space applications as well.



... with pinpoint precision - above and under water

SEA Applications



Stabilization from the sensor head to the complete ship navigation, ride control from speedboats and ferries to torpedoes as well as target tracking and much more, ranging from small to very large platforms: iMAR Navigation works closely with its clients to provide reliable solutions for all of these requirements.

We deliver systems and complete solutions, from the mechanics of stabilized platforms to sensor systems, actuating elements, and complex control technology.

SURFACE VESSELS

We manage, control and navigate - from small speedboats to cruise liners. The focus is on optimizing comfort as well as on conserving resources and protecting the environment. This is made possible through adaptive path planning and ride control which in return contributes to lower fuel consumption and emissions.

Providing local communication networks, our systems of type iSWACO enable also the guidance and control of swarms or, e.g., landing of UAVs on naval vessels or yachts.

Customers include German customs authorities as well as well-known ferry operators and the naval forces of friendly nations.

SUBMARINES AND TORPEDOES

The heavyweight torpedoes of many European armed forces are furnished with our navigation equipment. Our iTNAV offers longevity, simple operation and an attractive price-performance ratio. Furthermore, we are active in the area of positioning and navigation of support systems.

AUTONOMOUS UNDERWATER VEHICLES (AUV)

The fusion of information from various sensors and data sources forms the basis for effective and efficient solutions, even in places where, for instance, GNSS alone does not offer a solution.

STABILIZED PLATFORMS (EOIR, RADAR, LASER...)

Our stabilized platforms of type iIPSC are likewise based on proven solutions and can also be designed according to customer specifications. Many years of experience in the fields of inertial measurement technology, highly precise drive technology, image processing and control engineering allows us to realize even highly customized applications. The desired accuracy, the absolute positioning along with optical tracking, the required dynamics and the incorporation into control systems are all part of this configuration.

Our range of stabilized platforms covers the stabilization of agile camera gimbals and designators as well as antenna platforms weighing several tons.



With our solutions always a step ahead

Research & Development





iMAR Navigation offers a unique combination of comprehensive application know-how in navigation and stabilization, extensive experience with nearly all available gyro technologies - from Hemispherical Resonator Gyros (HRG), Ring Laser Gyros (RLG) and Fiber-Optic Gyros (FOG) to MEMS-based gyros - and many years of experience with all established accelerometer and Global Navigation Satellite System (GNSS) technologies.

Alongside this, we also have the expertise in machine vision based environment perception, magnetic field sensor systems, air data sensor systems and the accompanying data fusion (loosely, tightly or deeply coupled, and up to dissimilar-redundant solutions for safety-critical applications), as well as the control and guidance of mobile automated or partially autonomous platforms.

This knowledge as well as the superior technical skills of our development engineers form the basis for our success in developing customer-focused solutions. Our development teams make up roughly half of the employees at iMAR and are highly diversified in terms of their skills, from electronic, mechanical and mechatronics engineering to applied informatics, signal processing, mathematics and geodesy.

Development activities include all areas: from application analysis, compilation of specifica-

tions and selection of a suitable system architecture, to development of the circuit diagram, design of the layout and the mechanical construction, and modeling of the algorithms, and on through to programming and testing the required software and firmware, commissioning the first sample, calibration, and performance of field tests in continuous consultation with quality assurance.

Thanks to close cooperation between employees in all disciplines and divisions, we have been able to develop and manufacture highly innovative devices and system solutions, while at the same time, the form of our organization allows us a great deal of flexibility for incorporating even complex customer requests.

Modern laboratories as well as development and test environments are an additional important foundation for customer-oriented development activities which are the basis for an optimal customer value during application. This is equally true whether the object of development is a series-production device, a single device, a functional prototype for later series application, or a feasibility study.

We develop solutions for all application areas, ranging from complex systems to simple devices, in which the "inertial" components and signal processing usually represent important parts.

lean - fast - reliable

Manufacturing

iMAR possesses modern production facilities such as CNC machines (HERMLE 5-axes and MIKRON 3-axes milling machines, DMG CNC lathe, among others) for mechanical processing, as well as an electronics workshop where system integration is performed. In addition to series production of circuit boards performed externally, circuit boards can also be assembled with SMD and BGA technologies and tested with great flexibility here in our own facilities.

Employees working in our Manufacturing/Calibration division include government-certified technicians, master craftsmen, specialists and engineers with specialized experience in industry and aviation. The quantities produced range from single-unit production to low- and high-volume series production for industrial, military, automotive and aviation applications. Due to our significant manufacturing and testing depth, our structure also allows us to produce customized prototypes, e.g. to support the predevelopment activities of our customers.

Modern manufacturing methods meanwhile ensure high cost-effectiveness along with stable process reliability.

All processes implemented in manufacturing and development are subject, depending on the product class, to the standards of ISO 9001 / EN 9100, or to aviation production in accordance with EASA Part 21G.

The high quality standards of our manufacturing processes are ensured by process stability, reproducibility, and supporting employee self-assessment, among other things. Identification and traceability of all assemblies as well as comprehensive measurement and testing technology make up integral parts of our processes, which form the basis for reliable, on-time deliveries with high quality.



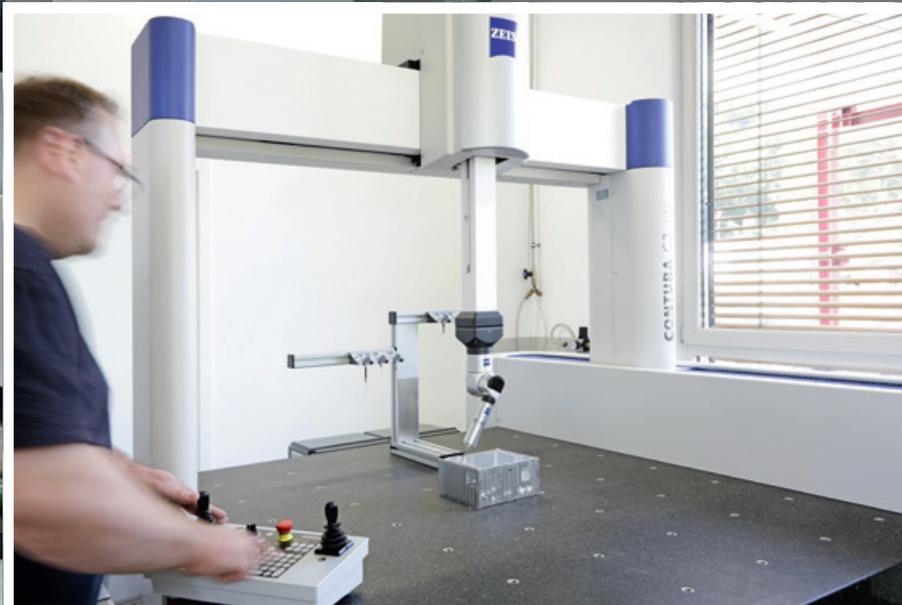


Test & Calibration Laboratory

iMAR possesses not only modern production facilities and development laboratories but also distinguishes itself from its competitors through its extensive in-house test facilities, including multiple one-, two- and three-axes turntables, temperature chambers with extended temperature range, a highly precise 3D ZEISS coordinate measuring machine, a 40 kN vibration and shock test station in accordance with military, aviation and aerospace standards, as well as a highly dynamic hexapod for translational and rotatory motion simulation for payloads up to 1 ton and 1 g acceleration which enable us to test our devices under real-world motion conditions, already in the lab.

The high quality standards with certifications in accordance with ISO 9001 - EN 9100 - EASA Part 21G (iMAR Navigation is a certified production organization for aviation components) are continuously verified and optimized, and guarantee high and reliable production quality.





iMAR is a technologically broad-based specialist in inertial technology, signal processing, mechatronics, hardware, and software, all of which we use as a basis for alignment, navigation, localization, guidance, stabilization and positioning of moving objects.

Among others, the earth's rate of rotation and the force of gravity are natural reference data used for terrestrial navigation.

Some key terms used in this context, which are drawn from Latin or Ancient Greek, include:

Inertial navigation - contains the root word:
Inertia [Lat.] force of inertia → acceleration

Gyroscope - angular rate sensor, composed of:
γυρος [ancient Greek] – circle or turning and
σκοπεῖν [ancient Greek] – see/observe

iMAR Navigation GmbH • Im Reihersbruch 3 • 66386 St. Ingbert, Germany
T. + 49 6894 96 57-0 • F. + 49 6894 96 57-22 • sales@imar-navigation.de

Lat 49.2738804° N • Lon 7.1596637° E • Alt 311.34 m
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32U LV 66120 59546