The Company Profile...

ETAS GmbH

**Headquarters:** Stuttgart, Germany  
**2013 Sales:** €145.8 million euros  
**2013 Operating Margin:** Approximately 15%  
**2013 R&D:** 39% of sales  
**Employees:** 805, as of January 1, 2014  
**2013 Sales per Employee:** €181,116 euros  
**Ownership:** Bosch owns 100% of ETAS  
**Products:** Software, hardware, engineering tools and services for the development of embedded software

**ETAS Sales by Year**

<table>
<thead>
<tr>
<th>Year</th>
<th>Sales (in million euros)</th>
<th>CAGR (2007 to 2013)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007</td>
<td>109.2</td>
<td></td>
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<tr>
<td>2008</td>
<td>116.0</td>
<td>4.9%</td>
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<tr>
<td>2009</td>
<td>84.4</td>
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<tr>
<td>2010</td>
<td>106.5</td>
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<tr>
<td>2011</td>
<td>138.2</td>
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<tr>
<td>2012</td>
<td>152.2</td>
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<tr>
<td>2013</td>
<td>145.8</td>
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</tbody>
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*Company estimate

**ETAS Sales by Segment**

- **2013 Total Sales:** €145.8 Million  
- **Services**, 11%  
- **Software**, 36%  
- **Hardware**, 53%  

*Including consulting

**ETAS Sales by Product Type/Application**

- **2013 Total Sales:** €145.8 Million  
- **Engineering Services**, 5.7%  
- **Consulting**, 1.4%  
- **Test and Validation**, 9.1%  
- **Security**, 0.3%  
- **Software Engineering**, 13.5%  
- **MCD** Tools, 70.0%  

*MCD: Measurement, calibration and diagnostics development tools

INCA is by far ETAS’ biggest selling product within the MCD product line.

**Background**

Founded by Robert Bosch GmbH in 1994 in Stuttgart, Germany, ETAS has become a global leader in automotive embedded software development tools, especially for powertrain ECUs. Siemens VDO acquired 10% ownership of ETAS in 2000, in exchange for Siemens’ line of calibration and measurement tools, and other technology. ETAS became a 100% Bosch-owned subsidiary following Continental’s acquisition of Siemens VDO in 2007.

ETAS operates as a separate entity from Bosch’s Automotive Technology business sector in order to serve both Bosch and Bosch competitors such as Continental, Delphi, Denso and Visteon (formerly JCI’s automotive electronics business) with assurances that no trade secrets will be compromised. “We’ve been doing business with these customers for 20 years. They trust that we can handle their projects while maintaining strict confidentiality from Bosch,” said Friedhelm Pickhard, president of ETAS and chairman of the advisory board. Mr. Pickhard is responsible for product management, product engineering and Real-Time Application (RTA) consulting. He was assigned to ETAS from Bosch four years ago, when he was managing Robert Bosch Engineering and Business Solutions in Bangalore, which at the time had 6,500 engineers.

Bosch subsidiaries ETAS and SoftTec are both in the business of providing embedded software and services to carmakers and tier-one suppliers. SoftTec focuses on vehicle connectivity and infotainment, whereas ETAS solutions are more deeply embedded into the vehicle’s control systems.

ETAS has been profitable every year for the last five, including 2009, a year when sales slumped markedly due to the global recession, although operating margin was only slightly above zero that year. According to the company, from 2010 through 2013 operating margins have been “double digit” and recently have been roughly 15%. ETAS annually spends a large percentage—between 30% and 40%—of sales on R&D. In 2013 the figure was 39%.

**Regional Market Development**

Since 2009, ETAS’ sales have been growing annually at the rate of 14.6%. Much of that growth is a result of increasing engineering and sales staff in some of ETAS’ 23 facilities in 13 different countries, and making sure they are well chosen and well trained. Especially in Japan, China and Korea, ETAS has been locating customer-facing staff closer to the carmakers’ engineering centers where the cars are developed.

“To adopt our tools, customers often have to change their processes. Not only have we brought in more people to help our customers do this, but we have done a lot of training to be sure that they have solid technical knowledge,” said Mr. Pickhard. “Everywhere we try to hire local people, but if we bring in people from Germany or elsewhere, we want them to know the local language and the culture.”

At present, ETAS employs approximately 30 development engineers in Japan, approximately 15 in Korea and some 30 in China. During 2013, ETAS increased its workforce in Germany to 500 employees. In Japan, China, South Korea and the Americas, employment increased between 12% and 20% in that period.

Revenue in Asia and the Americas grew “in the two-digit range,” in 2013, according to the company. ETAS opened a third facility in Japan and one in Thailand that year.
Industry Trends Drive Future ETAS Sales; More Embedded Software and Tool Development Engineers Needed

Finding more well-qualified engineers is one of the ongoing challenges that the industry worldwide faces. For example, ETAS' RTA Solutions business could grow more quickly if more "quality" embedded software engineers could be found, meaning candidates with at least six years of experience. As the development of autonomous driving systems ramps up, ETAS is also looking for engineers who can support the growing demand for validation tools, which are needed as vehicle functions grow in complexity. With more connected vehicles hitting the road, more security solutions for embedded systems will be needed.

The migration to more model-based development is another trend that favors ETAS' product line. "These are all areas where we can grow," said Mr. Pickhard.

Major Products

ETAS provides services and software, but primarily tools. ETAS tools cover the complete V design cycle from model-based design tools to validation and calibration. The ASCET product family supports model-based development of application software and automatic code generation from those models.

ASCET has been on the market since 1997, used particularly in the development of software for brake, steering and engine management systems. According to ETAS, ASCET-developed software can be found in more than 300 million ECU.

- INCA (Integrated Calibration and Acquisition), a product of ETAS' MCD (Measurement, Calibration and Diagnostics) business, is by far the company's largest selling product. "The measurement and calibration of powertrain is definitely our biggest business," Mr. Pickhard noted. According to the company, there are currently more than 25,000 installations of INCA tools globally used in development and series production projects.

INCA tools are used for ECU development and test, and for validation and calibration of electronic control systems in the vehicle, on the test bench or on a PC. Included in the tools are the following functions:
- Pre-calibration of function models on the PC
- ECU flash programming
- Measurement data analysis
- Calibration data management
- Automated optimization of ECU parameters

Optimizing ECU parameters for a new vehicle or engine is critical to the vehicle’s performance, fuel efficiency, emissions controls, safety features and reliability. Tens of thousands of calibration parameters need to be determined for all the variants of the engine, for different vehicle models and for different markets. INCA supports all standard ECU description formats, measurement, calibration and diagnostic protocols, and offers connectivity to vehicle bus systems such as LIN and FlexRay.

In addition to the INCA base product, ETAS has developed several add-on packages that increase INCA's functionality and allow for integration with tools from other vendors such as Mathworks. These interfaces allow customers to integrate INCA functions with their existing tool chain or third-party tools.

- The EHOOKS bypass-hook insertion tool is showing solid growth since it was first introduced in 2010. "EHOOKS shows our expertise in embedded software engineering," said Mr. Pickhard. The tool allows a function developer to easily insert a software bypass hook in existing ECU software, so that modifications can be made after the ECU ships, for example by the OEM. Since changes can be made without access to the ECU source code or build environment, development time and costs are saved.

"Imagine an OEM gets software from a tier one, but he wants to use it as a base for function extension," Mr. Pickhard explained. "He can use EHOOKS to hack into the software, make a bypass automatically and add a function in the ECU without knowing its architecture. This supports our customers tremendously."

- Operating Systems and Software

"While we are well known as a tools provider, a lot of companies don’t know that we also provide software," Mr. Pickhard observed. ETAS provides OSEK-compatible.
Distinctions Claimed by ETAS

- More than one billion ECUs in vehicles on the road run on operating systems from ETAS.
- ETAS’ ASCET code generator is more efficient and requires less hardware resources than the code generator from Mathworks.
- ETAS provides more operating systems to GM and Ford than any other supplier, via tier-one ECU suppliers Bosch, Continental and Delphi.

ETAS GmbH

plant operating systems for powertrain ECUs to the major powertrain suppliers including Bosch, Continental and Delphi.

According to ETAS, its RTA operating systems and Autosar run-time environment already power more than one billion ECUs worldwide.

ETAS’ RTA product family includes RTA-RTE, a mature, production-quality, Autosar runtime environment (RTE) generator that conforms to Autosar release 3.0. Basic software modules from other vendors can be integrated with ETAS’ operating system and RTE. Bosch uses ETAS’ OS and RTE as the basis for its Autosar ECU architecture in series production.

In February 2014, ETAS expanded its RTA Basic Software and Tools portfolio to provide complete coverage of the Autosar 4.x standard for basic software modules.

- ASCMO is an ETAS tool that allows developers to create mathematical models of complex systems, automotive powertrains for example, using a small number of measurements. According to ETAS, “This tool uses new data-based methods which make it possible to represent characteristic engine behaviors such as consumption, engine-out emissions and exhaust gas temperature as a function of the operating conditions (speed, load, engine temperature) and the settings of calibration parameters (for example, ignition, fuel injection, camshaft position, etc.) on the basis of a few measurements in a largely automated manner in the form of a mathematical model.”

At the 5th International Symposium for Development Methodology in Wiesbaden, Germany, Volkswagen reported that by using ASCMO, it was able to reduce fuel consumption by 2% to 4%.

The promise of model-based design replacing map-based software and look-up tables has been a subject of discussion in the industry for more than 20 years. ETAS is well positioned to benefit if more automotive tier ones and OEMs implement model-based control software. Mr. Pickhard estimated that more than 70% of engine ECUs are still designed the old way, using look-up tables and maps. “It is always about what computational resources are available in a real-time application,” he said. “Most of the controllers struggle for sufficient resources, because functionality is increasing exponentially. As a control engineer I would say it should be done, but I believe we will be living a long time with tables. A huge amount of parameters are still look-up table based.”

Hottest New Products/Applications

LABCAR Xil is one of ETAS’ most promising future products. “X” refers to software in the loop, model in the loop or hardware in the loop. Normally hardware in the loop tools are used at the end of the development cycle, but LABCAR Xil can be applied across the complete V cycle, according to the company. Like the LABCAR HiL (hardware in the loop) test system, LABCAR Xil will work with models generated by different tools from different tool vendors. The Xil product is due to be released in mid-2015. Pilot versions of the platform are currently being tested by three ETAS customers: two European OEMs (one German, one non-German) and an American tier one.

ETAS sees a growing demand for high quality embedded software. “We are hearing from our customers that they care not only about the lowest price, but also about quality, because most of our applications are safety applications. We offer high quality software at a reasonable price. And we have proven with our operating system that we are able to make highly reliable embedded software for low-resource ECUs,” Mr. Pickhard asserted.

As more functions migrate to the powertrain ECU, more computing resources are required, and the tier-one suppliers are switching to multicore microprocessors.

ETAS Competition

Test (hardware-in-the-loop) and Validation:
- dSPACE, in Europe and U.S.A
- HiRain Technologies, China

Emulator Test Probe
- Vector

Software Engineering
- Mathworks

ETAS is witnessing growing demand for its hypervisors to distribute the loads among the multiple cores. “They have started now with three or four cores. We see a trend that the next step will be so-called many-core processors, with up to eight or 16 cores,” said Mr. Pickhard.

Multicore microprocessors make sense, particularly with powertrain applications, which must operate in a high-temperature environment. “With multi-core you can have more computational power at lower clock rates, allowing the processor to run cooler,” explained Mr. Pickhard.

ESCRYPT

“THERE IS NO SAFETY WITHOUT SECURITY,” Mr. Pickhard cautioned. Although not often discussed publicly, protection of electronics systems and embedded software in vehicles is a top priority for carmakers and key to future functions such as autonomous driving and car-to-car communications. ETAS’ Bochum, Germany-based subsidiary, ESCRYPT, acquired in 2012, provides a two-part solution: on-board software that performs security functions in the vehicle and a backend server to support those services. ESCRYPT currently employs approximately 50 people, 2013 sales were in the range of 4 million to 5 million euros.

Mr. Pickhard offered several security use cases where ESCRYPT solutions can be applied.

- Engine performance upgrade software available in the aftermarket can introduce reliability and safety issues.
- OEM-generated remote software updates must be executed flawlessly.
- Bluetooth, cellular and other wireless connections make vehicles vulnerable to unauthorized access.
Vehicle-to-vehicle and vehicle-to-infrastructure data exchanges must be trustworthy and secure.

In the future, autonomous driving features such as communications between vehicles and electronic traffic and speed-limit signs need to be secure to prevent unintended braking or acceleration.

ESCRYPT recently started a collaboration with Red Bend Software, a leader in over-the-air software updates. ESCRIPT contributes its knowledge in the field of embedded devices and supporting infrastructure as well as its experience providing security. The verification of the software on the embedded device, as well as the setup of the communications channel, is achieved by ESCRIPT products such as CysurLIB, CysurTLS and CysurKeys. The two companies exhibited together at the recent Advances in Automotive Electronics conference in Ludwigsburg.

ESSCRIPT can tailor its security products to meet customers’ specific applications, and it offers embedded security consulting services. (See the the April 2013 Hansen Report for more on ESCRIPT.)

Strengths

Why do customers buy from ETAS rather than from its competitors? One reason, Mr. Pickhard believes, is because ETAS covers the complete V cycle, from requirements analysis through system test. Secondly, ETAS’ tools have proven to be very robust and reliable. “You can put our measurement tools in boiling water and they’ll still work,” he quipped. The third factor Mr. Pickhard stressed was ETAS’ global footprint. “We can support our customers in Detroit, or Germany, or South Korea, China, India—wherever they are.”

With its Bosch parentage, ETAS has strong relationships with the major European tier ones, especially in the powertrain domain. A company goal is to expand that powertrain dominance globally and at the same time grow business in the other vehicle domains and widen its customer base globally.

Major Acquisitions

ETAS has a small department that monitors the market for acquisition opportunities. It has set a target of 5% future growth through acquisitions. Possible candidates might be companies with local expertise, for example in the Japanese or Chinese markets, or companies with unique technology that is more easily acquired than developed in house.

In 2003 ETAS acquired LIVE Devices, a developer of OSEK operating systems, and VetroneX, which developed remote diagnostics software. VetroneX operated as an ETAS subsidiary until 2012, when it became part of Bosch’s Automotive Aftermarket Division.

Alliances

♦ Autosar is probably ETAS’ most important alliance. The standards created by the Autosar partnership form the basis of ETAS’ embedded software development tools, its principal product. Most of the world’s carmakers are basing their electrical systems on Autosar architecture. “The Autosar standard enables us to design tools that go deeper into the ECU development process,” said Mr. Pickhard.

♦ COMASSO e.V., founded by Robert Bosch GmbH and ETAS in May 2013, is an open source community of 22 companies that support a common implementation of the Autosar software standard version 4.0. After paying a modest membership fee, companies can use the contributed Autosar software software free of charge. Bosch provided the community with the first set of Autosar basic software modules as well as acceptance test software, which can be changed and extended by community members. In addition, Bosch provided the basic software development tool.

♦ BUSMASTER, initiated jointly by ETAS and Robert Bosch Engineering and Business Solutions, Bangalore, India, BUSMASTER is an open source tool to simulate, analyze and test CAN, LIN and other buses used in automotive automation applications. Thus far, the project is supported by seven additional companies.

♦ ETAS is a member of the OPEN Alliance (One-Pair Ether-Net), promoting and supporting the adoption of Ethernet-based networks as the standard in automotive networking applications. "Ethernet, along with Broadcom’s BroadR-Reach physical layer, is important to us because we assume that eventually most cars will have Ethernet connections," said Mr. Pickhard. "We want our tools to be compatible with the car’s backbone, which in the future will be Ethernet.” BMW and Broadcom have been strong supporters of the OPEN Alliance.

Because ETAS’ main mission is the provision of software design tools and services that increase the efficiency and quality of embedded software, it picks partners that can complement that mission. For example, ETAS invests in virtualization and knows how to develop tools for the embedded software engineer, but looks to partners who are competent in the domains of simulation, for example the simulation of hydraulic systems, chassis or engines. “What differentiates us is our tools are very open for integration of components from different partners," noted Mr. Pickhard.

IAV Automotive Engineering – Partner for guided application with INCA-FLOW
Kvaser AB – advanced CAN solutions
Mechanical Simulation – Partner for CarSim, TruckSim and BikeSim based on open product interfaces in ASCET, INTEGRIO and LABCAR
Model Engineering Solutions GmbH – Partner for the examination of modeling guidelines on the basis of ASCET’s open product interfaces with the aid of Model Examiner
Omnib GmbH – Partner for the integration of ASCET models in requirements engineering using means of VeriConf
SIMPACK – Partner for SIMPACK-VDM V5.0 based on the open interfaces of LABCAR
Softing – Partner for DTS7 (Diagnostic Tool-Set) based on the open product interfaces of INCA ODX-LINK
TESIS DYNaware – Partner for vehicle simulation software in LABCAR
Visu-ITI – Partner for ASAP-2 tool kit based on the ASAP MCD 2MC standard exchange format, which is supported by INCA