First Sensor

Sensor Solutions
BY FIRST SENSOR

BE THE FIRST TO CREATE

Sensor solutions are the basis of intelligent technology, and therefore they are always the first step on the path to innovation. First Sensor is your partner on this journey. We are one of the world's leading providers for developing and producing customized sensor solutions for OEMs, system suppliers and equipment manufacturers. We provide you with the most tailored and most precise certified top-quality solution. That's what First Sensor stands for.

Over the past 20 years, we have continually expanded our business model and driven forward our development to become an integrated, international technology company. Numerous long-standing relationships with customers are just one sign our competence and expertise, which we embody both as a company as a whole and through each individual employee at all of our 14 locations worldwide. Our many research cooperations ensure that we are at the forefront of the development of all relevant innovations.

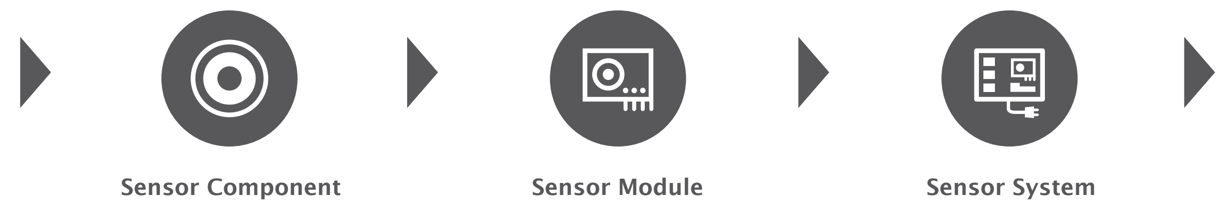
Get in touch with us and experience how this combination of specific engineering knowledge, customer orientation and integrated project execution turns a tailored solution even to unusual challenges into reality. It doesn't matter whether you need one or several million pieces. See what's possible – and be the first to make it into something new.

SENSOR SOLUTIONS FROM A TO Z.
FROM A SINGLE SOURCE.

Name your requirements and we'll do the rest. It's really that simple when you work with First Sensor as your strategic supplier. We are unique in sparing you from tough price negotiations with numerous providers, internal coordination problems or incompatibilities. We provide you with tailored sensor solutions along the entire value chain and are happy to give you advice on what exactly you need for your application. Everything from the semiconductor process to the integrated system is then planned, developed and produced with the help of our project expertise. Right up to optimal logistics and competent support – the precise solution!

OUR COMPETENCE:
UNIQUE SENSOR SOLUTIONS

INHOUSE DEVELOPMENT AND MANUFACTURE



WHAT FIRST SENSOR STANDS FOR

- Design, engineering and production of the sensor chip
- Use of state-of-the-art assembling & packaging technologies
- Test capacities with our own measuring and testing technology
- Expert knowledge of the behavior of individual properties (including light, radiation, pressure, flow, level, position, acceleration)
- Flexible and mature production technologies for system installation
- EMS series production from one to several million pieces a year
- Material expertise
- Automatic assembly technologies including SMD, chip on board, and special assembly
- Testing, characterization & simulation
- Application-specific expertise of material and packaging technologies
- Highly qualified application engineers
- System design including engineering, layout, assembling & packaging, electronics, hardware and software
- Calibration expertise
- Scalability of production capacities

DETECT MORE. ACHIEVE MORE.
OUR PRODUCTS.

What would you like to find out today? Or what would your product, your customer or a user like to find out? Whether it involves position, displacement, light, radiation, particles, motion, distance, speed, pressure, flow rate, liquid level, moisture, temperature or acceleration – we know which sensor is right for you and will provide you with the precise value. Our sensor modules and systems immediately convert this value into results and signals that can be used digitally, thereby giving your product eyes, ears, or a sense of touch. Needless to say, we can adapt all our products or develop them specially to fit your application.
You will already find the right solution to many applications in our broad and field-tested range of high-performance product platforms. This will help you to save time and resources!

LIGHT

- Detectors
  - UV
  - Visible light
  - Infrared
- Emitters
  - Laser diodes
  - LED
- Optoelectronic modules

RADIATION

- Detectors & modules for ionizing radiation

PRESSURE

- MEMS elements for highly specialized applications
- Pressure sensors
  - Uncompensated, temperature compensated & amplified
  - Based on flow measurement
  - Integrated signal conditioning
  - Increased media compatibility
  - Corrosive liquids and gases
- Pressure transmitters
  - Corrosive liquids and gases
  - Low pressure

FLOW

- Thermal mass flow sensors
- Sensors for volumetric flow measurement

LEVEL

- Hydrostatic liquid level sensors
- Capacitive level sensors
- Level switches

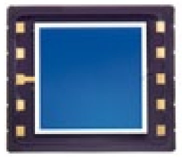
ACCELERATION

- Low-g sensor system for high-precision applications

OPTICAL SENSOR SOLUTIONS – LIGHT

DETECTORS

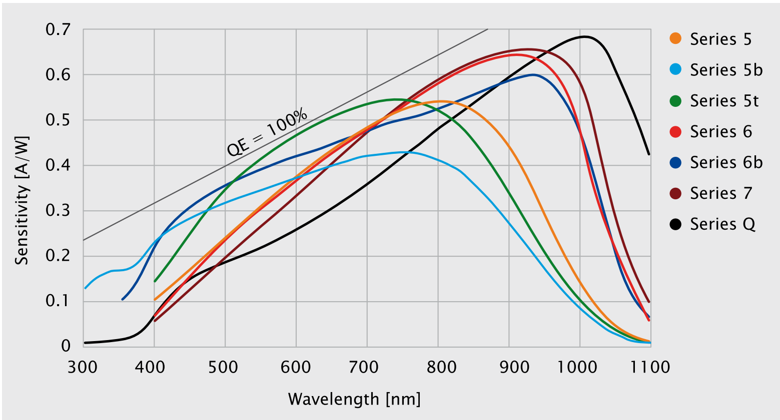
First Sensor has a large selection of high sensitivity, high speed and low dark current photodetectors optimized for ultraviolet, visible and infrared light as well as ionizing radiation. Package solutions include surface mount (SMD), through hole (THD) and metal can type (TO) devices.



PIN photodiodes

Silicon photodiodes are used to convert photonic energy into electrical current. Silicon has unique properties for light detection from 200 nm to 1100 nm as well as detection of α, β, γ and X-ray radiation. First Sensor's product line includes seven different series of silicon photodiodes. Each series is specially fabricated to address different performance specifications and design goals.

Spectral response; Typ. temp. 23 °C, M = 100

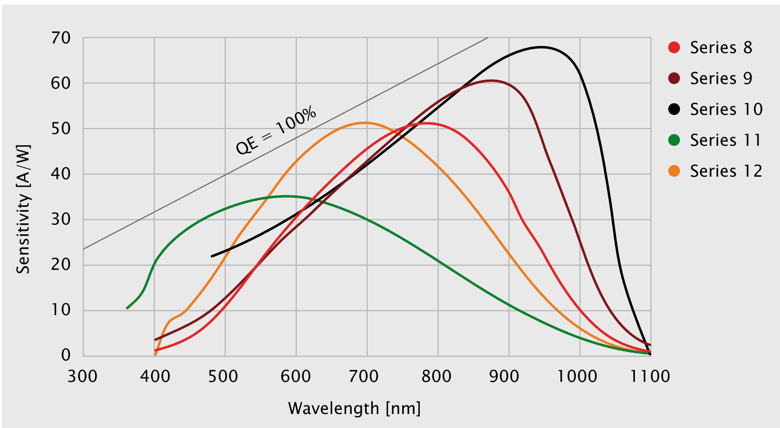


PIN series	Optimized for	Special features
SERIES 6b	400...650 nm	Blue / green enhanced
SERIES 5b	350...650 nm	High speed blue-enhanced Epitaxy PIN-diode
SERIES 5t	400...900 nm	High speed red-enhanced Epitaxy PIN-diode
SERIES 5	400...950 nm	High speed NIR-enhanced Epitaxy PIN-diode
SERIES 6	700...950 nm	General purpose, low dark current, fast response
SERIES 7	700...1000 nm	Low capacity, full depletable design available
SERIES Q	900...1100 nm	Enhanced NIR sensitivity, low voltage, fully depletable, low capacitance
SERIES i	600...1700 nm	InGaAs photodiodes, high IR sensitivity, low dark current

APD photodiodes

Silicon avalanche photodiodes (APD) are high speed, high sensitivity photodiodes with an internal gain mechanism capable of a high gain bandwidth product. APDs are excellent for measurements at very low light levels where a fast response time is required. All avalanche photodiodes from First Sensor are available in a wide range of sizes and packages, including multi-element arrays.

Spectral response; Typ. temp. 23 °C, M = 100



APD series	Optimized for	Special features
SERIES 11	360...560 nm	Blue enhanced, high speed
SERIES 12	550...750 nm	Ultra low temp. coefficient, flat frequency response up to 3 GHz
SERIES 8	750...820 nm	High speed, low temperature coefficient, high gain, high gain bandwidth product
SERIES 9	750...930 nm	Low rise time at higher NIR sensitivity, low temperature coefficient, high gain
SERIES 10	860...1100 nm	Sensitivity at 1064 nm is close to physical limits

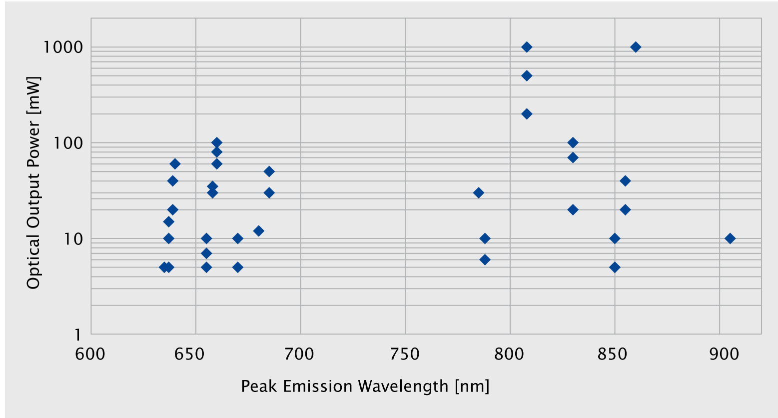
EMITTERS

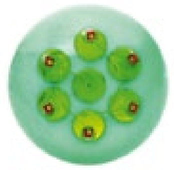
First Sensor emitters include a wide range of light emitting diodes and lasers for visible and infrared applications.

Red laserdiodes & IR laserdiodes

Laser diodes are available in the wavelength range from 635 nm to 905 nm. The large selection includes lasers with up to 100 mW single mode CW operation as well as high power multi mode lasers.

Overview of available output powers and wavelengths; Typ. temp. 23 °C

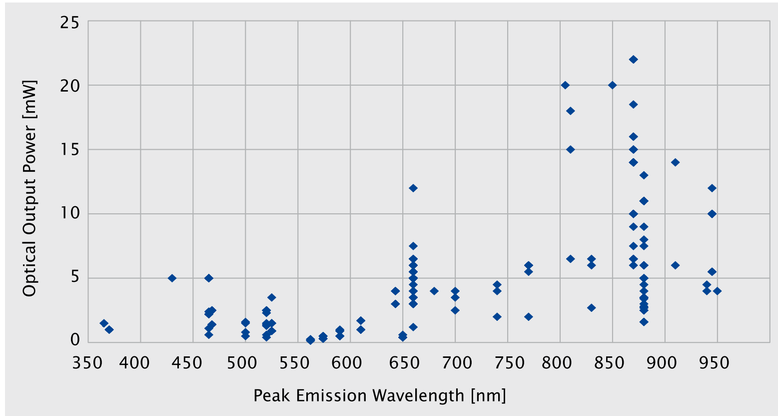




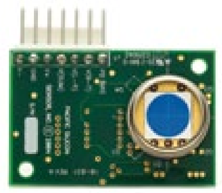
LEDs

Optimized for industrial applications these LEDs are available from 365 to 950 nm peak wavelength in a large variety of packages. Ask for our customized solutions to fit your needs.

Overview of available output powers and wavelengths; Typ. temp. 23 °C



OPTOELECTRONIC MODULES



First Sensor provides the necessary circuits to simplify the use of our photodiodes. Available products range from compact high voltage sources to complete evaluation boards and modules ready for integration in your system or for test runs on the lab bench.

Hybrids

First Sensor offers compact integration of its photodiodes with amplifiers matched to the specific strengths of the detectors. Specific solutions are available on request.

Development modules

First Sensor offers APD modules and evaluation board modules for quadrant, duo-lateral PSD and wavelength sensitive photodiodes. They enable an easy integration into your system or a fast evaluation under lab environment.

Evaluation Kits

First Sensor offers complete evaluation kits including temperature compensated high voltage source and amplification to make the evaluation of our APD products as simple as possible. More evaluation kits upon request.

High-voltage modules

First Sensor offers high-voltage sources optimized for use with PIN photodiodes and APDs as well as feature minimal voltage noise and a compact design.

OPTICAL SENSOR SOLUTIONS – RADIATION

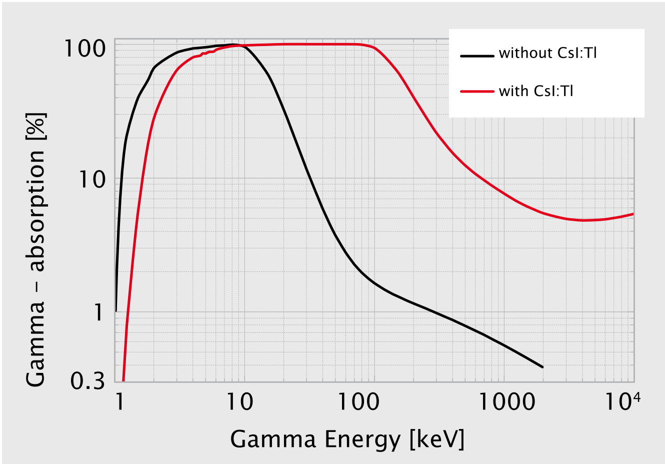
DETECTORS FOR IONIZING RADIATION

Nuclear particles and X-rays can be detected with silicon either directly via absorption within the crystal lattice or indirectly via scintillators. For the absorption mode to be efficient it requires a large absorptive volume. This capability is achieved by First Sensor's superior wafer fabrication processing that produces detectors which can be operated at bias voltages that produce fully depleted active regions but still maintain extremely low dark currents.

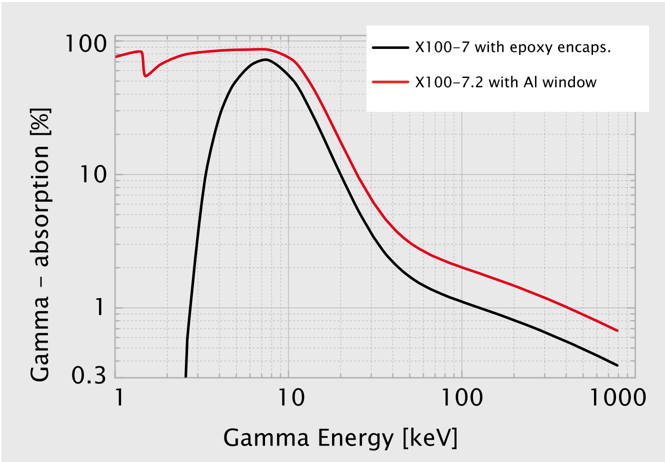
Special features

- Wafer thickness up to 700 µm
- Very low dark current signals
- Very low capacitance levels
- Minimal series resistance at full depletion

Gamma absorption; Typ. temp. 23 °C
X10-γ with and without 3 mm CsI: Tl scintillator



Gamma absorption; Typ. temp. 23 °C
X100-7 and X100-7.2



PIN series	Optimized for	Special features
SERIES X	Ionizing radiation	With or without scintillator, ultra low dark current

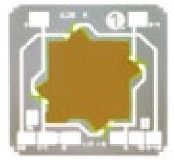
PRESSURE SENSOR SOLUTIONS

MEMS ELEMENTS FOR HIGHLY SPECIALIZED APPLICATIONS

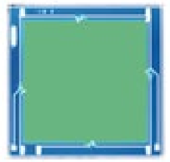
Piezoresistive Si pressure sensor solutions for absolute, gauge and differential measurement in the range from 6 kPa (60mbar) to 40MPa (400 bar).

Chips

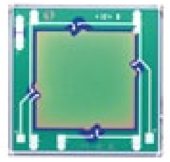
First Sensor pressure sensor chips are based based on the "Sensor Technology for Advanced Resistors" (STARe). The chips are particularly suitable for highly precise meassurements of aggressive media and fluids (rear operation) as well as in filled with oil transmitters. This technology contributes to the further advancement in pressure measurements. The engineering of suitable materials, layouts and electrical shielding generated the STARe Technology. Thus enabling pressure measurement with highest accuracy and stability.



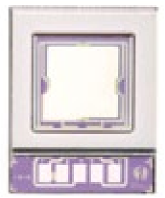
Standard Line STARe
Absolute, relative and differential pressure 1 bar to 30 bar



High Stability Line STARe
Absolute, relative and differential pressure 60 mbar to 400 bar



Industrial Line STARe
Absolute, relative and differential pressure 100 mbar to 400 bar



Harsh Environmental Line
Absolute pressure 2 bar to 16 bar

Modules

Serie STARe pressure sensors are based on the specifications of the High Stability Line STARe by First Sensor. Moreover, a high accuracy PTC temperature sensor is equipped on top of the Kovar TO-8 header. The K-Series is particularly suitable for highly precise meassurements (stability < 0,1%) in filled with oil transmitters and for vacuum applications. The K-Series STARe is supplied with a plastic housing for transport protection and pressure measurements up to 10 bar.

K-Serie STARe A/G
Absolute and relative pressure 60 mbar to 400 bar

K-Series STARe D
Differential pressure 60 mbar to 10 bar

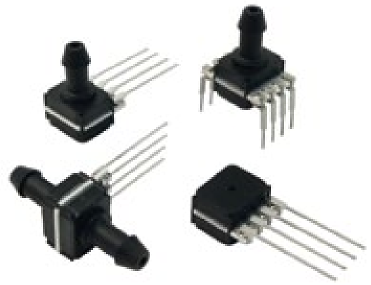
PRESSURE SENSOR SOLUTIONS

PRESSURE SENSORS

Reliable, highly accurate pressure sensors and pressure transmitters for air, gases and liquids form the largest part of our extensive product range.

Uncompensated pressure sensors
Cost-effective piezoresistive pressure sensors for air and gases with pressure ranges up to 10 bar. The uncalibrated and uncompensated basic sensors feature analogue mV output signals and almost unlimited resolution. They offer very small housings with pressure ports for tubing or manifold connection and custom pressure ranges.

Pressure sensors with integrated signal conditioning
Digital piezoresistive miniature pressure sensors with amplified output signals for air and gases with full scale pressure ranges from 2.5 mbar, a broad range of housing options and custom pressure ranges. High resolution digital signal conditioning provides for a very high level of overall accuracy within large operating temperature ranges.



Pressure sensors with increased media compatibility
Miniature pressure sensors with digital signal conditioning and pressure ranges up to 10 bar. Increased media compatibility for gases and liquids. Very small housings with a selection of pressure ports for tubing connection or manifold mounting. Custom pressure ranges and modifications are available.

Temperature compensated pressure sensors
Highly accurate piezoresistive pressure sensors for air and gases with full scale pressure ranges from 5 mbar. The sensors feature calibrated and temperature compensated analogue mV output signals and almost unlimited resolution. They are available in many different housing options and with custom pressure ranges.

Pressure sensors based on flow measurement
Ultra-low differential pressure sensors for air and gases from 0.25 mbar (25 Pa) based on thermal flow measurement through a micro-flow channel integrated within the sensor chip. The extremely low flow through the sensor ensures high immunity to dust contamination and condensation. The sensors feature high sensitivity and offset stability.

Pressure sensors for corrosive liquids and gases
Pressure sensors suitable even for corrosive liquids and gases. Small housings for space-saving integration into demanding OEM applications. These sensors stand out through their excellent price/performance ratio as well as very good stability and repeatability. Customised options are available.

PRESSURE TRANSMITTERS

Low pressure transmitters
Pressure transmitters with amplified output signals for air and gases with full scale pressure ranges from 1 mbar. Options include a broad range of pressure and electrical connections as well as fast and flexible customisation to specific requirements.

Pressure transmitters for corrosive liquids and gases
Pressure transmitters with amplified output signals even for corrosive liquids and gases. These transmitters use ceramic or stainless steel pressure sensor elements to ensure high media compatibility. The transmitters are available with a choice of different pressure and electrical connections and as custom versions.

Product matrix – Pressure sensors

Type	Series	Pressure range	Low media compatibility	Increased media compatibility	High media compatibility	mV output	Amplified output	Digital output	PCB mountable	Industrial housing	Ultra low pressure	High pressure	Absolute pressure	Differential pressure	Gage pressure
Transmitter	BTE5000	1 mbar...10 bar	▪				▪			▪	▪			▪	▪
	CTE7000	10 mbar...7 bar	▪				▪			▪			▪		▪
	CTE9000	100 mbar...35 bar			▪		▪			▪		▪	▪		▪
	CTE8000	250 mbar...100 bar			▪		▪			▪		▪	▪		▪
	KTE6000	250 mbar...400 bar			▪		▪			▪		▪	▪		▪
Sensor	SSI	200 mbar...35 bar			▪		▪	▪				▪	▪		▪
	SSO	200 mbar...35 bar			▪	▪						▪	▪		▪
	KMA	500 mbar...100 bar			▪		▪					▪			▪
	LBA	0,25...5 mbar	▪				▪		▪		▪			▪	▪
	LDE	0,25...5 mbar	▪				▪	▪	▪		▪			▪	
	HCLA	2,5...75 mbar	▪				▪	▪	▪		▪			▪	▪
	HCL	5...75 mbar	▪			▪			▪		▪			▪	▪
	HCE	10 mbar...5 bar	▪				▪	▪	▪				▪	▪	▪
	HDI	10 mbar...5 bar	▪				▪	▪	▪				▪	▪	▪
	HDO	10 mbar...5 bar	▪			▪			▪				▪	▪	▪
	HRO	10 mbar...10 bar	▪			▪			▪			▪		▪	▪
	HDU	100 mbar...5 bar	▪			▪			▪				▪	▪	▪
	HMA	100 mbar...10 bar		▪			▪		▪			▪		▪	▪
	HME	100 mbar...10 bar		▪				▪	▪			▪		▪	▪
	HMI	100 mbar...10 bar		▪				▪	▪			▪		▪	▪
	HMU	100 mbar...10 bar		▪		▪			▪			▪	▪	▪	▪

FLOW SENSOR SOLUTIONS

Depending on the application – mass flow or volumetric flow measurement – the broad range of sensors from our company use different measurement principles, each of them highly accurate. Our flow rate sensors quickly record even the smallest flows with a high degree of accuracy.

THERMAL MASS FLOW SENSORS

Mass flow sensors for air and gases based on a highly sensitive thermal measuring principle. Due to stable MEMS silicon chip technology the sensors feature fast response times and low power consumption.

SENSORS FOR VOLUMETRIC FLOW MEASUREMENT

Differential pressure sensors and robust differential pressure transmitters for volumetric flow measurement.

LEVEL SENSOR SOLUTIONS

To reliably monitor the level in tanks or containers, First Sensor offers a range of different sensor technologies. Depending on the application, they can register the level continuously or using limit values. Fluid level control sounds quite easy but can turn into a demanding sensor application problem if movement, foaming, or media and container issues come into play.

Product matrix – Level sensors

Type	Series	Continous	Switching output	Amplified analog output	Digital output	Submersible	Contact free
Hydrostatic	CTE9000...CS	▪		▪		▪	
	CTE8000...CS	▪		▪		▪	
	KTE8000...CS	▪		▪		▪	
Capacitive	CLC	▪		▪	▪		▪
	CLW		▪				▪
Optical	OLP		▪				
	OLT		▪				
	OLM		▪				

HYDROSTATIC LIQUID LEVEL SENSORS

Submersible hydrostatic level sensors with amplified output signals. These transmitters use ceramic or stainless steel pressure sensor elements to ensure high media compatibility. Fast and flexible modifications based on custom specific requirements are available for all hydrostatic liquid level sensors.

CAPACITIVE LEVEL SENSORS

Continuous contact-free level sensors based on a new capacitive sensor technology. High flexibility to measure desired levels and media, also including application set-up by two-point calibration.

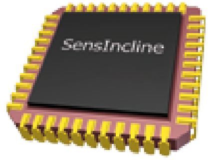
LEVEL SWITCHES

Level switches based on capacitive or optical measurements. Both technologies operate reliably and accurately without any moving parts.

ACCELERATION SENSOR SOLUTIONS

ACCELEROMETER

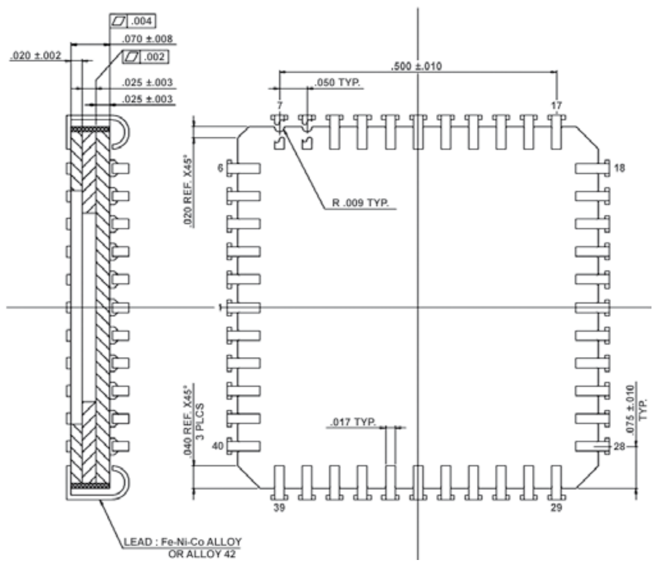
Technology platform to fabricate precise inertial sensors for geo-engineering, condition monitoring or navigation by First Sensor: The patented AIM-technology (Air gap Insulated Microstructures) is used to fabricate sensors and actuators based on high aspect ratio silicon microstructures with capacitive working principle. Typical devices are MEMS inertial sensors and RF-MEMS.



Low-g sensor systems for precise applications
High-precision detection of acceleration, inclination or vibration.

- Surface micromachining by AIM-technology
- Thin film free mechanical components – crystalline silicon only standard wafer used – no mechanical stress
- Minimizing of parasitic capacitances due to insulation of the functional components by air gap
- Complete dry processing
- Excellent thermal performance
- Large signal to noise ratio
- Mechanical over damped to reduce parasitic signals
- Customer specific solutions for packaging and signal processing

CCJ44 (dimensions in inch)



Parameters	Accelerometers
Measurement range	± 0.5 g … ± 75 g
Resolution	5 µg … 2 mg
Bias repeatability	25 µg … 10 mg
Temperature range	–45°C … +85°C
Shock resistance	> 2000 g

BE THE FIRST TO CREATE.
IN EVERY INDUSTRY.

With products becoming increasingly complex, it is important that suppliers understand the market as well and are able to communicate with their customers “in a common language”. Specific quality criteria must be observed and it must be possible to integrate new developments into the existing technological environment quickly and flawlessly. This leaves no room for misunderstandings and vagueness. Customer products that are truly innovative often involve large investments and high qualification standards, making the long-term reliability of production and supply in the supply chain all the more important.

LIFE SIENCE

DIN EN ISO 13485
DIN EN ISO 14001

- medical and laboratory technology
- analytics
- biotech and environmental technology

SAFETY & SECURITY

DIN EN 9100

- traffic monitoring
- security surveillance
- air traffic
- aviation
- satellite systems & communication
- defense

AUTOMOTIVE & TRANSPORTATION

ISO/TS 16949

- safety & security
- comfort
- drive train

INDUSTRIAL

DIN EN ISO 9001

- automation and process control
- environmental control
- HVAC

LOCATIONS

First Sensor AG is headquartered in Berlin and has development and production at seven German subsidiaries as well as at seven international subsidiaries.

FIRST SENSOR AG

www.first-sensor.com
Development, design and manufacture of silicon PIN photodiodes, avalanche photodiodes, linear and matrix photodiode arrays, laser and light emitting diodes, position sensing photodiodes, wavelength sensitive photodiodes as well as opto-electronic modules and systems.

FIRST SENSOR INC.

www.first-sensor.com
USA based subsidiary of First Sensor AG, providing design, manufacturing and testing of semi-standard and unique photodetector, emitter and Opto-electronic solutions for the US market.

FIRST SENSOR AG (MUNICH)

www.first-sensor.com
Development and manufacture of pressure, level and flow sensors as well as custom sensing systems and integrated fluidics control solutions.

MICROELECTRONIC PACKAGING DRESDEN GMBH

www.mpd.de
Services in the development and manufacturing of electronic microsystems (EMS) to electronic components up to complex multi-ship modules and systems. Custom miniaturisation of opto-electronic and MEMS-based sensors as well as highly integrated circuits.

ELBAU ELEKTRONIK BAUELEMENTE GMBH BERLIN

www.elbau-gmbh.de
Electronic engineering and manufacturing services (EMS) for pressure, flow and optical sensor systems as well as for other custom sensor solutions.

LEWICKI MICROELECTRONIC GMBH

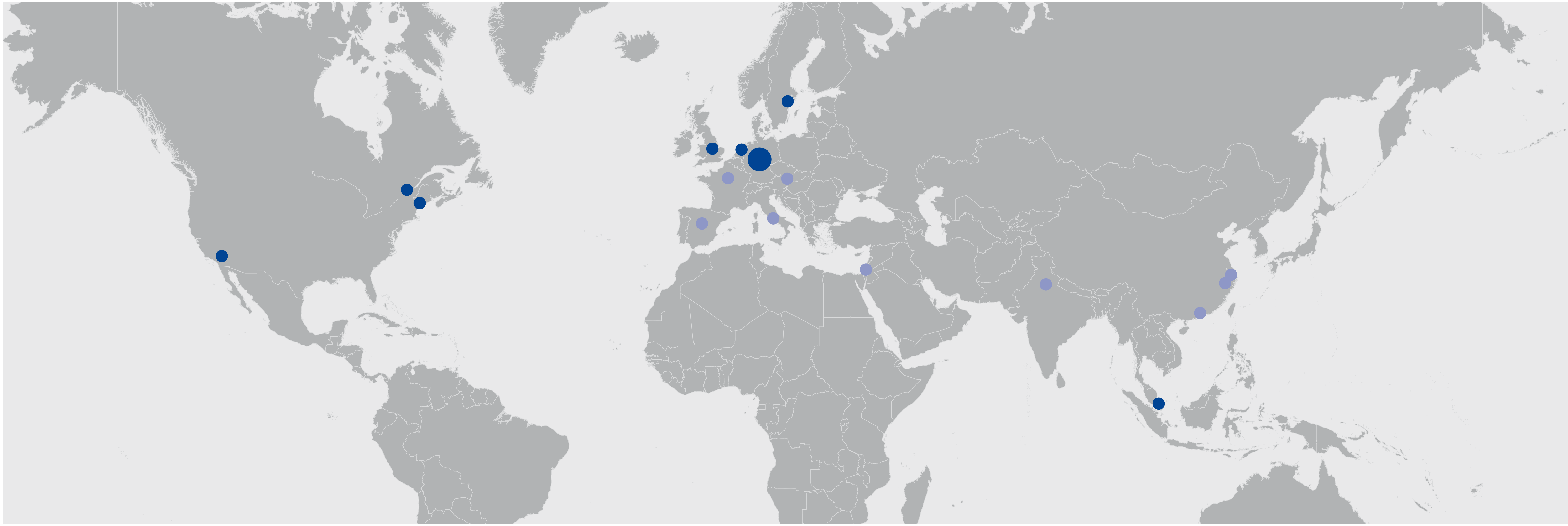
www.lewicki-gmbh.de
Contract manufacturer of integrated circuit packaging for highly sophisticated hybrid circuits and microelectronic applications.

SILICON MICRO SENSORS GMBH

www.smicrosensors.de
Development, design and manufacture of optical and MEMS based sensor solutions for harsh environmental conditions; Cameras and Pressure Transducers.

MEMSFAB GMBH

www.memsfab.de
Research & Development, design and production of MEMS solutions (micro-electro-mechanical systems).



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