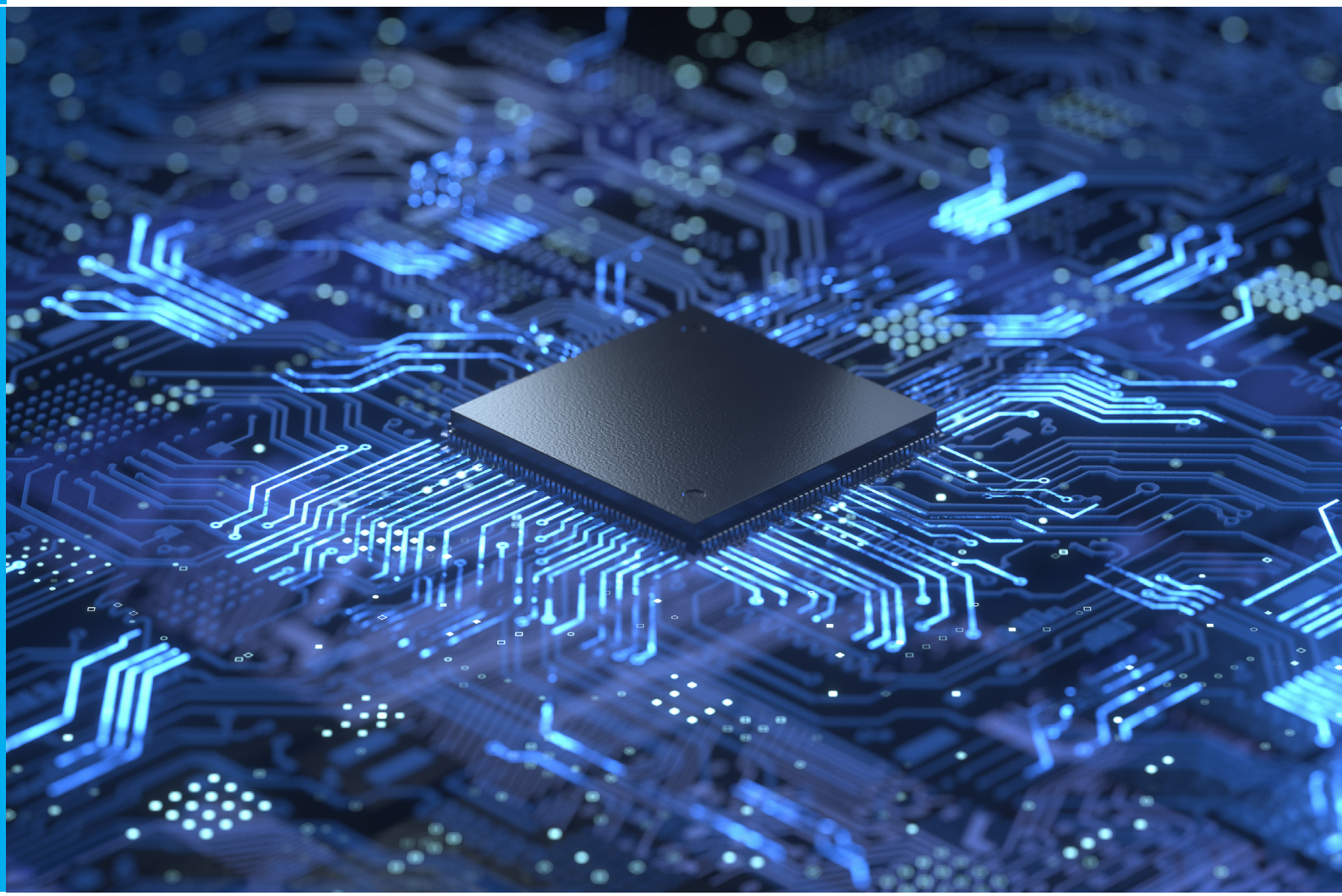
Endress+Hauser

Your partner for semiconductor fabrication



Endress+Hauser

People for Process Automation

Contents

National Business Development Manager Liza Kelso

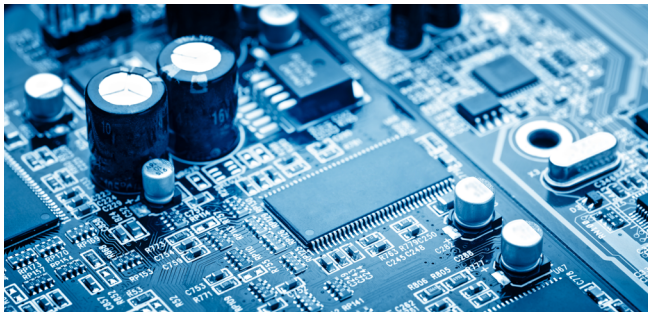
Liza Kelso is an accomplished business development leader with a strong background in critical account management. She brings extensive experience from her role as a national business development manager at Endress+Hauser Group. In this capacity, Liza has been focused on growing and fostering new business development and strategic alliances in the semiconductor industry and the digital data storage market sector.

Throughout her career, Liza has played a pivotal role in partnership management efforts and strategic client resolutions. She is well-regarded for her ability to collaborate effectively. Liza is a servant leader, prioritizing success from every angle for organizations.

Liza Kelso, LinkedIn

Semiconductors and how we can help

The semiconductor industry operates in a complex landscape where precision, scalability and cost-effectiveness are critical for success. At Endress+Hauser, we recognize the unique challenges faced in semiconductor fabrication.



Semiconductor plants require accurate measurements across various parameters, including liquid analysis, level, flow and temperature. Our comprehensive portfolio covers these essential aspects, ensuring precise data collection and informed decision-making. Whether it's monitoring chemical processes, managing water usage or optimizing energy consumption, our instruments provide the necessary insights.

Boosting yield rates

Our solutions are tailored to optimize your systems and processes, maximizing productivity while minimizing operational expenses (OPEX).

Endress+Hauser's products are engineered for dependable operation, reducing downtime and ensuring consistent high yield rates.

Sustainability and efficiency

We help you monitor and optimize energy and water consumption, crucial for the energy-intensive semiconductor fabrication process.

Our products and solutions are designed to support your sustainability initiatives, ensuring operational continuity and reducing costs.

Global support and expertise

With more than 1,000 specialists and a global service network, we provide localized support to meet your specific needs.

Our process experts partner with you to manage and optimize your maintenance processes, ensuring your operations run smoothly.

Innovative solutions

Our instruments are equipped with IIoT sensors and connectivity, providing precise control and energy efficiency.

Digital transformation

Endress+Hauser's digital solutions offer real-time data insights, helping you optimize fabrication processes, reduce waste and increase yield.

Our digital tools enable proactive maintenance, preventing issues before they impact production.

Why choose Endress+Hauser?

Our products are trusted in harsh conditions and clean room environments, ensuring high performance and reliability.

Global reach, local support: Benefit from our extensive global network and localized support, ensuring quick response times and expert assistance.

Commitment to excellence: We are dedicated to helping you achieve the highest standards in semiconductor fabrication through innovative solutions and expert support.

Process for ultrapure water

Water covers more than 70% of the Earth's surface, and its natural form varies widely in purity.

Liquiline Compact CM82 and RIA46 field meter

Ultrapure water serves as a primary source in semiconductor fabrication plants. Unlike impure water, ultrapure water does not cause corrosion or stress cracking in critical equipment such as cooling systems and boilers.

Companies rely heavily on ultrapure water, often using hundreds of thousands of gallons per day for large plants. The water can be processed from various sources, including city water, nearby rivers or even seawater. Specialized systems purify the water through electrodionization, membrane filtration and reverse osmosis. Monitoring pH levels is essential during both purification and production usage to ensure correct pH maintenance. The quality of water directly impacts fabrication plant efficiency and equipment longevity. Two critical parameters — conductivity and pH — play a significant role.

Improperly conditioned water leads to corrosion and scale formation which could cause poor wafer quality and inefficient water usage. Conductivity via resistivity measurement alone does not provide sufficient information for ultrapure water chemistry, pH monitoring is equally crucial with additional parameters such as dissolved oxygen and total organic carbon.

Pure water, known as the "universal solvent," aggressively dissolves almost everything it contacts. Its deficiency of ions drives it to seek equilibrium by stripping ions from other substances. For our purposes, pure water has a conductivity range of 0.055 to 10 µS/cm or 18.2 to 0.1 megohms-cm. Specialized pH sensors are necessary to measure water with conductivity below 10 µS/cm, as standard sensors will produce noise due to the low ionic strength solution.

Optimizing industrial water processes with instrumentation and service solutions

At the heart of successful water treatment lies reliable process control, which hinges on accurate measuring instrumentation.

Our commitment to your success extends beyond instrument delivery. Endress+Hauser offers a comprehensive portfolio of service offerings tailored to the unique challenges of the water and wastewater industry.

Our experienced technical experts assist you during the commissioning phase. Their goal? Ensuring instrument performance right from the start, within specified timeframes and budgets.

Detailed documentation, including baseline reports and backup files, ensures smooth process monitoring and control. Proper installation of components is crucial for stable operation.

In many countries, operators must verify flowmeters at specific intervals. Our expertise in verification ensures accurate measurement of water extraction and discharge. Verification can be done on-site or remotely using Heartbeat Technology. Endress+Hauser's Heartbeat Technology is designed to enhance the functionality of their smart instrumentation. It integrates diagnostics, verification and monitoring functions to provide in-depth insights into sensor and process conditions. This technology aims to optimize productivity, ensure compliance with legal requirements and maintain high product quality and safety.

Key benefits include:

- **Increased reliability and safety**: Outstanding diagnostic coverage ensures confidence in device performance under various conditions
- **Higher efficiency and plant uptime**: Timely and clear diagnostic messages help in efficient operations
- **Certified verification**: Instruments can be verified in-situ without process interruption, minimizing effort and downtime
- **Predictive maintenance**: Condition monitoring capabilities allow for timely prediction of maintenance needs, enhancing overall process optimization

Increase your plant performance and ...

... boost reliability as well as safety levels	... reduce your verification efforts	... improve your process insights
Heartbeat Technology		
for diagnostics	**for verification**	**for monitoring**
		
Permanent process and device diagnostics	Documented device functionality without process interruption	Information for process optimization and predictive maintenance

Flow

The semiconductor industry predominantly uses clamp-on ultrasonic flowmeters for flow measurement, unlike other industries that typically use electromagnetic meters. Ultrasonic flowmeters are preferred because they can be used in tight spaces and existing facilities, which is crucial for semiconductor environments. Clamp-on ultrasonic flowmeters can measure from half an inch to 160 inches, providing flexibility in various applications.

Key product offering

Proline Prosonic Flow W 400 ultrasonic clamp-on flowmeter

- FlowDC reduces inlet runs to a minimum
- Medium temperature range (−40 to +130 °C or −40 to +266 °F)
- Measuring range: 0 to 15 m/s (0 to 50 ft./s)
- Proven sensors in combination with maintenance-free mounting system deliver long-term stable signals
- Cost-effectiveness increases with the pipe diameter (up to DN 4000/160")
- Web server offers full remote access, while the device's display offers convenient on-site interaction
- Heartbeat Technology with its integrated diagnostics, verification and monitoring functions always enable compliance and process safety

Proline Prosonic Flow P 500 ultrasonic clamp-on flowmeter

- FlowDC reduces inlet runs to a minimum
- Developed according to IEC 61508 functional safety requirements and holds international approvals for hazardous area, Zone 1 and Class I, Division 1
- Proven sensors in combination with maintenance-free mounting system deliver long-term stable signals, also in high-temperature applications (≤550 °C/1022 °F)
- Cost-effectiveness increases with the pipe diameter (up to DN 4000/160")
- Web server offers full remote access, while the device's touch display offers convenient on-site interaction
- Heartbeat Technology with its integrated diagnostics, verification and monitoring functions always enable compliance and process safety

Liquid analysis

Endress+Hauser's liquid analysis devices can handle a wide range of sample types, from ultrapure water to complex chemical mixtures, providing flexibility and precision in various applications, ensuring the purity and quality of chemicals and water used in fabrication processes.

Key product offering

1-channel transmitter Liquiline Compact CM72/82

- Can be used in all industries, and their utilities, and supports all sensors with the Memosens plug-in head, including pH sensors, ORP sensors, conductivity sensors and oxygen sensors
- Measuring range: 0 to 14 pH
- Output/communication: 4 to 20 mA
- Two-wire device fits inside an assembly and does not require its own power supply

Digital conductivity sensor Memosens CLS16E

- Titanium body
- Measuring range: k=0.1: 0,04 to 500 µS/cm
- Process pressure: 13 bar at 20 °C (188 psi at 68 °F); 9 bar at 120 °C (130 psi at 248 °F)
- Process temperature: 5 to 120 °C (23 to 248 °F)

Digital pH sensor Memosens CPF81E

- Measuring range: pH 0 to 14
- Process pressure: 1 to 10 bar abs at 80 °C (15 to 145 psi at 176 °F)
- Process temperature: Version LH: 0 to 110 °C (32 to 230 °F); Version NN: 0 to 80 °C (32 to 170 °F)
- Stores calibration and process data for trend identification and future-proof predictive maintenance and IIoT services
- Double junction provides better protection against electrode poisoning ions such as sulfides and cyanides

Turbidity sensor Turbimax CUS52D

- Measuring range: 0.000 to 4000 FNU
- Process temperature: stainless steel version: -20 to 85 °C (0 to 185 °F)
- Process pressure: stainless steel version: 0.5 to 10 bar abs (7.3 to 145 psi abs)
- Highly accurate and reliable monitoring of your water quality
- Factory calibration and Memosens technology for easy plug-and-play

4-channel transmitter Liquiline CM444

- One controller for all parameters and applications, intuitive user interface, automatic sensor recognition, hot plug-and-play with pre-calibrated Memosens sensors
- Universal modules for all parameters minimize spare part stock and allow for easy 1-click extension
- Unique portfolio of communication standards suits every distributed control system (DCS)
- Saving configuration on SD card enables fast set-up on duplicate installations
- Integrated web server that allows the operator to remotely view diagnostics, access and modify parameter settings in any web browser

Low-range TOC analyzer CA78

- Determination of total carbon in ultrapure water applications that meet the following conditions: Conductivity < 10 µS/cm, pH range: neutral
- Total Organic Carbon (TOC) determination by UV digestion and measurement of the differential conductivity
- Measuring range 0.5 to 1000 µg/l (ppb)
- Process pressure: max 0.5 bar (7.25 psi)
- Process temperature: < 50 °C (122 °F)

Pressure

Non-metallic wetted materials, specifically PVDF (polyvinylidene fluoride) body and ceramic pressure cells, are used in the semiconductor industry. These materials are chosen for their compatibility with ultrapure water and chemicals used in semiconductor processes.

Key product offering

Cerabar PMP71B

- Pressure measuring range up to 700 bar (10,500 psi)
- Process temperatures up to 400 °C (752 °F) with diaphragm seal
- Accuracy up to +/- 0.025%
- Heartbeat Technology verifies the health of the device while the process is running
- Display changes from green to red when diagnostic messages occur
- Error-free SIL commissioning and instrument guided proof testing
- Wireless control of the device in the process area with the SmartBlue app

Level

Those in the semiconductor industry can benefit from 80 GHz FMCW (Frequency Modulated Continuous Wave) technology for precise level measurement. Non-metallic wet components are used to ensure compatibility with semiconductor processes. These products offer complete non-metallic wetted materials for all radar level transmitter applications in the semiconductor industry.

Key product offering

Micropilot FMR60B
80 GHz radar sensor

- Process connections: threads and flanges
- Temperature from −40 to 200 °C (-40 to 392° F)
- Pressure from −1 bis to +20 bar (-14.5 to +290 psi)
- Maximum measuring range 50 m
- Accuracy: ±1 mm (0.04 in)
- Simplified, intuitive operation and wizards for commissioning and verification
- Heartbeat Technology

Micropilot FMR62B
80 GHz radar sensor

- Process connections: flanges
- Temperature from −196 to to 450 °C (-320 to 842°F)
- Pressure from −1 bis to +160 bar (-14.5 to 2320.6 psi)
- Maximum measuring range: 80 m (262.5 ft.)
- Accuracy: ±1 mm (0.04 in)
- Simplified, intuitive operation and wizards for commissioning and verification
- Heartbeat Technology

Temperature

Temperature measurement, like level, pressure and flow, is critical in semiconductor processes. Endress+Hauser offers a wide range of temperature transmitter products and sensor technology. Our products feature large, backlit displays that can be seen from a distance, making it user-friendly in various settings. In addition, our products offer Bluetooth configuration.

Key product offering

iTEMP TMT142B temperature transmitter

- Accuracy: (Pt100, -50 to 200 °C) <=0,1 K; (Pt100, -58 to 392 °F) <=0,18 °F
- Certified for use in hazardous areas
- CSA (IS, NI, XP and DIP), ATEX, INMETRO, NEPSI (Ex ia, Ex d, dust ignition-proof)
- Reliable, long-term stable and accurate temperature measurement even under harsh environmental conditions thanks to a pressure-encapsulated, single-chamber housing and integrated overvoltage protection
- Bluetooth interface helps save time and effort on commissioning, configuration and maintenance using the Endress+Hauser SmartBlue app

iTEMP TMT72 temperature transmitter

- Accuracy: (Pt100, -50 to 200 °C) <= 0,1 K; (Pt100, -58 to 392 °F) <= 0,18 °F
- Safe operation in hazardous areas thanks to international approvals
- Reliable operation thanks to sensor and device monitoring
- Bluetooth interface helps save time and effort on commissioning, configuration and maintenance using the Endress+Hauser SmartBlue app
- Diagnostics information according to NAMUR NE 107
- Available with plug-on display TID10
- Optimization of the measurement accuracy by sensor-transmitter matching

Digital services for the semiconductor industry

Unlock the power of digitalization with Netilion

Our cloud-based platform, Netilion, provides seamless access to digital data and analytics, empowering you to optimize your processes and eliminate risks.

Collaborate effortlessly with your trusted advisor to transform data into actionable insights and enhance process efficiency.

Optimize your operations

Digital Commissioning app: Manage projects with full visibility. Gain real-time insights into work progress, issues and completion status.

Asset management: Maintain a comprehensive analytical view of your installed base, ensuring you stay informed about asset information and status.

Comprehensive support and connectivity

Service Portal: Access on-demand knowledge articles and connect with our tech support team for expert assistance.

Remote connectivity: Stay connected to your devices to improve performance and reduce downtime with our remote support services.

Efficient reporting and verification

Calibration and maintenance reports: Receive digital delivery of certificates with summarized information for ease of use.

Heartbeat Technology verification: Perform comprehensive functional performance assessments remotely or on-site.

Performance optimization services

Enhance your maintenance and calibration processes sustainably

Partner with Endress+Hauser process experts to manage and optimize your maintenance activities across your installed base, improving your Operational Equipment Efficiency (OEE).

How we can help

We collaborate with you to find the optimal balance between increasing performance, mitigating risks, and reducing costs, ultimately enhancing production outputs and delivering superior business results.

- **Expert personnel:** Our team of qualified professionals with metrology and measurement technology expertise will manage, plan, schedule, execute, and record maintenance activities for all your critical instruments.
- **Proven process knowledge:** We prioritize mitigating safety and compliance risks.
- **Safety and compliance focus:** We ensure the availability and reliability of your installations.
- **Performance commitment:** We are dedicated to improving operations and reducing operational expenses.

Benefits

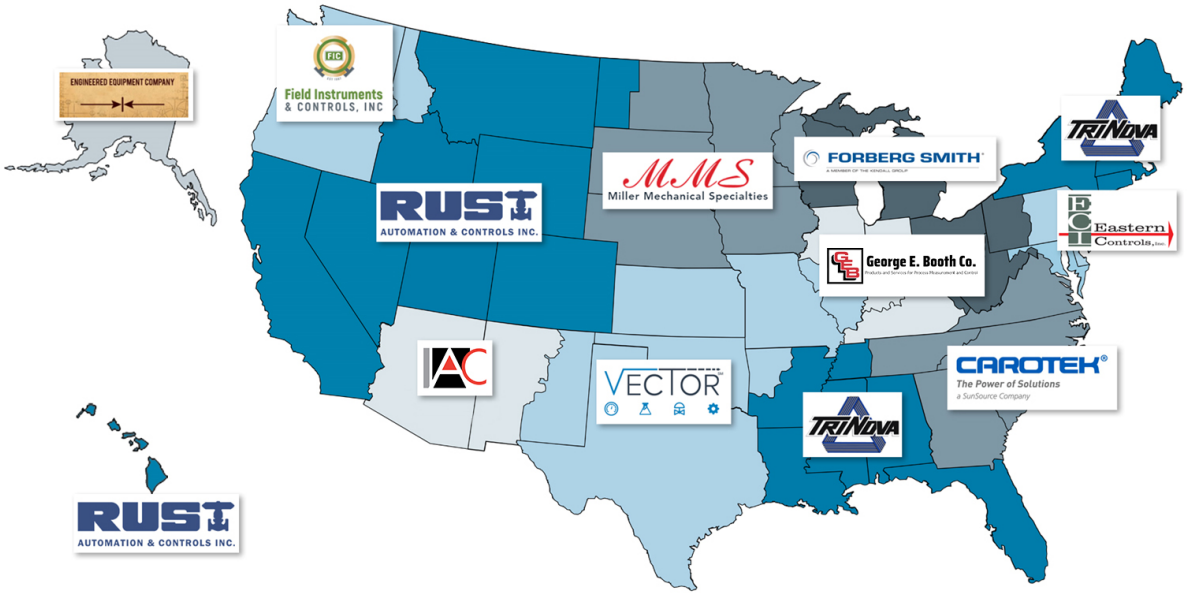
- **Improve process efficiency:** Our experts provide in-depth analysis and recommendations to optimize your maintenance processes and long-term asset management strategy.
- **Save costs and mitigate risks:** Leveraging global expertise and sensor data, we identify options to reduce operational costs and ensure compliance with defined requirements.
- **Focus on core competence:** Endress+Hauser manages your day-to-day maintenance processes, continuously striving for improvements to boost your productivity and efficiency.

A reliable partner

At Endress+Hauser, we manufacture flow, level, pressure, temperature, liquid and optical analysis products and have a complete network of sales and service representatives to support products wherever they're installed.

To support our customers' project needs, we offer engineering and project management services directly. We are a complete process automation partner.

New features transform us.endress.com into a powerful and intelligent cooperation platform that directly connects you to us and our extensive network of sales representatives. Your personalized space allows you to perform operations within minutes. Manage transactions, purchase products, order spare parts, download documentation and access your contacts — whether at the office, in the field or while on the move — simply with My Endress+Hauser.



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