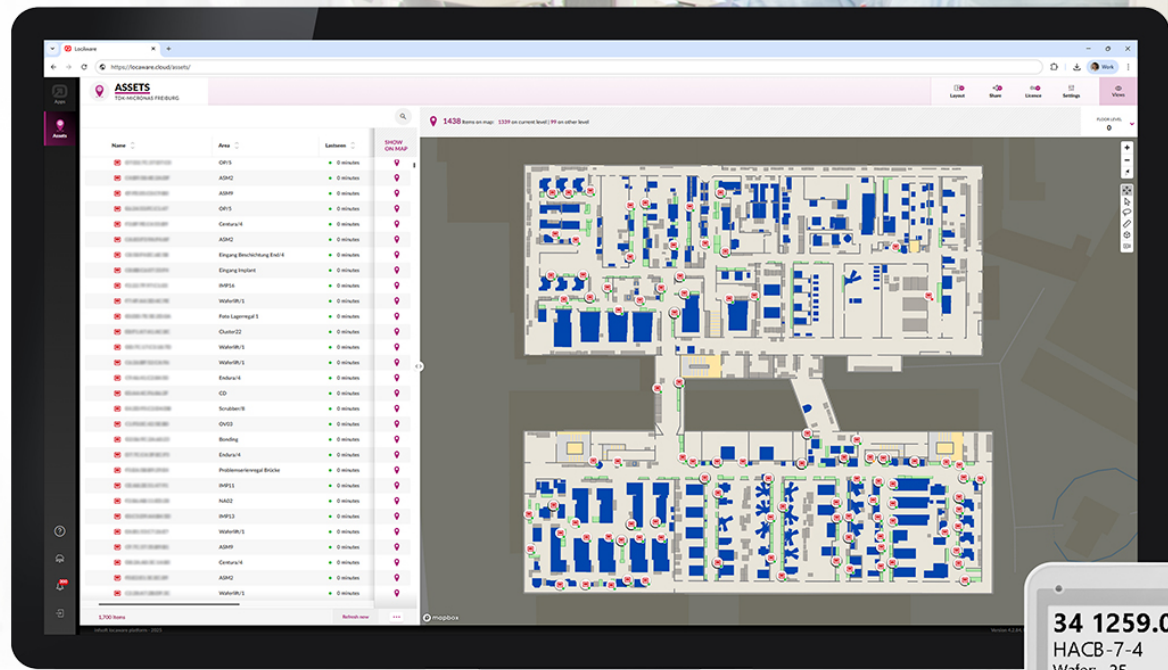




34 1259.000
HACB-7-4 NR
Wafer: 25
INJFOV
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Während Prozess, Box & Carrier austauschen
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Digital Transformation in Semiconductor Manufacturing





At its Freiburg site, TDK-Micronas operates a fully integrated wafer fabrication facility for magnetic field-based CMOS sensors – covering the entire process from production and assembly to final testing. Within the cleanroom environment, the company relies on digital tracking across an area of 3,600 m² to monitor approximately 1,700 wafer boxes.



The solution enables real-time, end-to-end traceability, eliminates media disruptions, enhances process reliability, and increases both efficiency and sustainability in manufacturing. The previously paper-based workflow – requiring around 160,000 sheets of special cleanroom paper annually – has been completely replaced by electronic E-Ink displays.



Holger Häßig
Project Manager Frontend Operations, TDK-Micronas GmbH

The introduction of E Ink displays on our wafer boxes at the Freiburg wafer fab has been a great success.

Replacing paper-based documentation has significantly reduced administrative effort and potential sources of error. The integrated location tracking provides us with sustainable digital transparency and has noticeably decreased search times.

What deserves special mention is the collaborative partnership with infsoft and the rapid implementation of all emerging requirements - this allowed us to respond flexibly and quickly integrate the solution into our daily production processes.

We are impressed by the immediate positive impact and view this as an important step in the digitalization of our manufacturing operations, laying the foundation for further digital transformation projects.

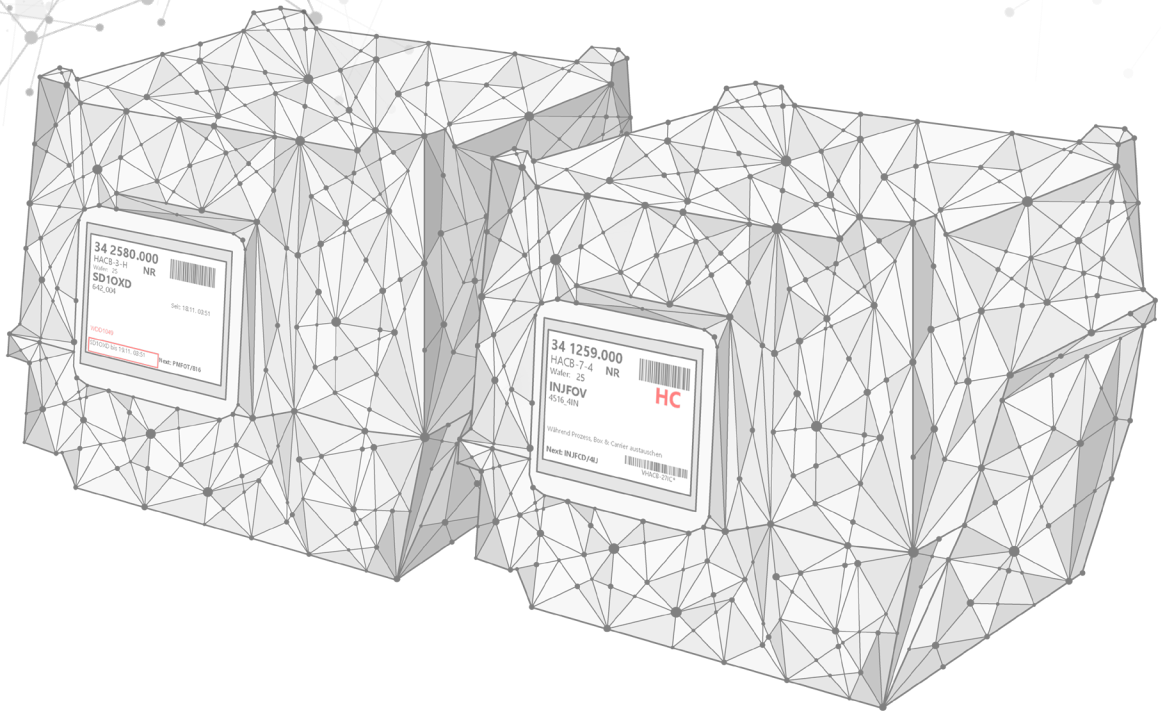


Ewald Ehling
Director Frontend Operations, TDK-Micronas GmbH

The use of E-Ink displays on the wafer boxes provides clear, measurable production benefits.

Eliminating paper-based documentation reduces administrative effort and potential sources of error, while location tracking ensures continuous digital transparency and significantly decreases search times and material shortages. As a result, material flows and production processes run more smoothly and responsively, minimizing downtime and delays.

In addition to the immediate efficiency gains, the reduction of paper and printing processes also contributes noticeably to improving our sustainability performance. The professional implementation and reliable support provided by infsoft were key to the seamless rollout and rapid integration into our processes. Overall, this project represents a substantial contribution to enhancing the efficiency and quality of our manufacturing operations.





The Previous Process

Paper-based Workflows with Constraints

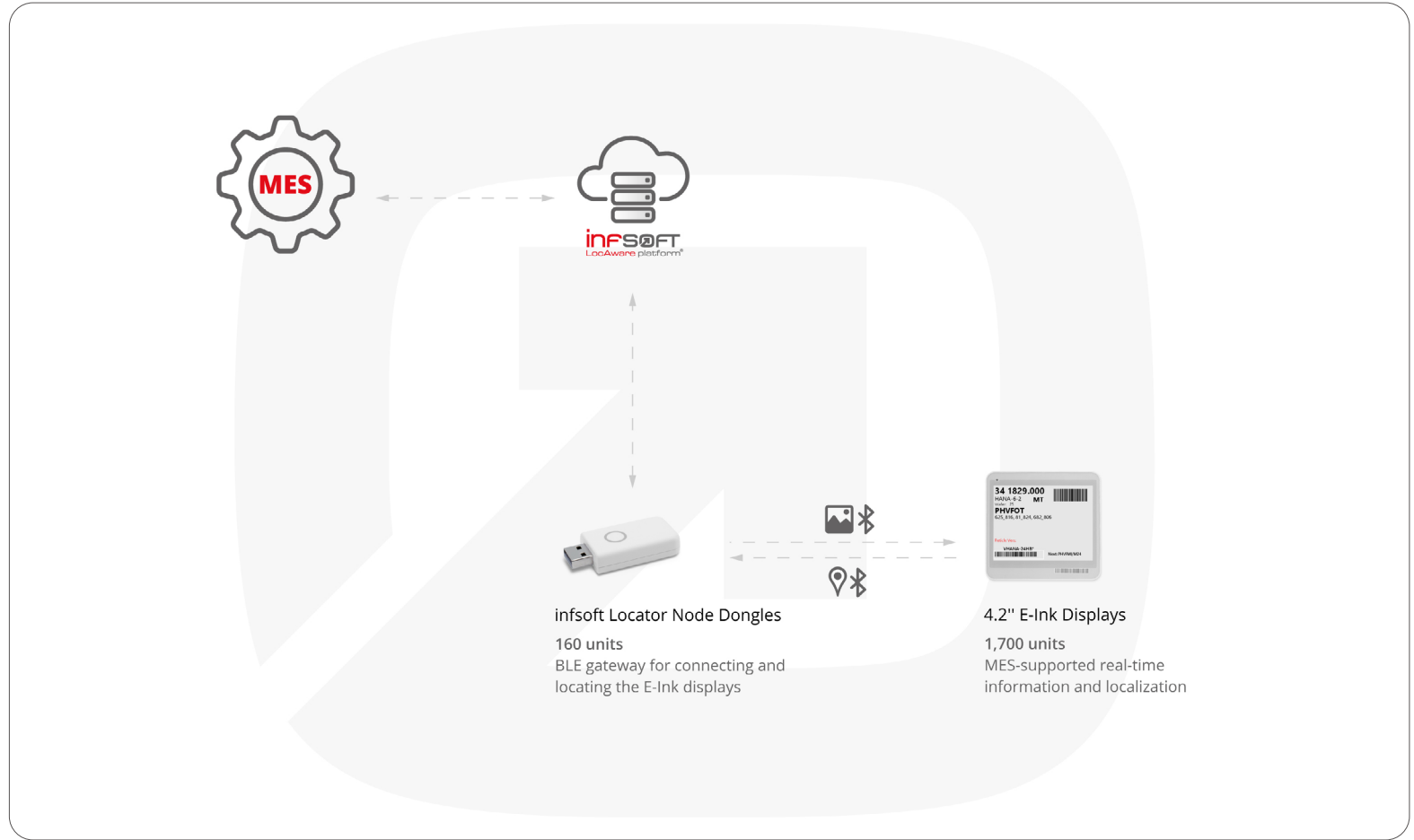
In the sensitive environment of a semiconductor cleanroom, end-to-end traceability of delicate materials is essential. Wafer boxes – specialized containers for protecting, transporting, and storing thin silicon wafers – play a central role in this process.

The wafers pass through numerous production stages, such as photolithography, ion implantation, diffusion processes, thin-film deposition, metallization, wet chemical processing, and dry chemical etching. Throughout the entire manufacturing process, as well as during handover to partners for further processing, the boxes ensure protection, safe transport, and secure storage of the wafers.

Until now, documentation has relied on paper-based documents.

The limitations:

- No real-time visibility of box location and status
- Media disruptions caused by manual documentation
- Time-consuming search processes when wafer boxes are missing



infsoft hardware components

Transition to E-Ink Displays

RTLS & E-Inks for Digital Transparency

As part of the digitalization initiative, approximately 1,700 wafer boxes were equipped with 4.2" infsoft E-Ink Displays and dedicated mounting brackets. These displays are managed via the infsoft LocAware platform®, which communicates bidirectionally with the Manufacturing Execution System (MES) of TDK-Micronas. Tracking and control of the E-Ink displays in the cleanroom are enabled by around 140 Locator Node Dongles, acting as gateways between the displays and the cloud platform.

Automatically generated templates with process-specific information are displayed on the screens. In addition, integrated LEDs and a digital map view enable rapid localization during search operations.

The infrastructure is seamlessly integrated into the existing IT landscape, enabling continuous, automated real-time data communication.

The Benefits:

- Complete replacement of paper-based documentation
- Reduced administrative effort
- Minimized error risk
- Increased process speed

The position data of the boxes is captured live and automatically transmitted back to the MES together with process-relevant information – including precise localization on a digital map.

The combination of E-Ink technology and Bluetooth Low Energy (BLE) also enables dynamic, automated display updates via infsoft Automation, through an MES interface, or manually if required.



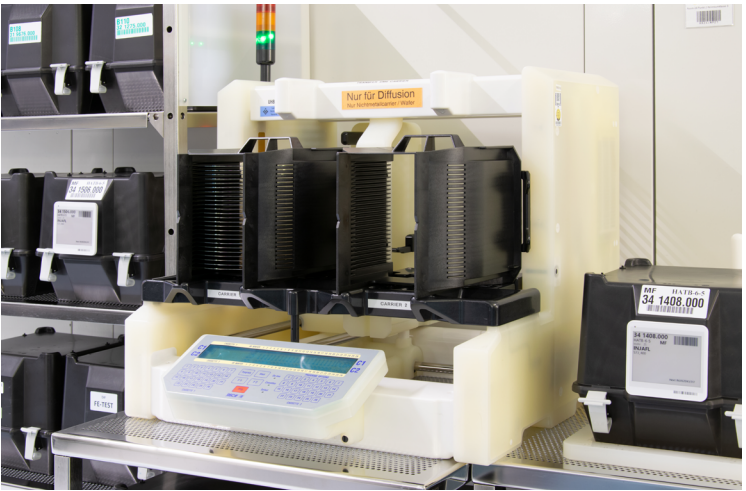
Easy Localization

The integration of LED indicators and real-time location tracking enables targeted and rapid searches. This significantly reduces search efforts.



Cleanroom Compatibility

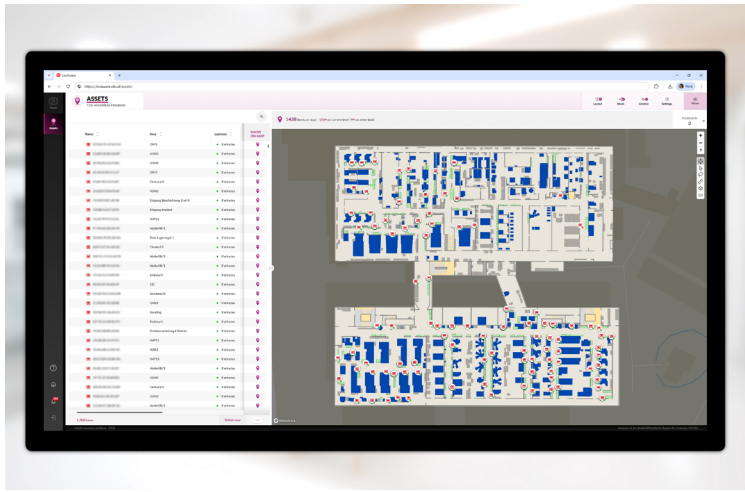
The solution is optimized for use in sensitive production environments such as cleanrooms. Its robust, contactless technology ensures reliable system interaction without introducing particulate contamination.



Success Factors at a Glance

Digital Transparency

The position of all wafer boxes is captured in real time and visualized on a digital map. This provides users with full transparency regarding locations and movements within the production environment.



Process Automation

Process-relevant information is provided automatically and without the need for paper. The solution ensures a fully seamless flow of information without media disruptions.



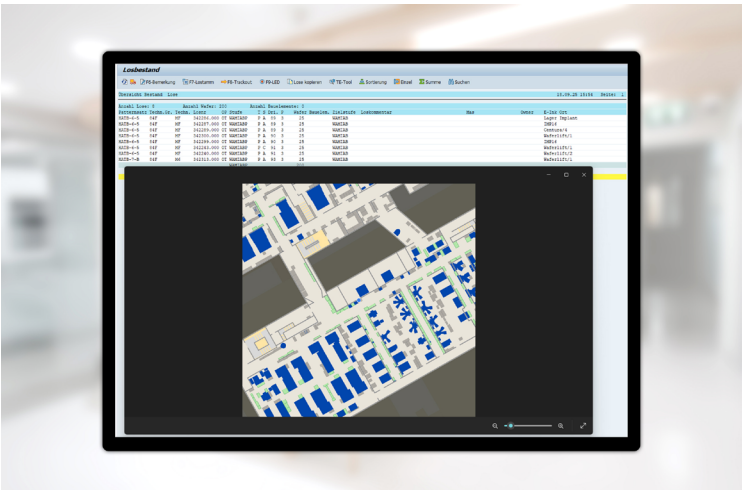
Error Minimization

A system-supported display of information plays a key role in reducing manual input errors and significantly enhancing process reliability. Relevant data is automatically provided in a contextual and targeted manner.



MES Integration

Seamless connectivity to existing Manufacturing Execution Systems enables end-to-end traceability and detailed analysis of production processes.





Efficiency through Connectivity

The implementation of the digital tracking and E-Ink solution marks a major milestone on TDK-Micronas' path toward Industry 4.0.

Cross-system networking, extensive automation, and real-time capabilities not only boost efficiency and transparency but also establish a future-proof foundation for further digitalization initiatives.

By fully replacing paper-based processes, potential sources of error are significantly reduced, resources are conserved in a sustainable manner, and a modern, future-oriented production environment is created – where digitalization, process quality, and environmental responsibility go hand in hand.

This approach supports efficient and transparent production control while ensuring compliance with high quality standards and continuously improving environmental performance.

With digitalization and automation, TDK-Micronas lays the groundwork for a future-ready production.

The combination of innovative technologies and sustainable processes strengthens competitiveness and creates optimal conditions for continued growth in the digital age. Feel free to contact us for a personalized consultation regarding a similar project.



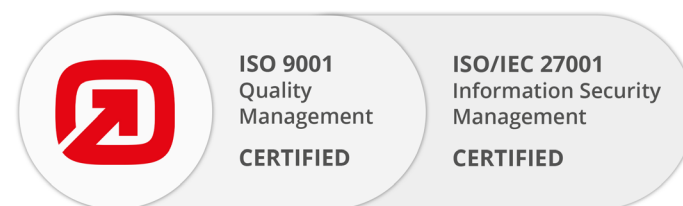


About infsoft

infsoft GmbH, based in Großmehring near Ingolstadt, has been offering comprehensive platform solutions for large companies since 2005. The focus is on the location of people and assets, utilization analyses of space and equipment, room sensor evaluations and the provision of workplace experience systems. E-labeling components for mobile assets and situational room labeling complete the portfolio.

smart connected locations: The infsoft LocAware platform® forms the basis of the full-service offering as a central cloud IoT hub. Extensive web applications for data management and visualization are available within the platform. infsoft LocAware offers a bi-directional connection to third-party systems via numerous interfaces in order to bundle internal and external data streams.

Long-standing customers include F. Hoffmann-La Roche, Roche Diagnostics, Audi, Frankfurt Airport and the Swiss Federal Railways (SBB). infsoft's quality management is certified according to DIN EN ISO 9001, and our information security management is certified according to ISO/IEC 2700. Our quality management encompasses all measures to improve processes, services and products in order to consistently meet customer and regulatory requirements.



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