

SmartFactory^{KL}

Pioneering the factory of tomorrow

Production
Level4

Since accepting the job as chairman of **SmartFactory**^{KL} in May 2019, I remain thrilled and inspired. Defining the future of production is a challenge that comes with high expectations. Yet, I am a member of a unique team: creative, highly educated, interdisciplinary, and collegial. We have jointly developed our vision and named it Production Level 4.

SmartFactory^{KL} is differentiated from other SmartFactories on one point: We get things done. We take what is continuously in development and technically implement it. This was the case for our first demonstrator and Industrie 4.0, and the same is now true for the second demonstrator and Production Level 4. Our theory proves itself in practical and industrial applications. In collaboration with partners from research and industry, we will continue to drive the advances forward in our new demonstrator over the coming years.

Combining the latest scientific findings and industrial know-how is our aim. That makes us unique. We are creating a manufacturer-independent demonstrator and research platform for the industrial environment of the future.

I am delighted that **SmartFactory**^{KL} is playing such a key role in shaping the production of tomorrow.

Sincerely,



Prof. Dr. Martin Ruskowski,
Chairman of the Board at **SmartFactory**^{KL}



Industrie 4.0 & Production Level 4



Production Level 4 is an advanced development in the age of Industrie 4.0. The future demands a modular and agile production structure. We proceed from the position that people, machines, and software must act as a unit, to form a working entity. The decision-maker and sovereign in this unit is always the worker, the person on site. IT and equipment are to support people and must always remain under the control of the worker. We call this form of teamwork *Production Level 4* (PL4).

With the number 4, the term is an extension of Industrie 4.0. We learn from past experiences to engage continuously with ongoing Industry 4.0 developments. The 4 also refers to the fourth level of autonomous production, a level at which

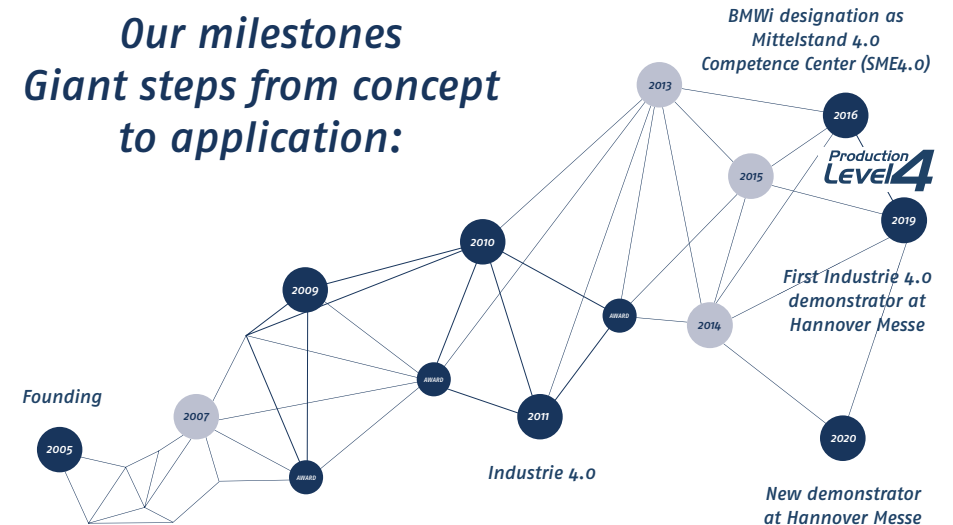
people still play an important role. In our vision, new technology is not developed to replace the worker.

We have drafted a statement that explains the concept behind *Production Level 4* :

Production Level 4 ...

- ... increases robustness through agile reactions to external influences.
- ... requires people as decision makers in the production process.
- ... increases transparency through automated data processing.
- ... networks and automates production scheduling.
- ... enables flexible plant reconfiguration / retooling.
- ... implies a self-learning ability as an enabler of continuous improvement.

Our milestones Giant steps from concept to application:



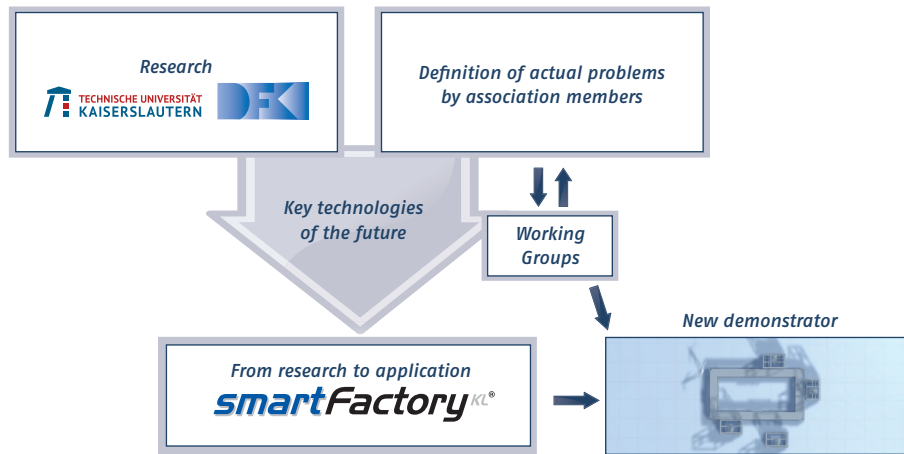
Research & Industry

The idea for *SmartFactory*^{KL} originated with Prof. Detlef Zühlke. He founded the Technologie-Initiative SmartFactory KL e.V. together with the German Research Center for Artificial Intelligence (DFKI), the Technical University of Kaiserslautern (TUK), and five Industrial companies in 2005. To this day, the association is based at the Innovative Factory Systems department of DFKI and the Institute of Manufacturing Technology and Production Systems at TU Kaiserslautern. Prof. Zühlke headed *SmartFactory*^{KL} as Chairman of the Board until 2019, when Prof. Martin Ruskowski was appointed. Three representatives from member companies also sit as members of the board.

The association offers its members diverse opportunities to cooperate and

contribute. Meetings and assemblies take place on a regular basis where managers answer questions. Technical innovations are presented together and visionary concepts are discussed. The employees of *SmartFactory*^{KL} discuss strategies, milestones, and expectations with representatives of the members in a newly established steering committee. Also, active working groups enable all companies to share equally in research results. The constructive cooperation within the association requires a willingness to consider different perspectives and to cooperate across platforms. The best new ideas and concepts are created when people think outside the box, beyond the usual boundaries.

Working groups & demonstrator construction



At **SmartFactory^{KL}**, experts from the member companies work together in working groups. These WGs are led by scientists who are otherwise engaged in research on specific topics within the framework of **DFKI** or **SmartFactory^{KL}** projects.

Their expertise flows into the working groups, but is also vital to the technical development and construction of the demonstrator. The results of the working groups are made available to all active member companies. The demonstrator represents the current state of the art at **SmartFactory^{KL}**.

Three working groups were established in 2019:

- **Cyber-physical production modules:** Design and use of cyber-physical production modules for a sustainable manufacturing environment in the future.
- **Connect & Control:** Create a manufacturer-independent platform for autonomous manufacturing process controls.
- **Cognitive Factory:** Design a cognitive factory, that is capable of active decision making to improve production.

Our members



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The Technologie-Initiative SmartFactory KL e.V. (**SmartFactory^{KL}**) is a non-profit association registered in the register of associations for Kaiserslautern.

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Executive Board

Prof. Dr. Martin Ruskowski (Chairman of the Board)

Andreas Huhmann, HARTING AG & Co. KG

Klaus Stark, Pilz GmbH & Co. KG

Management

Rüdiger Dabelow, DFKI GmbH

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