Schumacher
Precision Tools GmbH

Changes in Performance

100 Years in Threading Technology.
A Passion.

schumachertool.de

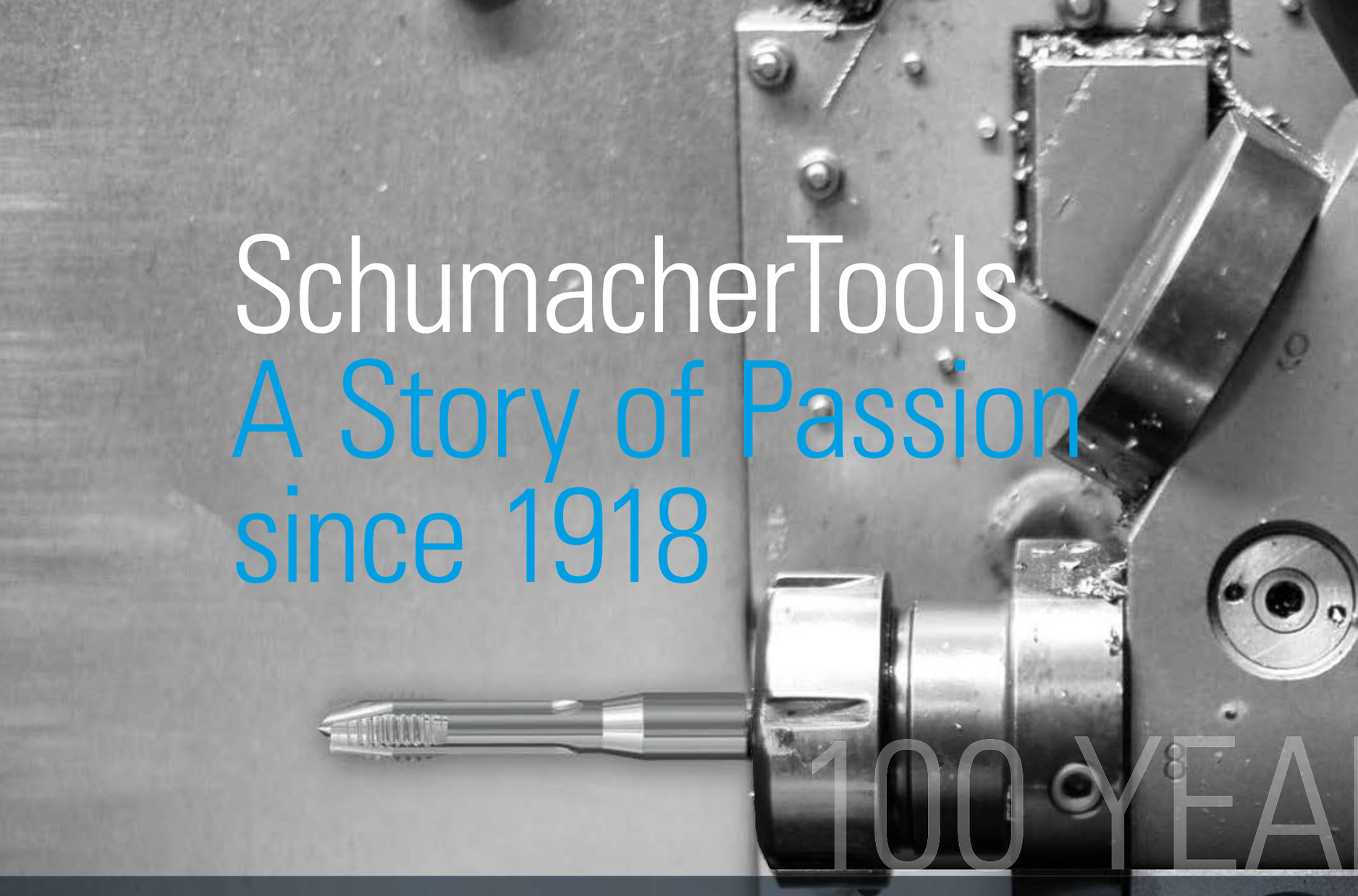
SCHUMACHER
PRECISION TOOLS SINCE 1918

Innovation & customer service

We have a clear focus for our products and services: **precision.** This is true for the tools we make and for the services we develop and provide to our partners. We work with one of the most advanced tool types and we are aware that topmost quality is required for all processes.

It is part of our self-image to support and strengthen our partners with our core competence, which is threading technology. Our business relations with our customers, suppliers, and development partners are aimed at longevity. We are committed to this tradition of our company.

| Dr.-Ing. Bernd Schniering



SchumacherTools
A Story of Passion since 1918

100 JAHRE
1918 - 2018
SCHUMACHER
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As a classic tool manufacturer **SCHUMACHER & CO.** was founded in Remscheid in 1918 and has been producing precision tools for the metal-working industry ever since.

SCHUMACHER & CO. has gained an excellent reputation as a developer and manufacturer of high performance threading tools – our activities were always particularly focused on the field of customized special threading tools.

The evolution of the industry of cutting tools over the last three decades has led to radical changes and thus to new challenges regarding the competitive situation of tool manufacturers with SME character, such as **SCHUMACHER & CO.** used to be. This led **SCHUMACHER & CO.** to make drastic changes in the way the company operates to adapt to the new situation of the market.

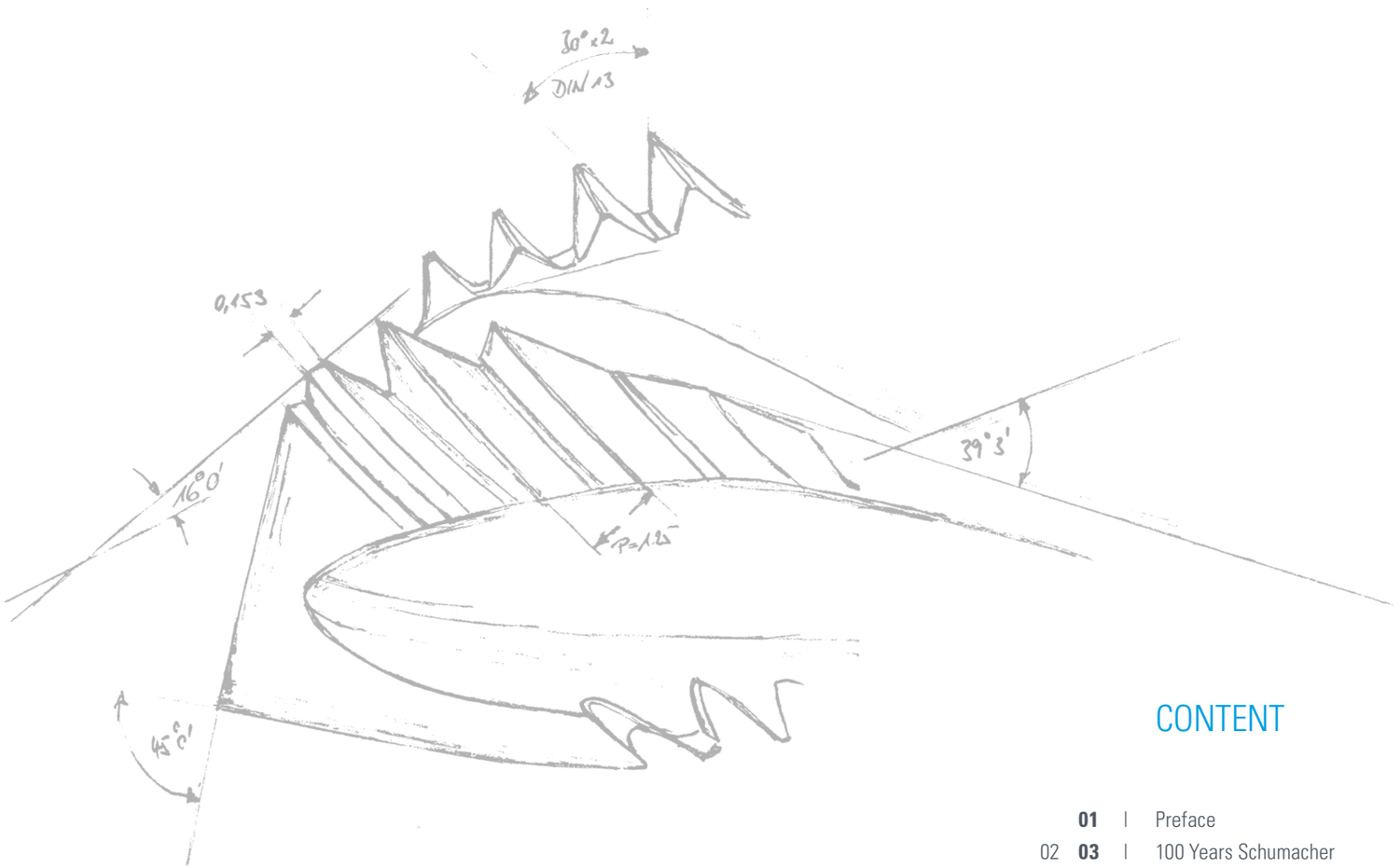
RS SCHUMACHER

Already in the early 1990s the changing industry prompted **SCHUMACHER** to conduct extensive research that has been focusing on the development of practical network and process control models to strengthen the competitiveness of industrial SMEs. Over the last 20 years, several R&D projects have produced control modules for data management, the standardization of construction, and production control for this class of enterprise.

Meanwhile, **SCHUMACHER** has become a specialist in the construction and production of high-performance threading tools for the premium market in Germany and in other countries.

Today **SCHUMACHER** cooperates with renowned customers from the industry as well as with different trade groups. Moreover, we have built close relationships with colleagues from the industry. In all partnerships, the technology is communicated digitally – including the provision of 3D-models of the constructed threading tools. **SCHUMACHER** also provides a service program to its partners from all industries, which includes the so-called **'Smart Services'** of the strategy **'Industry 4.0'** with groundbreaking service enhancements.

The company **Schumacher Precision Tools GmbH** is family- run in the fourth generation.



CONTENT

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Background Information about the Precision Tools Industry & SMEs

Dr.-Ing. Bernd Schniering
Shareholder & Managing Director

Dr. Peter Schniering
Managing Director, Sales & Administration

Dipl.-Wirt.-Ing. Christoph Schniering
Managing Director, Production & Logistics

Changes in the market lead to new objectives regarding quality, cost, time, and flexibility

In contrast to larger engineering companies with competitive structures, small and medium-sized enterprises are at a disadvantage because of limited personnel in administration and production and because of smaller batch sizes. Synchronized processes can generate a high efficiency in the product-defining fields of development, construction, planning, as well as in production.

For production companies with a strong customer focus and smaller batch sizes, the use of new methods for process analysis in the product-defining departments becomes as important as production itself. The importance of providing information during the processes multiplies because of the rapidly increasing demands of customers regarding web-based networking with their suppliers.

There is an increasing demand for technical services that add value and for information that goes beyond the actual product. These are the challenges in the Schumacher Project **'Horizon 2025'.**

Foundational Research
Threading Technology

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Research & Development
by Schumacher

Innovation as Strategy

Research & Development

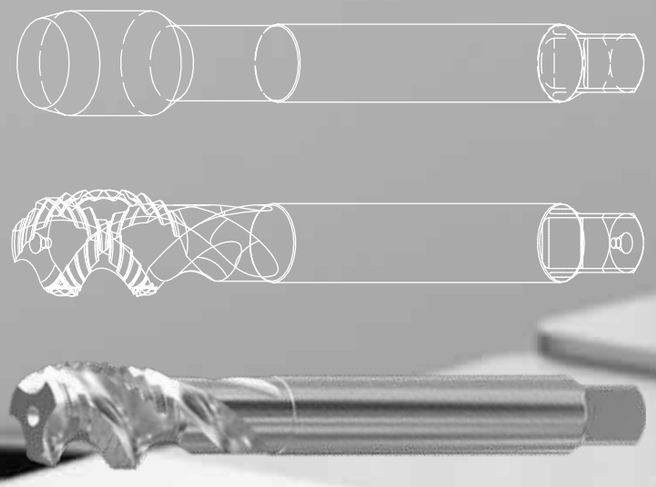
RWTH AACHEN UNIVERSITY

R&D Cooperation with
German Universities of Technology

Our R&D activities in the field of tool and machining technology focus on maximum performance for users of demanding industrial production. Our developments focus on the fields of new cutting materials, adapted cutting geometries, and highly developed hard material coatings. They moreover include high tool life of precision tools for a successful partnership with our customers.

Schumacher has an internal standardized product database with more than 30,000 tool variants at its disposal for research purposes. For **‚Rapid Prototyping'**, this technology basis can be used for the new design of tools - among other things by using CAD variant design and solid state simulation of the resulting 3D-models of the precision tools.

Externally, the company has a network of well-known institutions at its disposal for the research disciplines of high-speed steel as well as carbide substrates, heat and surface treatments, and hard material coatings.



”

... Rapid prototyping using 3D-models and solid state simulation leads to a successful application of the tools.“

Development
Design & Simulation

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GAP
Gesellschaft für angewandte Prozesslenkung

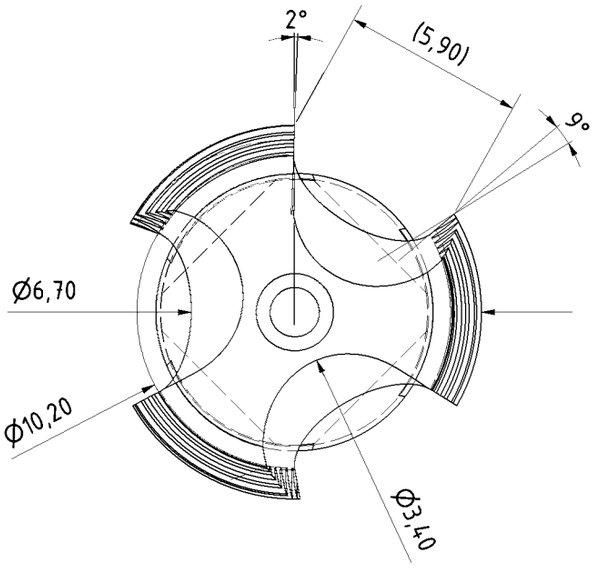
ToolDesign
by Schumacher

ToolSimulation
by Schumacher


Seitenansicht

„

... the combination of digital 3D-models and the simulation of their application with a high number of variants leads to flexible machining solutions.“



Design & Simulation

The ToolDesign Principle

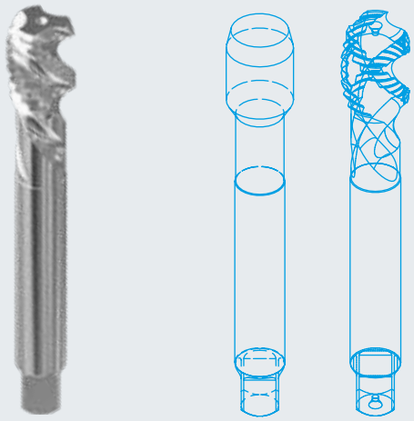
The market conditions in the industry of precision tools have changed in recent years. Triggered by this change, GAP has developed a new management tool over the past ten years called **ToolDesign**. As a control module, **ToolDesign** uses algorithms to automatically design Precision Tools such as Taps, Drills and Endmills. The design of these tools requires highly complex geometry-parameters – up to 190 different data are required per tool variation.

The development of **ToolDesign** was based on a standardized GAP-data structure that comprises all of **Schumacher Precision Tools'** technology data in the sections product, production and process control. The data is then used to generate the necessary CAD-models for production.

When a user chooses the conditions for application in the menu, **ToolDesign** generates the complete data set of new tool variations including the volume model. At the same time, it creates the required working parameters for CNC turning, milling and grinding machines needed for the manufacturing of the new tool. The modular design of the GAP-data structures allows a cross-departmental and redundant-free net-working of all processes.

CAD design using algorithms
and methods of variant construction

ToolDesign
by Schumacher



3D-Modell

detail drawing

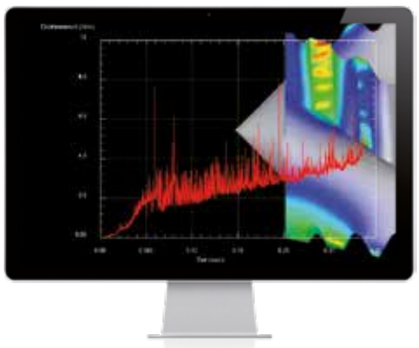
Optical Control

Profile Control

Digital Quality Control

Simulation test runs before the start of production
increase the development quality of new tool variants

Design & Simulation



torque curve through FEM simulation

The ToolSimulation Principle

The module **ToolSimulation** simulates and quantifies the performance of 3D tool models – which were digitally designed with **ToolDesign** – as they are used in pre-defined work piece models with their respective properties.

These CAD-3D-models of tool variants are then used in the new system for simulating their performance in **ToolSimulation**. In this GAP development project, the simulation process is realized with a high processor performance through complex modifications of a standard simulation software. As a start of the process, the user of **ToolSimulation** is guided through an interactive description of the work piece. This digital work piece obtains all properties that are required for the simulation from a programmed database.

This way, new tool variants are being tested in simulation before they enter production or further optimized by modifying the 3D-models in **ToolDesign**. This procedure reduces development cycles of new tool variants and moreover minimizes expenditures for field testing.

ToolSimulation

by Schumacher

Development Production & Digital Process Control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Die Digitale Produktion
Bausteine der Umsetzung
KST. 2040 Rundschleifen

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Production & Digital Process Control

The ToolProduction Concept

The objective: The introduction of digital process control according to Industry 4.0

GAP, the Gesellschaft für angewandte Prozesslenkung has cooperated with technical universities including Aachen, Dortmund, Stuttgart, and Bochum since 1988. As part of a cooperation that bridges the space between science and industry, GAP has developed management tools and digital control systems for small and medium-sized enterprises (SMEs) in various research projects.

Smart services for customers through data that is created during the production process

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Gesellschaft für angewandte Prozesslenkung

Location-independent digital mapping of the entire process

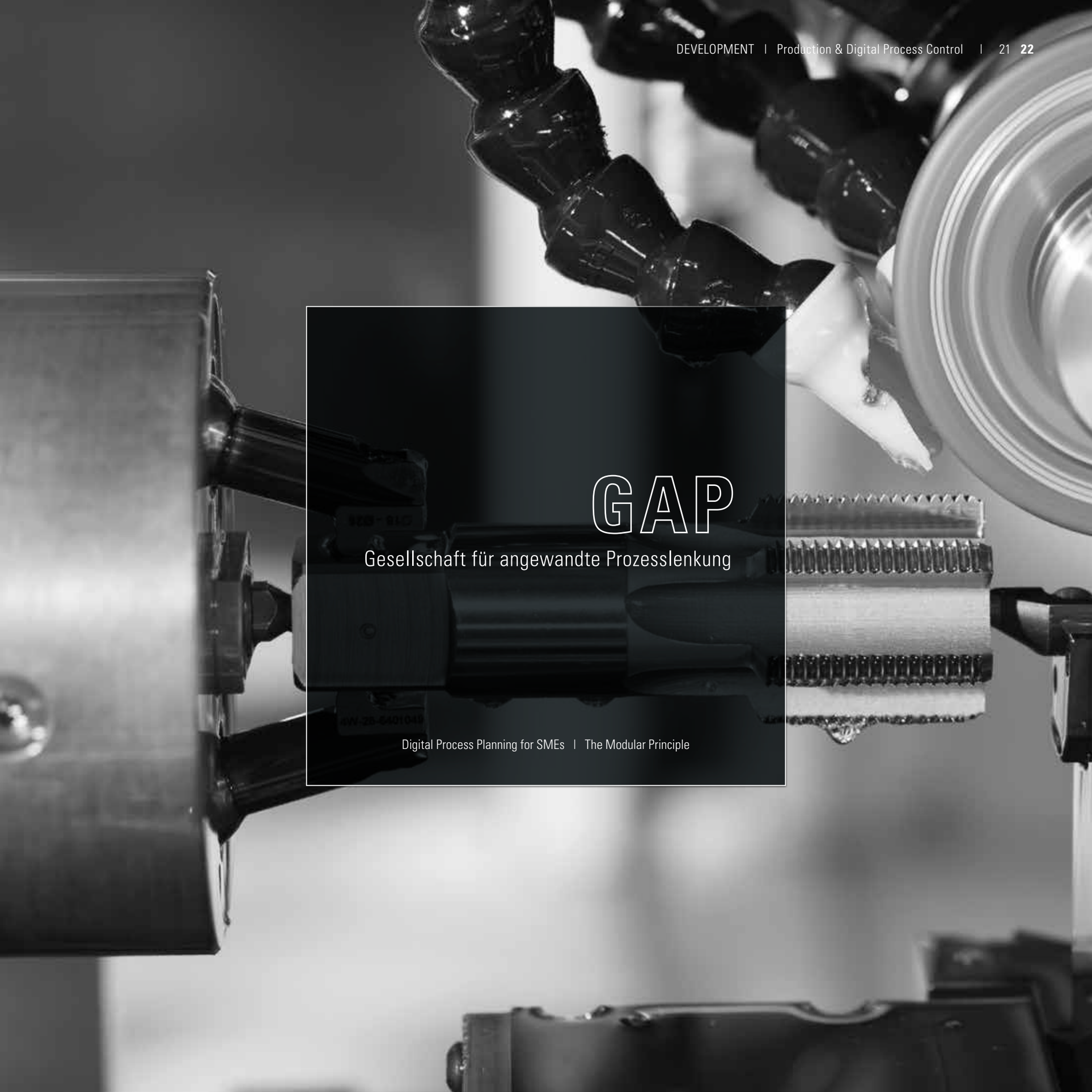
Production & Digital Process Control

ToolProduction/Industry 4.0

The German government's initiative **'Industry 4.0'** reacts to the current challenges of the manufacturing industry. These challenges forced the advancement of CIM-strategy (Computer Integrated Manufacturing), which was initially introduced in the 1980s. The **'fourth industrial revolution'** utilizes cyber-physical systems to link physical objects with virtual models. Essentially, the product to be manufactured is designed to operate its production processes on its own. The potential of this futuristic project is revealed in the value chain of production lines with decentralized process control, which organize themselves drawing upon concept **'Industry 4.0'**. By contrast, the **'predecessor'** CIM had the disadvantage of using a centralized and thus inflexible process control.

These new factors of digitalization are considered drivers of significant innovation in Mechanical Engineering and the Machine Tool Industry.

The target of the new GAP-project is to develop an all-encompassing system that plans and controls processes according to **'Industry 4.0'**. The project focuses on the production of rotation-symmetric precision tools. **ToolProduction (TP)** is the name of a GAP project that digitally models the whole process of precision tool manufacturing from incoming order to design, simulation, production, quality management, controlling, as well as warehouse and distribution logistics. This sector-overlapping inter-connectivity is enabled by **TP's** modular design, which also works across borders, regardless of the respective production location. The modules **ToolDesign** and **ToolSimulation** are the centerpieces for the digital construction and simulation of tools.



GAP

Gesellschaft für angewandte Prozesslenkung

Digital Process Planning for SMEs | The Modular Principle

Speed
Distribution & Logistics

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Distribution & Logistik
by Schumacher

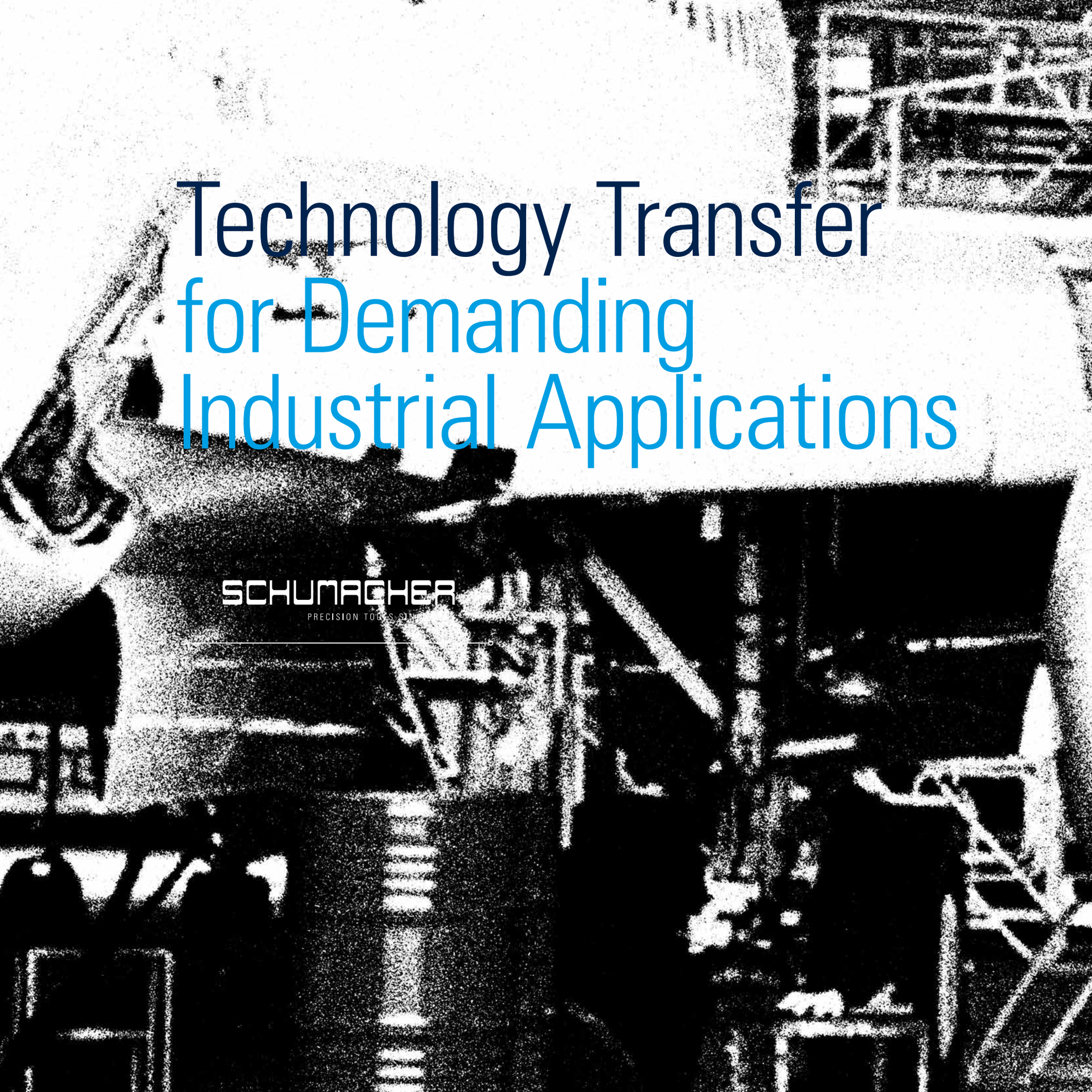
Clear organizational processes and
an awareness for sophisticated tools

Distribution & Logistics

Logistics is one of the key organizational units of the company for manufacturers of precision tools.

Complexity
On the one hand, this is related to competently managing the number of variants: With a complexity of more than 35,000 product variants, only digital process control and highly experienced employees can achieve lean and customer-friendly product management.

Sensitive Technology
On the other hand, there are high demands on tool handling: From quality assurance to shipping to the customer, proper handling can only be guaranteed with the right feeling for the sensitive technology of the tools.



Technology Transfer for Demanding Industrial Applications

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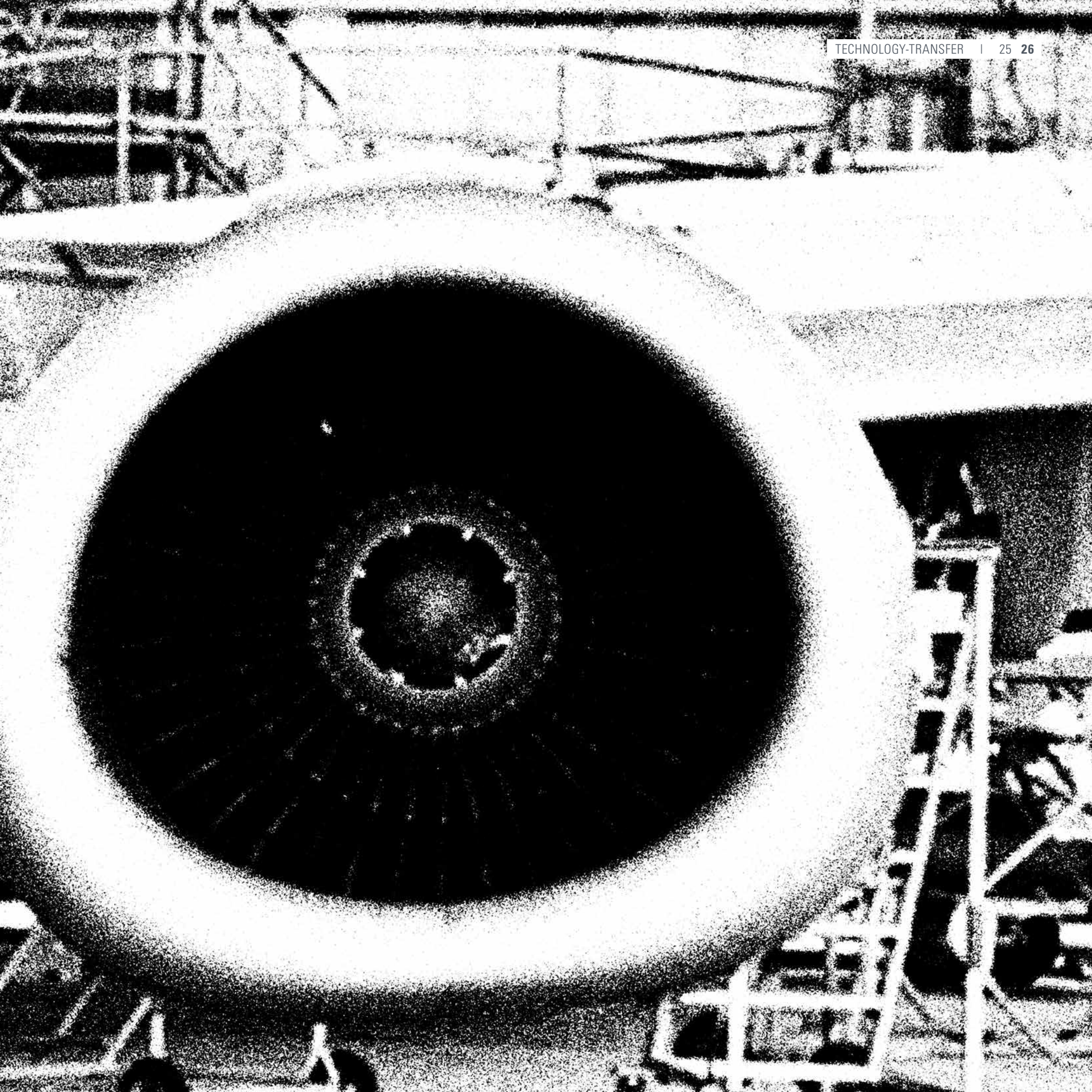

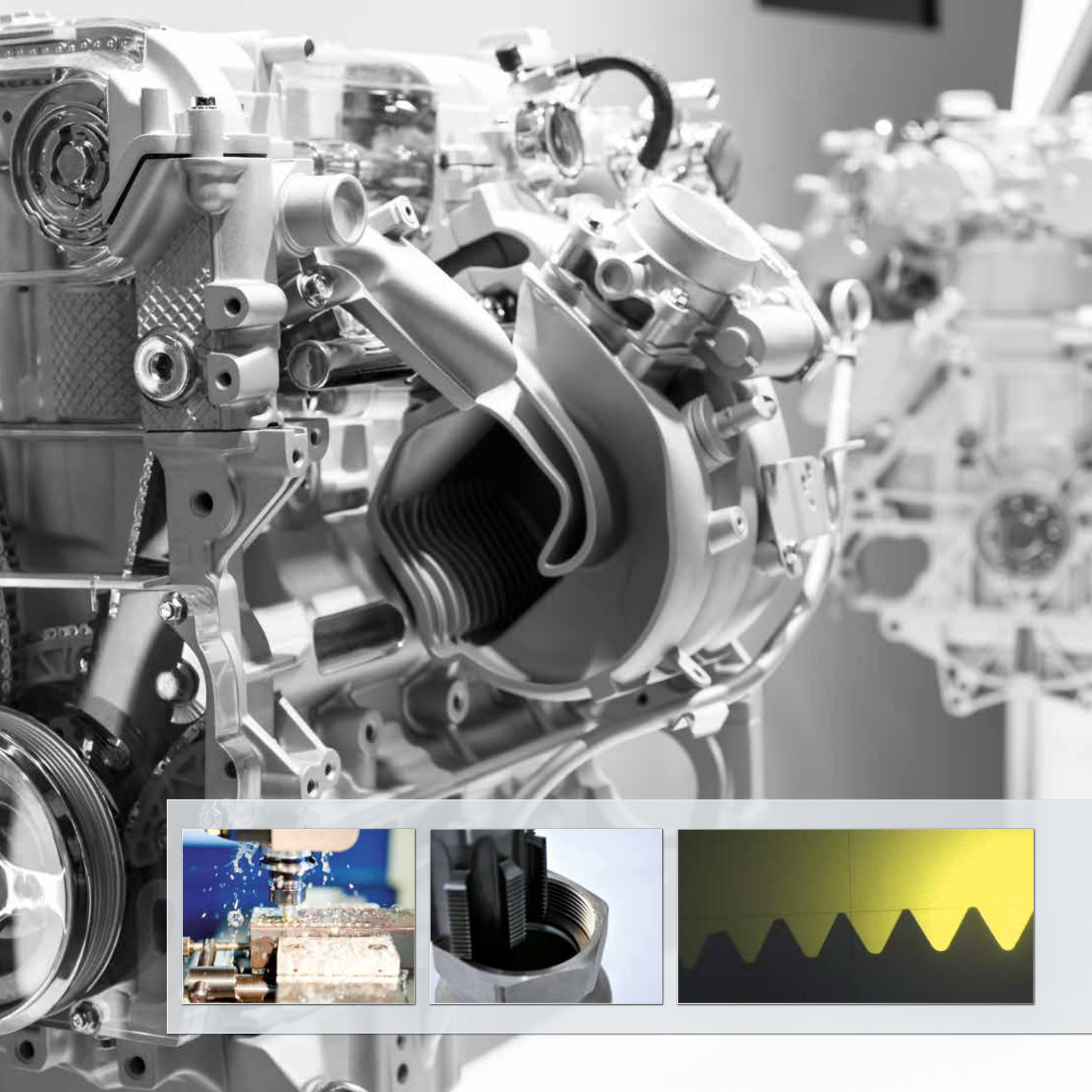

The perfect tool alone is not enough -
we aim for the perfect cutting process

Applications

Application support is one of **SCHUMACHER's** most important consulting fields. The demands of our customers in special industries such as aerospace, medical technology or energy are constantly increasing. The range of workpiece materials to be machined is increasing, as are the requirements for manufacturing tolerances and surface finishes.

Analysis
At the beginning of each consultation, the first step is a detailed inventory to develop the best possible geometry on the basis of machine equipment, target material, and possible application parameters.

Inclusion of Digital Application Data
Due to the increasing possibilities of digital monitoring and controlling machines, vertical integration in the supervision of applications is increasing as well. The aim of the current development projects of our application engineers is a complementary monitoring and fine-tuning of the machining process from the machine spindle to the clamping device and the peripheral equipment. The peripheral equipment includes the cutting parameters, the selection of the coolant, and the optimization of the tools for preparatory work.

Human Resources
decisive factors of success for SMEs are motivation and the skills of employees.

01-04 | Sales processes
05-06 | Management accounting
07 | Process optimization – R&D
08 | Development – R&D
09-12 | Production – R&D
13 | QM-Processes – R&D
14-15 | Logistics
16-18 | Management


10


11


12


13


14


15


16


17


18

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of the enterprises SPT / GAP

BAUER & BÖCKER GmbH & Co., Remscheid

FGW Forschungsgemeinschaft Werkzeuge & Werkstoffe e.V., Remscheid

ISF Dortmund University of Technology

ISW Stuttgart University

LEICH & DEPPE GmbH & Co. KG, Essen

OERLIKON BALZERS COATING GmbH, Remscheid

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Co-operation with:

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