

Friction Systems – We Drive Technology



Automotive



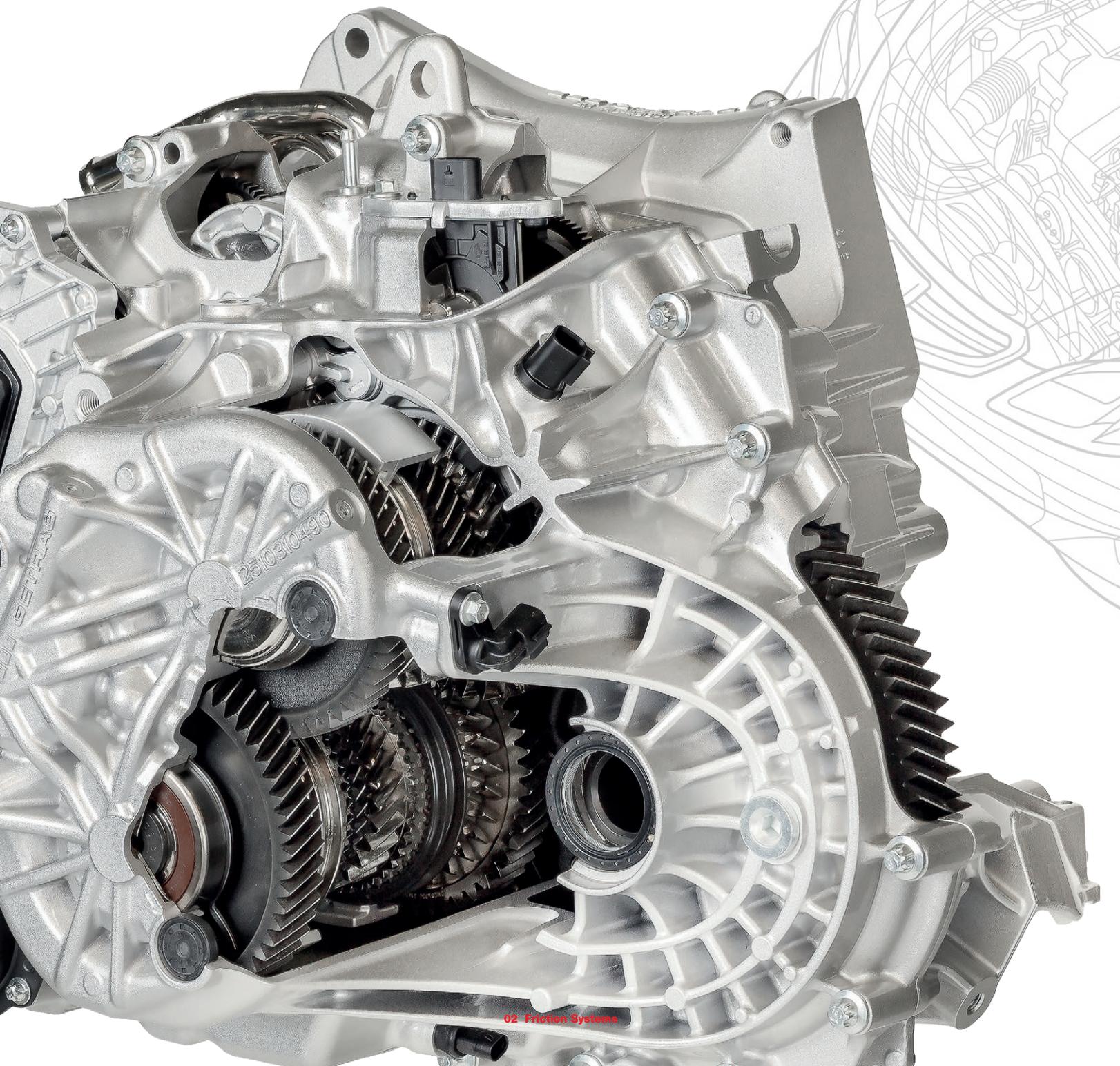
Committed partner of the global automobile industry

Partnership is the key to success

When it comes to synchronizer rings for passenger, commercial and off-road vehicle transmissions, Friction Systems is the benchmark for performance and a global industry leader.

Our engineers and technicians are proactively improving, enhancing, and further developing high performance synchronizer modules and components in close cooperation with our customers.

Each dual clutch and manual transmission has its own specific requirements. With our comprehensive understanding of what makes transmission technology, we can offer a modular system developed together with you in a structured process, from the start of the project to its completion.



From passenger car to commercial vehicle

Today's preferred solution for modern transmission systems consists of synchronizer components made of stamped steel coated with Carbon friction materials. This is precisely where the Friction Systems specific synchronizer expertise comes into play. Our components are available for single cone and multi cone synchronizers, with many of them based on a modular design.

The advantage: modules can be used in multiple applications, such as passenger cars, trucks and off-road vehicles from Ø 40 to Ø 250 mm ring diameter.

In case of automated and dual clutch transmission an optimized design of the control unit software is possible by the constant friction behavior of our Carbon materials during life time.

Our global presence allows

- coating service locally for all applications and
- reduced logistic cost
- combined with full flexibility for Carbon coated synchronizer rings with diameters up to 250 mm.

Truck and off-road applications

Friction Systems is the world's largest manufacturer of Carbon friction components used in heavy duty, commercial vehicle and off-road transmission. Our products are specified by the world's leading manufacturers and are used in the full range of market sectors – heavy and medium duty, agricultural and off-road vehicle transmissions.

The right choice for:

- Small manufacturing to high volume production
- High performance applications
- Modular design
- Cost efficiency
- Passenger car and motorcycle
- Heavy & medium duty truck
- Off-road & agriculture vehicles

Benefit from our extensive experience in Carbon Synchronizer Technology

Friction Systems draws on more than 70 years of experience with synchronizer technology for different transmission types.

Increased performance, excellent oil compatibility, enhanced comfort, extended life cycle, lower weight, excellent wear resistance and reduced costs: These are the key benefits of Friction Systems' synchronizer technology.



CAD FEA Design

Friction Systems utilizes state-of-the-art CAD software for product and tool design and FEA for our industry leading components.



Consistent Quality Management

Consistent quality management across the entire process ensures excellent quality. Friction Systems manufactures its products according to current standards, and all production sites are certified to one or more of the following international standards:

IATF 16949, ISO 14001,
OHSAS 18001, ISO 50001



Coating and Bonding Processes

Friction Systems' automated processes utilize the latest in LEAN principles and advanced inspection to assure every part meets our high quality standards.

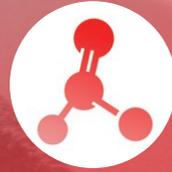


Material and Components Testing

Friction Systems utilizes state-of-the-art test rigs, software, and data analysis. Our in-house testing capability provides a full range of evaluation from initial frictional evaluation to in-vehicle shift analysis.

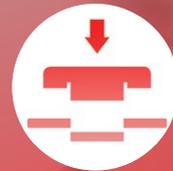
We drive technology

There isn't just one way of doing it right. But there is always a specific way to do things really well. This is why we have decided to integrate all of Friction Systems' development and manufacturing operations into a single in-house process chain, providing a one-stop source for our expertise. The result? Complete independence from external suppliers.



Carbon Friction Material

Friction Systems is the industry leader in Carbon friction material with proven and innovative solutions for all transmission applications in each targeted market.



Advanced Steel Stamping Technology

Friction Systems' stamped synchronizer cores feature tightly-toleranced synchronizer rings, low weight, high-strength steels, excellent wear resistance of teeth and lugs, and exclusive design features.



Heat Treatment

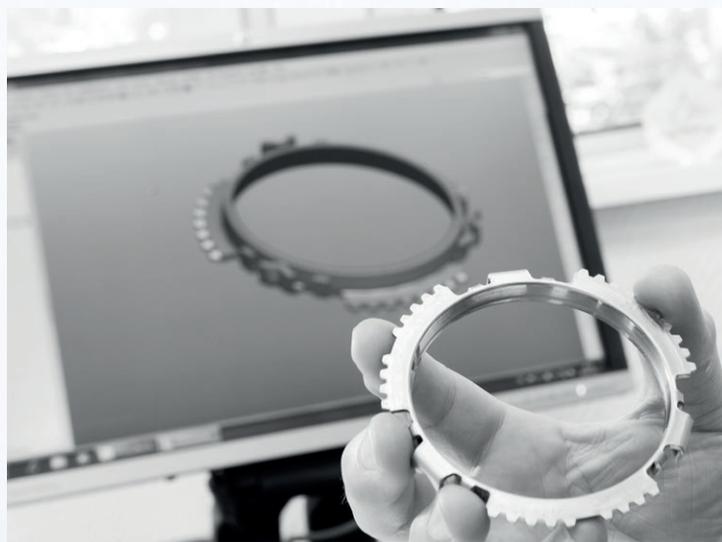
Friction Systems' advanced PNC, GNC, and IHT heat treatment processes offer superior performance.

Product innovation

Custom engineering and design support

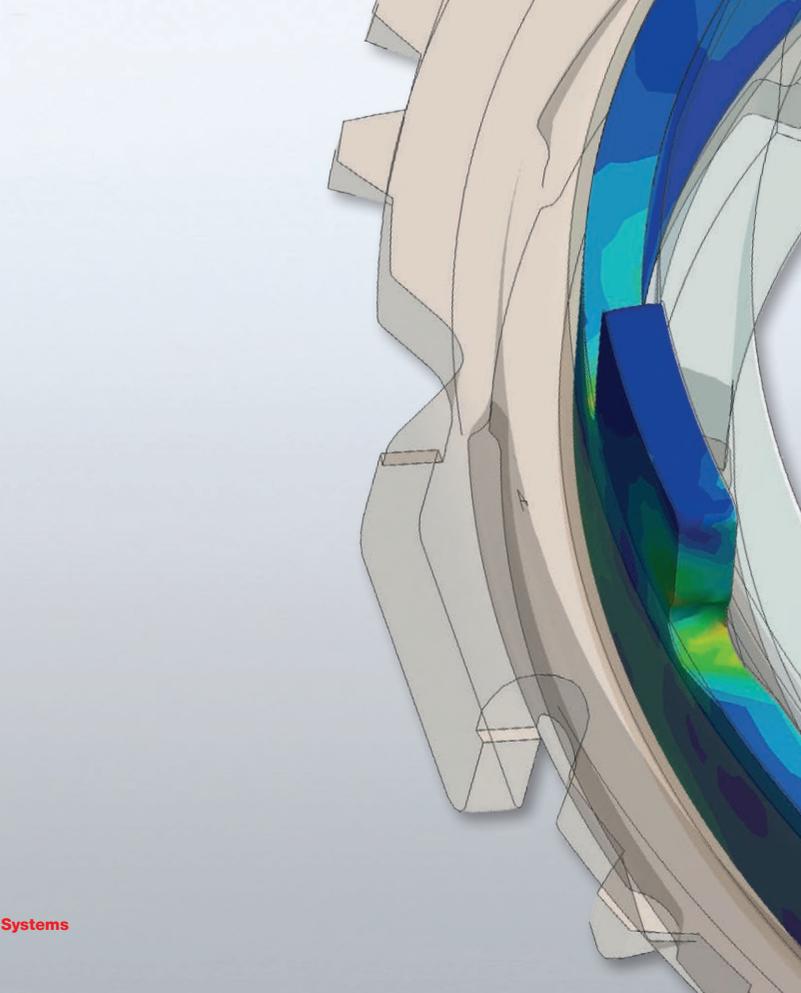
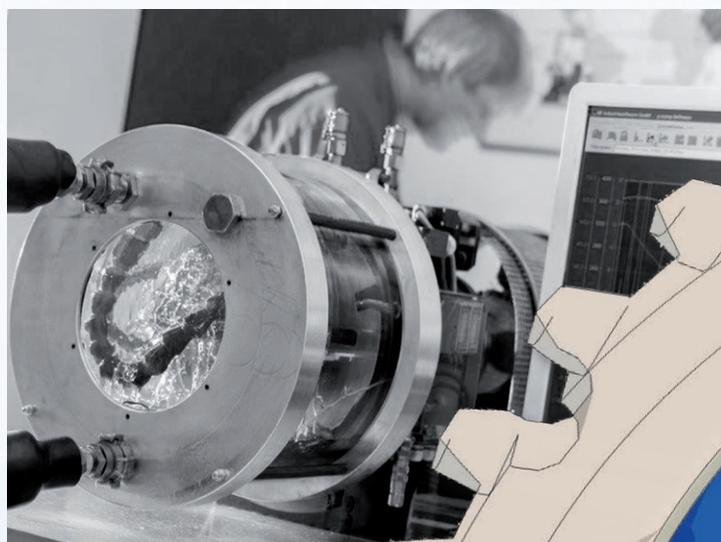
Friction Systems provides custom engineering and design support including performance calculations, system integration and tolerance stack analysis, 3D modeling, space claim investigations, and Finite Element Analysis (FEA).

We offer a global test support capability with R&D centers in nearly all our locations which can fully support our customer base in the early development stages and through the program life.



OEM approved test rigs

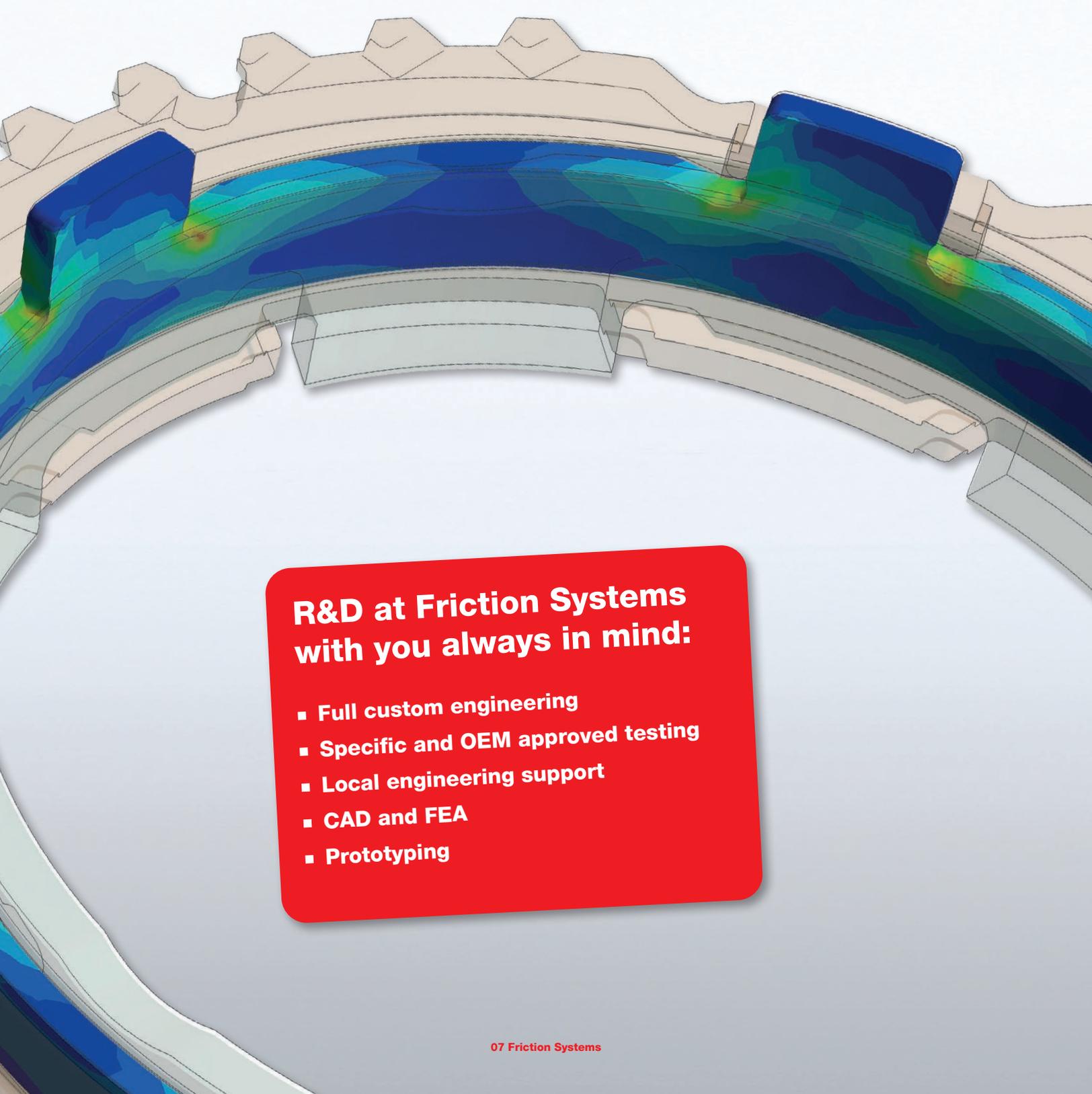
Utilizing OEM approved test rigs and equipment, Friction Systems conducts initial friction material and tribology development through to full evaluation of synchronizer component modules, full system development and in vehicle shift quality analysis. This enables realistic testing in the early material and component development stages.



Research & development

Research and development for you – this is the motto that guides Friction Systems. Our engineers and technicians are always working on proactively improving, enhancing and further developing high performance synchronizer modules and components in close cooperation with our customers. In fact, every single one of our ten locations is dedicated to finding the answers to the challenges of tomorrow.

Our global engineering support and test centers ensure that results will always be transparent, comparable and 100% dependable. We work together with a variety of leading universities in order to push our continuous improvement strategy forward. We are sharing the latest data, newest innovation and lessons learned from all our sites. This know-how and experience, in turn, is available to all our locations and, most importantly, to our customers.



R&D at Friction Systems with you always in mind:

- Full custom engineering
- Specific and OEM approved testing
- Local engineering support
- CAD and FEA
- Prototyping

Synchronizer components

Advanced transmissions require a strong foundation. Ours is a combination of Carbon friction material and stamped steel synchronizer parts, providing heavy-duty strength for demanding applications in all modern transmissions. Especially our high expertise in Dual Clutch Transmission synchronizers exemplifies our technology leadership: today the majority of all DCT on the market are equipped with Friction Systems technology.

Our high-performance Carbon synchronizer components and modules are the industry's solution of choice when it comes to manual and dual-clutch transmissions. The reason? Compelling versatility for passenger and commercial vehicle transmissions coupled with compelling performance for mass production applications and limited series applications with demanding requirements.



Single cone synchronizer



Multi cone synchronizer

Key Benefits

- Low weight
- High performance
- Excellent shift quality due to superior friction
- Compatible with state-of-the-art transmission fluids
- Enhanced durability due to wear resistant friction materials
- Consistent shift performance

Competence in Carbon friction material

Friction Systems not only uses thermal spray molybdenum, but also offers more options of highly innovative Carbon friction materials than any other competitor in the industry. Because of our broad range of materials with superior friction characteristics, we can match one of our material offerings with your specific application needs to provide excellent shift comfort, unsurpassed durability and transmission fluid compatibility.

That's why Friction Systems is a leader in friction technology. Always at the forefront, Friction Systems offers our two-layer Carbon, which has set the industry standard with more proven experience in customer

applications than any other type of Carbon material already over 20 years ago, as well as multiple types of Carbon composites and woven Carbons, all within the same thickness range. This enables our customers to select the ideal Carbon material for their applications, while ensuring that materials can be introduced even during late development phases when necessary, resulting in added flexibility during the ongoing project phases.

High-performance friction materials



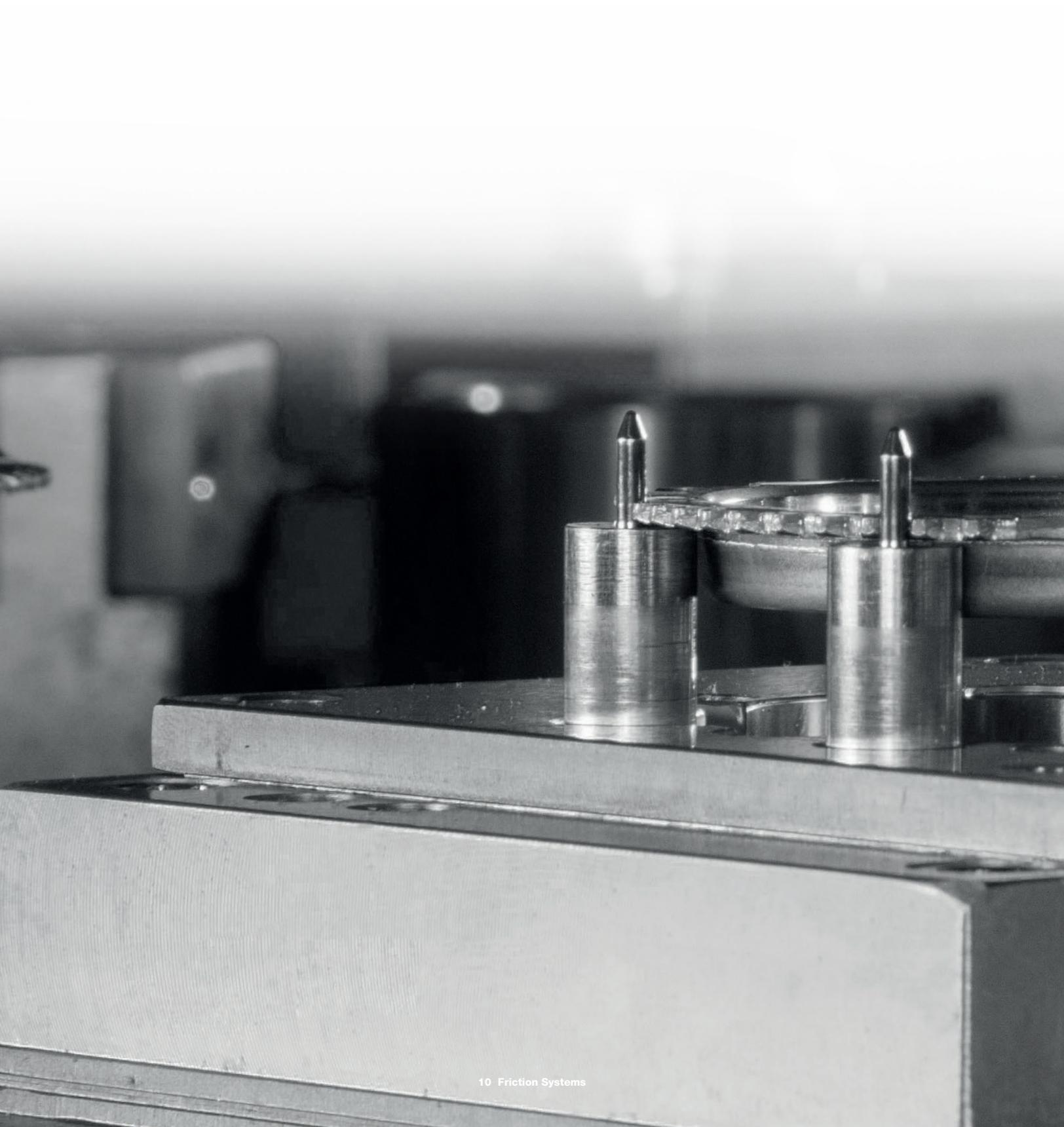
Competence in manufacturing

Steel Stamping

Friction Systems develops and manufactures high volume, stamped steel synchronizer solutions. With our stamping presses and automated production systems we are capable of handling the most innovative and complex part designs. Friction Systems is uniquely positioned to support its customers.

Heat treatment

Our special heat treatment process increases the durability of the synchronizer rings that it meets even the highest customer requirements.



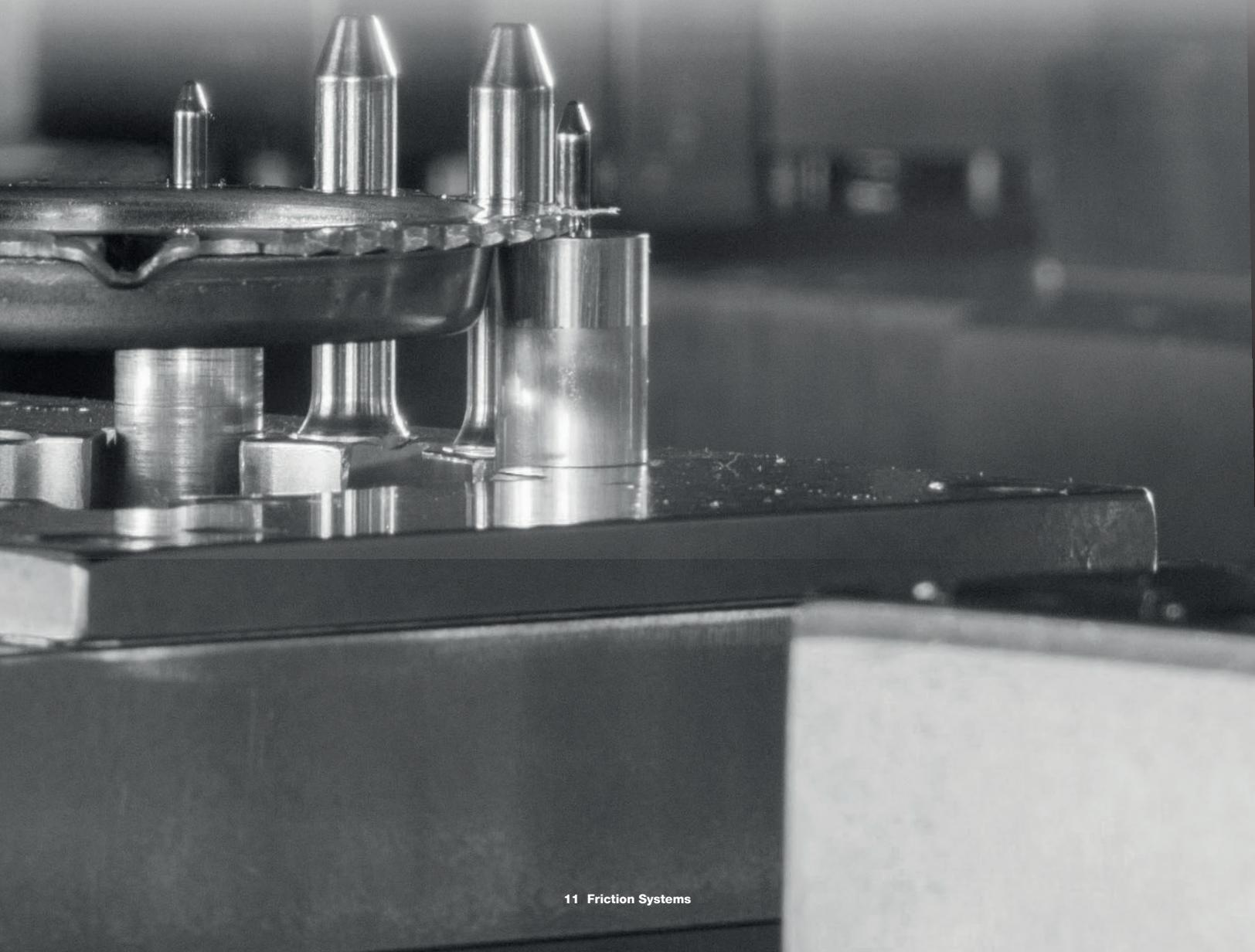
Carbon bonding

The production equipment reflects our latest state-of-the-art technology and best practice approach. This new generation of automated machine technology and production standardisation will be based upon best practices with respect to high safety features and quality controls on all

key production parameters. The representation of the entire process sequence (flow-production and one piece-flow method) and simplified maintenance according to “LEAN - tools” assure operational excellence.

Key Advantages

- 25 years of steel forming experience
- Innovative design features
- Weight and space reduction
- High strength and wear resistance



Friction Systems worldwide



There's much more to talk about Friction Systems – please get in touch to find out how we can help you to improve your business!

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