

GF Machining Solutions

+GF+

Envision your future

Automotive



GF Machining Solutions: all about you

When all you need is everything, it's good to know that there is one company that you can count on to deliver complete solutions and services. From world-class electrical discharge machines (EDM), Laser texturing and Additive Manufacturing through to first-class Milling and Spindles, Tooling, Automation and software systems—all backed by unrivaled customer service and support—we, through our AgieCharmilles, Microlution, Mikron Mill, Liechti, Step-Tec and System 3R technologies, help you raise your game and increase your competitive edge.

Passion for Precision



**Dedicated
Solutions**

We drive your success

From pioneering EDM technology more than 60 years ago to introducing the first truly high-speed Milling solution almost 30 years ago, GF Machining Solutions continues to innovate on behalf of and collaborate with automotive original equipment manufacturers (OEMs) and the industry's Tier 1 and Tier 2 suppliers. Working hand-in-hand with our automotive partners, we develop the solutions essential to help them outperform their competitors.

With a wide range of dedicated and optimized solutions extending from turbocharger impellers, tire molds, tire pressure monitoring systems, hardware and electronic connectors for state-of-the-art automotive lighting, to mold texturing for highly differentiated car interiors, GF Machining Solutions' has the best-in-class technologies, products, solutions and services to drive your success in automotive manufacturing, with:

- **Improved and reliable machining processes**
- **Ramped-up quality and productivity**
- **Reduced cost per part**

Leading automakers count on GF Machining Solutions to challenge their machining processes and deliver new and reliable process solutions to ramp up quality and productivity while reducing their cost per part. You can keep pace with precision mold and die manufacturing's short product life cycles with the fast tooling manufacturing enabled by our multi-technology portfolio's stand-alone and flexible fully automated lines, and peerless services. We support your lean manufacturing processes, shorten your turn-around times and make you more competitive in an increasingly global market place.

In addition to our high-speed and high-performance Milling, superior electrical discharge machining (EDM), Laser texturing, micromachining, Automation and Tooling, and unique Customer Services solutions, we pave the way for intelligent and self-optimizing machines and systems within an Industrie 4.0 environment.



Die-sinking



Wire-cutting



Hole-drilling



Milling



Customer Services



Automation



Tooling



Spindles



Laser



Additive Manufacturing

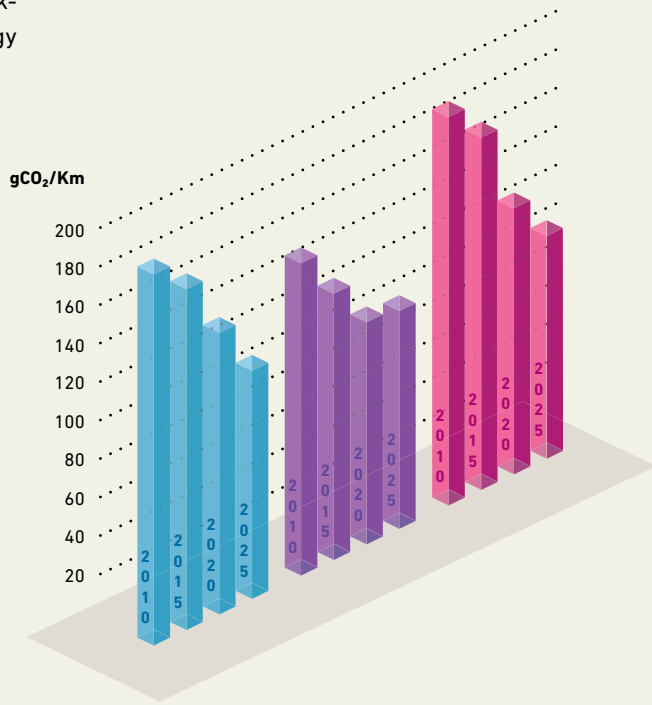
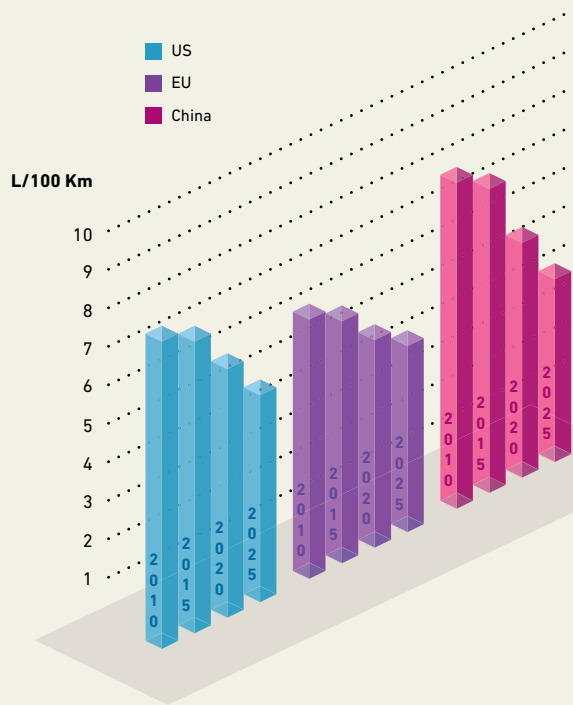
Innovating to zero emissions

Achieving the industry's emissions, mileage and fuel consumption targets depends on innovation all along the automotive supply chain. Realization of those targets will be driven by technology developments in ICT, artificial intelligence, new materials and nanotechnology, alternative powertrain and fuel systems.

At the same time, automotive landscape is being shaped by trends like emission and mileage norms, safety standards and connected vehicles. As automakers face a vast array of challenges—rapid technology

convergence, the new emerging middle class's need for affordable autos, the rise of smart connected vehicles and integration of infotainment features—suppliers play a key role in their innovation strategies.

Backed by decades of process expertise and a foothold in both automotive and ICT manufacturing, GF Machining Solutions is your ideal partner.



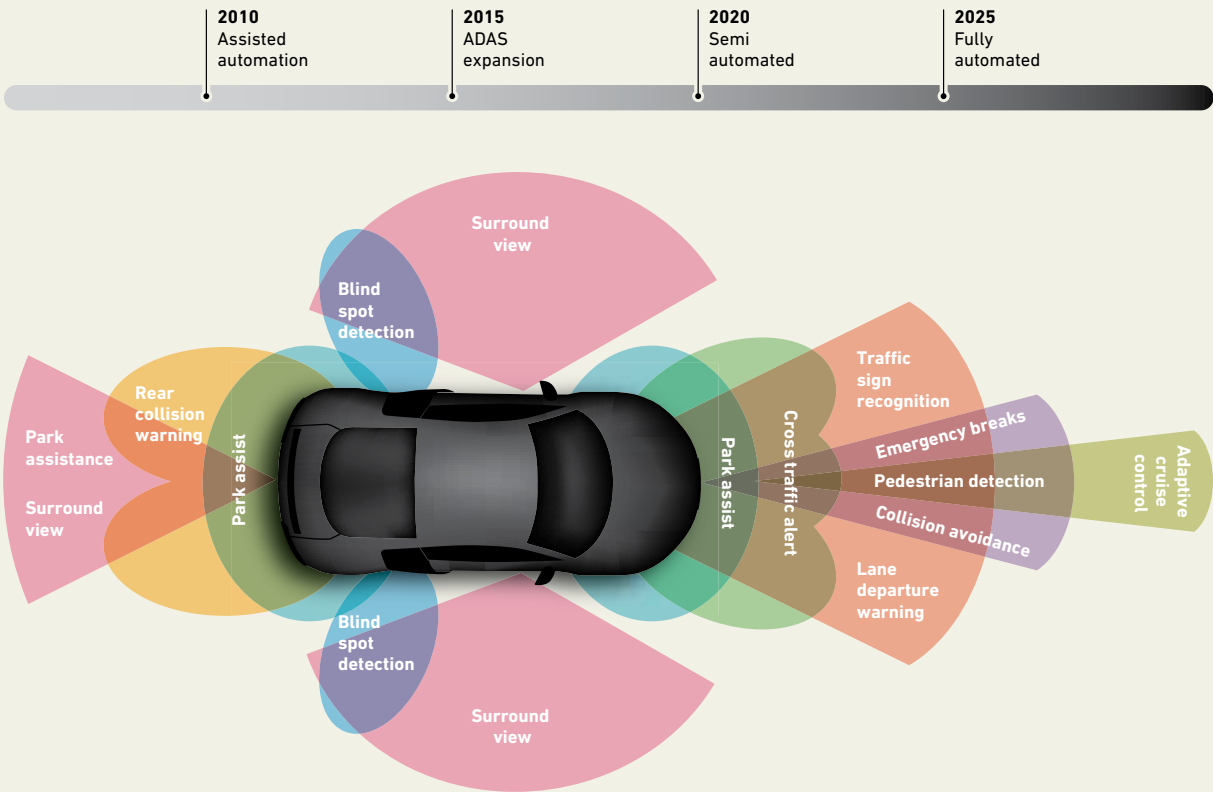
Light vehicles Emissions and mileage targets by region

Despite optimistic growth outlooks, especially in developing countries, automakers can't afford to relax their efforts around new technologies for next-generation cars while containing costs and maintaining productivity are must to sustain. For example, the automotive Consumer Price Index (CPI) hasn't changed in 20 years; OEMs must reduce costs while meeting technological and quality standards.

With changing global megatrends, automotive OEMs and supply chains face a host of potential disruptive forces. The change from central consoles' touch keys toward touch panels is one example, the change from ADAS (Advanced Driver Assistance System) to fully autonomous car is another one.

Technology is rapidly changing the face of mobility as industry races to meet fuel consumption, emissions and safety standards, primarily in the US and Europe. Endless powertrain advancements including both the rise of electrified vehicles (EVs) and continued innovation of conventional Internal Combustion Engines (ICEs) will be necessary to meet ambitious targets. Hybrid technologies are expected to represent 25 percent of global car sales by 2020. Steady innovation in direct fuel injection and turbocharger downsizing will improve ICE performance.

Wherever you are in the automotive value chain, GF Machining Solutions supports you by developing optimized, dedicated solutions and strategies to help you achieve your targets for efficient, cost-effective, secure, and highly productive manufacturing.



Market potential and volume overview

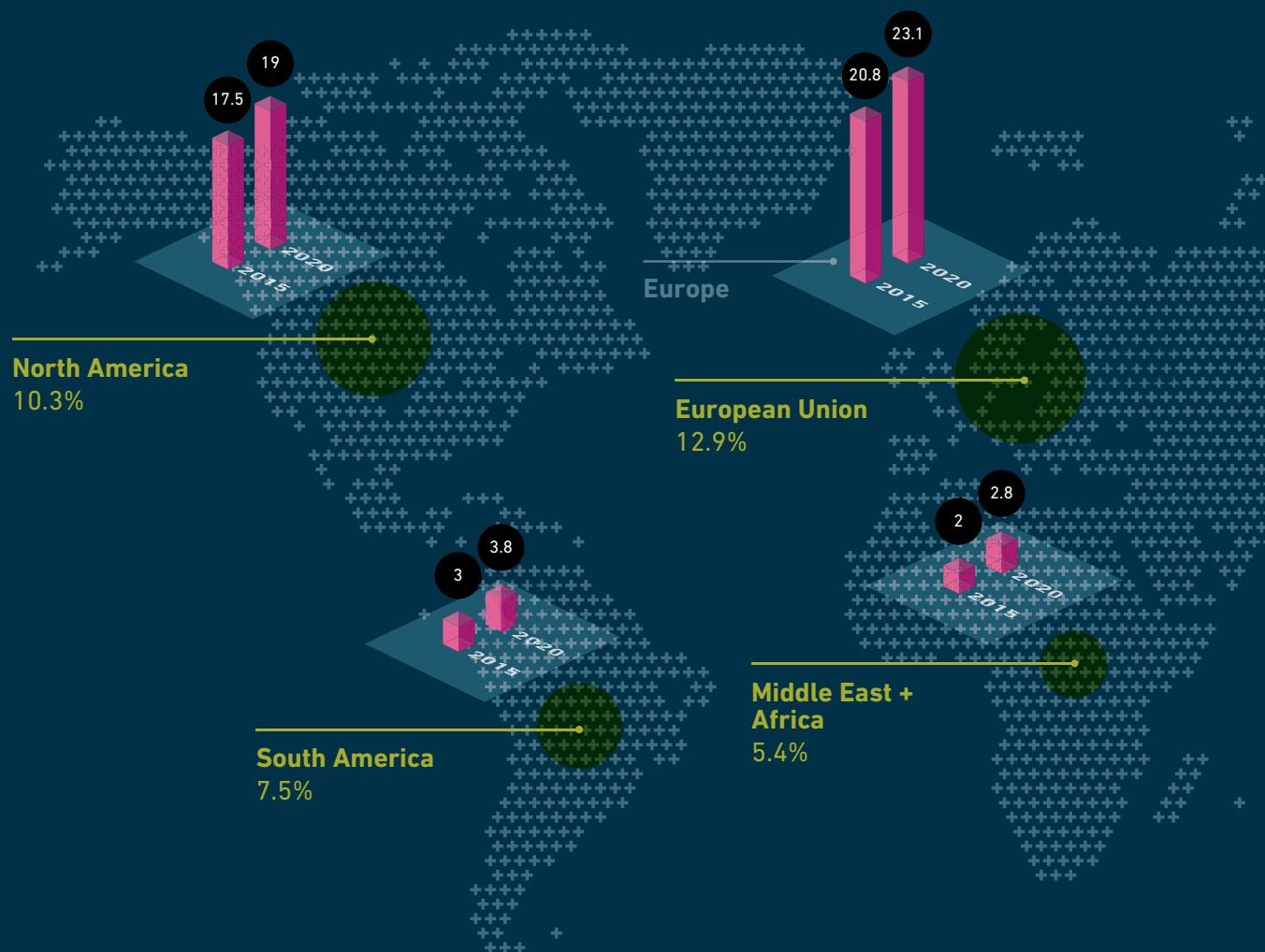
Share of production growth by region

in percentage, 2015 to 2020

Regional light vehicles

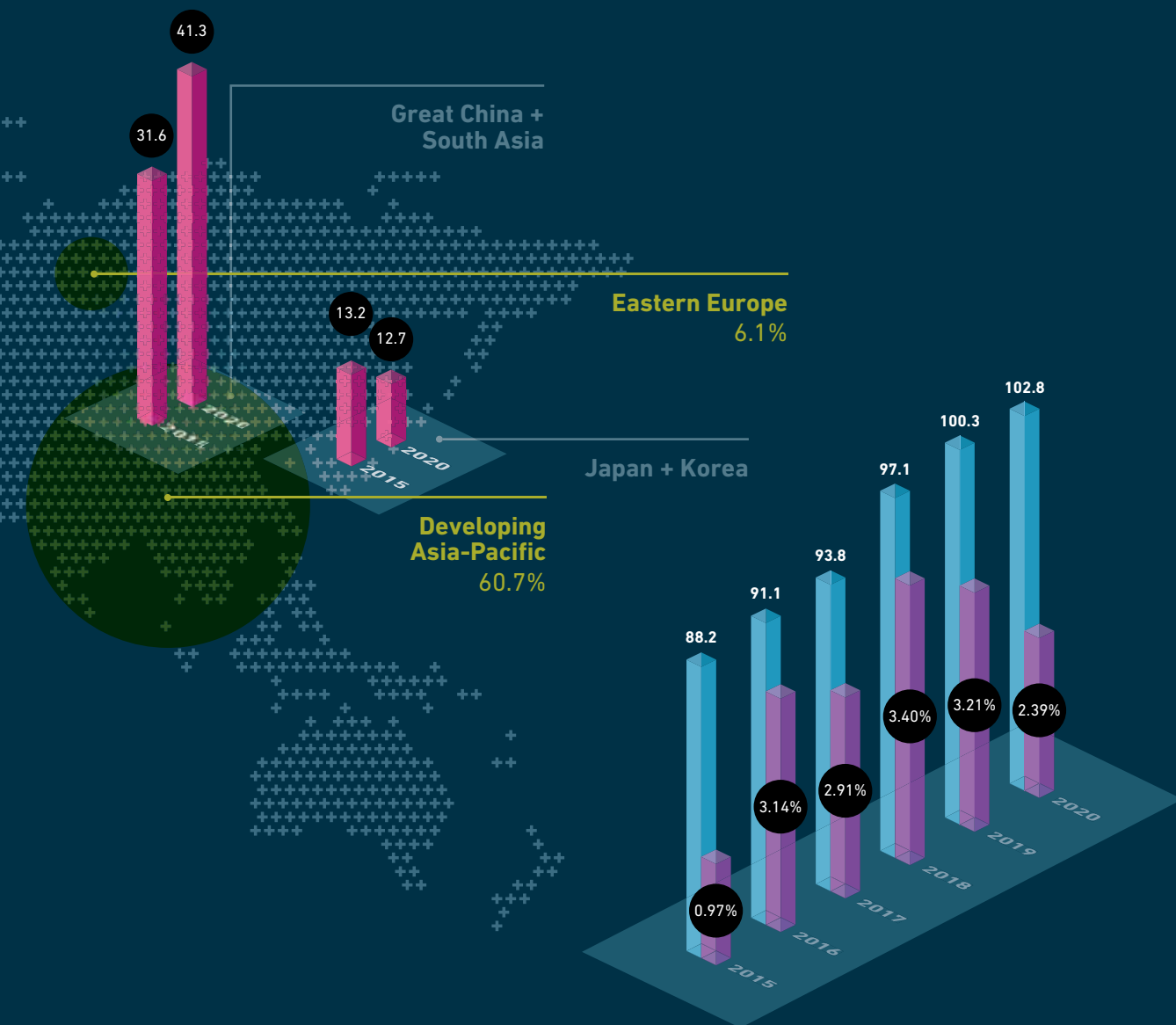
Production forecast

in million



Global light Vehicles Production forecast in million

Global light Vehicles Annual growth rate in percentage



Milling



Optimal process stability

Pioneering the world of five-axis Milling with our Mikron Mill platforms, GF Machining Solutions is renowned for delivering the highest productivity—and ensuring process stability is a must.

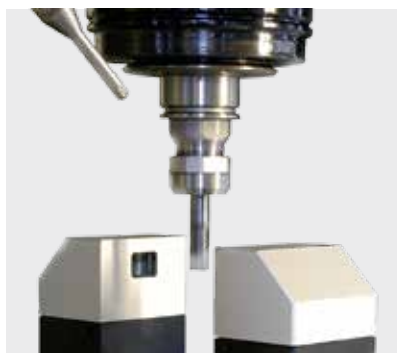
Our commitment to your productivity can be found in the pure Milling process, thanks to our high-speed and high-performance solutions, our dynamic Step-Tec Spindles and our application-centric smart machine modules. Benefit, too, from our manufacturing approach leveraging System 3R Tooling agility and Automation solutions.

Count on us for the greater process stability delivered by the peerless thermostabilization of our platforms and key components, and efficient and user-friendly software layers. We put you on the fast track to highly productive, zero-defect automotive manufacturing.



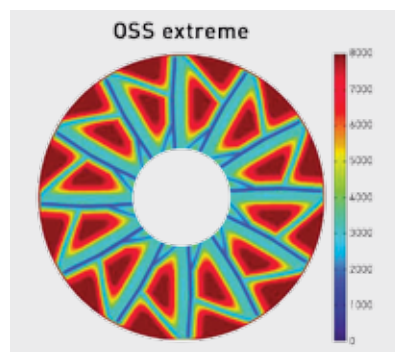
Step-Tec Spindles

Developed in-house, deliver best performance and are directly serviced throughout their lifecycle.



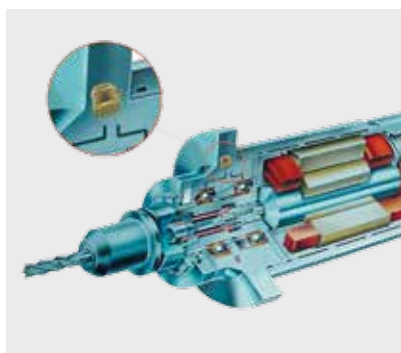
Intelligent Tool Measurement (ITM)

Achieve consistent micron-level precision and superior finish with digital cleaning and measurement.



Operator Support System

Boost your process performance according to manufacturing phases and speed, precision or finish needs.



Advanced Process System (APS)
Optimize your processes and monitor your productive equipment.



One-minute setup with System 3R Tooling
Experience process flexibility with proven reliability and reproducibility.



Integrated pallet magazine Automation
Maximize your productivity and autonomy while producing at lowest cost.

EDM



Pushing the boundaries

GF Machining Solutions is distinguished by its commitment to advancing automotive manufacturing by partnering with industry leaders, R&D departments and research institutes worldwide.

As a result, our latest-generation EDM technologies and onboard machining strategies boost machining speed while leaving no visible recast layer to maintain surface integrity, and our iQ (innovative Quality) technology yields lowest electrode wear.

Our comprehensive onboard data acquisition software, in-process measurement via Integrated Vision Unit (IVU) and eTracking traceability solution boost your manufacturing efficiencies.



iGAP and wear partitioning technologies
Deep, thin, sharp corners; uniform results on multi-cavities.



Integrated Vision Unit (IVU Advance)
In-process measurements for closed-loop processes to achieve highest accuracies.



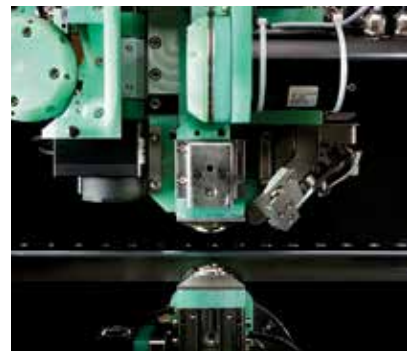
Designed for flexible processes
Ready for Automation, expandable and linked to complete processes.



Digital Intelligent Speed Power Generator
Best surface quality for tough materials, complex geometries.



eTracking process monitoring
Supports complex manufacturing processes and Industrie 4.0 standards.



Automatic Wire Changer
To maintain positioning accuracy and reduce part costs.

Laser texturing

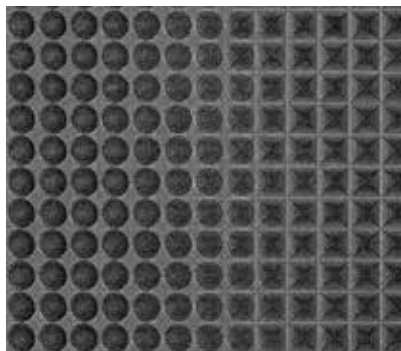
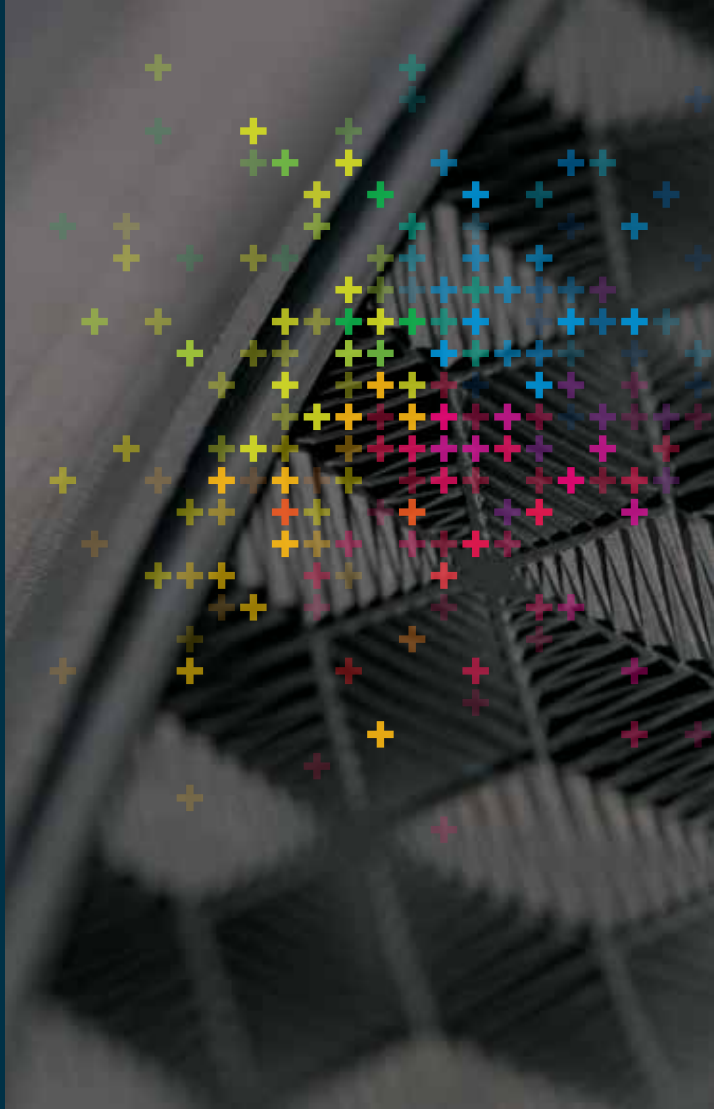


Faster time to market

Quickly and repeatedly transform your designer's art to perfectly finished part with GF Machining Solutions' high-precision Laser texturing solutions. We help you make your distinct mark on 2D and complex 3D geometries and speed up your time to market.

Apply functional textures to any complex mold shape or size—without affecting its physical properties—while reducing quality-related costs and adding value to your products, with five-axis Laser texturing.

Reach new levels of aesthetic texturing on automotive molds and enjoy greater injection efficiency with our environmentally friendly Laser solution. From tire molds and lighting modules to interiors and beyond, what you design is what you get.



Geometrical texture

Digital process converts native files to achieve best results.



Complex 3D mold cavity

Molds of any size and shape to form uniform flow, increase scope of creativity.

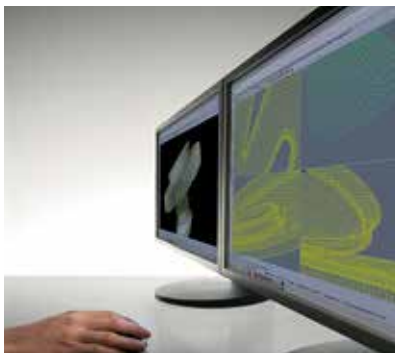


Extra-large 3D mold

Complete solutions to cover automotive molds.



All-in-one Laser head
Simplifies setup time and maintains positioning to produce perfect results.



Digital process
What you see on the screen is what you get on the workpiece.



Small to extra-large molds
Covers texturing, engraving, Laser blasting applications in one process with Automation solutions.

Micromachining

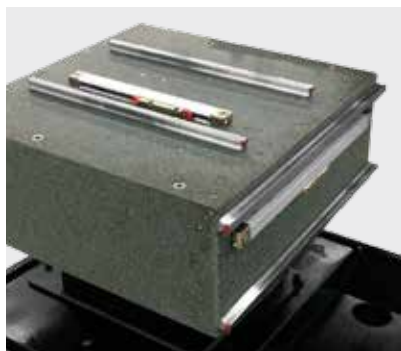


Solutions for microgeometries

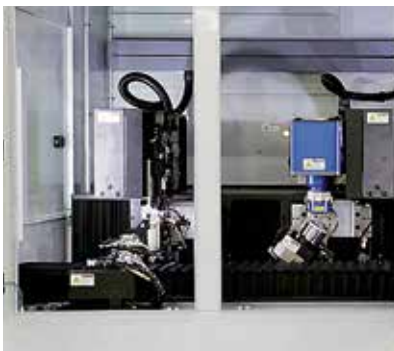
Today's micro parts—and those of the future—require more than standard CNC machining, due to their decreasing size and increasing sophistication.

Such parts demand integrated systems that coordinate accurate measurement, rapid part handling, motion control and ultra-precise machining. Microlution delivers this integration with complete manufacturing solutions enabling companies to create economically and technically feasible precision parts.

With Microlution, manufacturers arrive with a precision parts challenge and leave with turnkey integrated micro manufacturing solutions. Microlution solutions deliver unsurpassed precision, cycle times and part consistency on factor floors around the world.



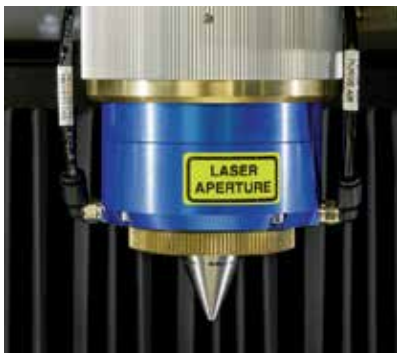
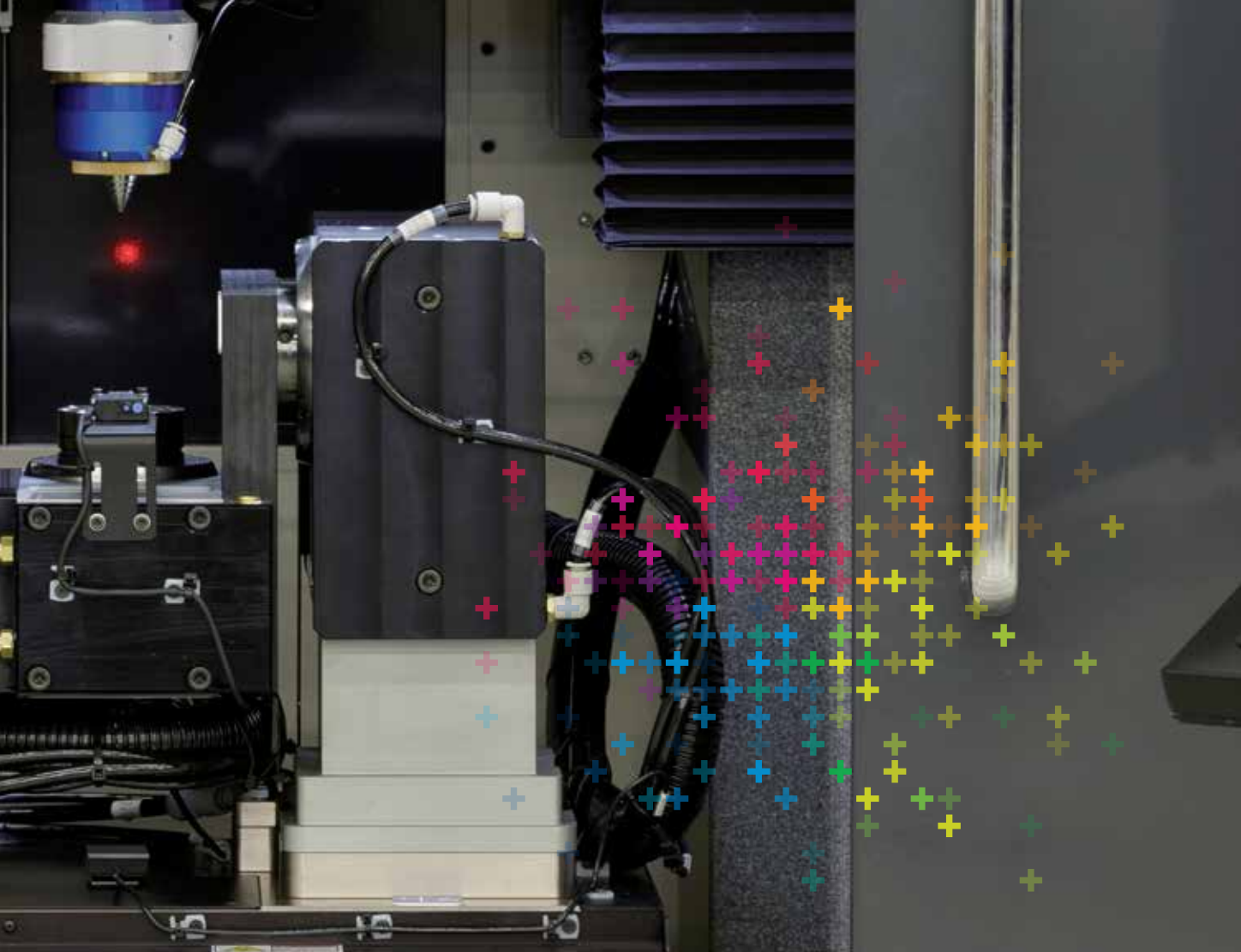
Axes mounted on the granite base
for maximum thermal and dynamic stability



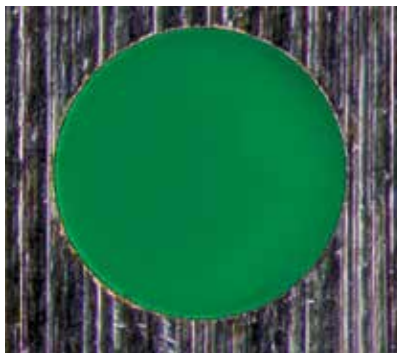
Dual five-axis stations
to combine Milling and Laser machining



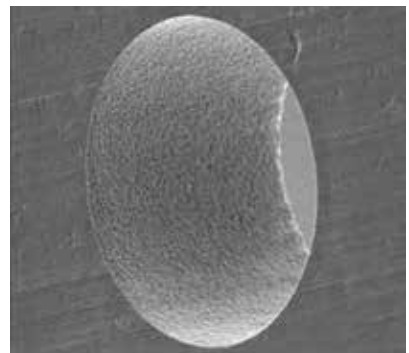
Integrated palletized workholding
for high-volume production capacity



Femto laser
for athermal machining



Micro hole
with micron accuracy
and sub-micron repeatability



True athermal ablation
leaves no Heat Affected Zone (HAZ)

Automation



Greater ROI

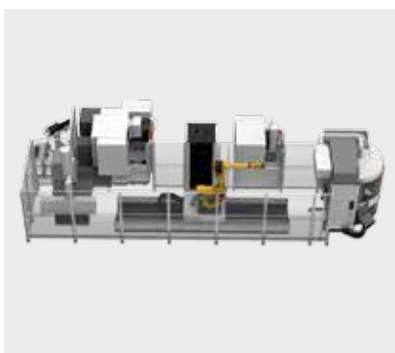
Accelerate your return on investment by increasing your process control and attaining greater efficiency. Fully compatible with complete portfolio, our adaptable Automation and Tooling solutions are easily integrable into your existing production environment.

Automotive manufacturers rely on GF Machining Solutions' Automation, including our accurate reference systems and work holding devices for easy scheduling and control for better resource allocation and inventory control.

Design flexible and scalable lines that consume minimal floor space, with our onboard software. Ramp up your traceability and reduce your quality costs—and be ready to reach Industrie 4.0 levels.



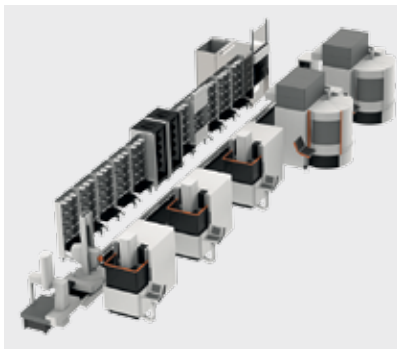
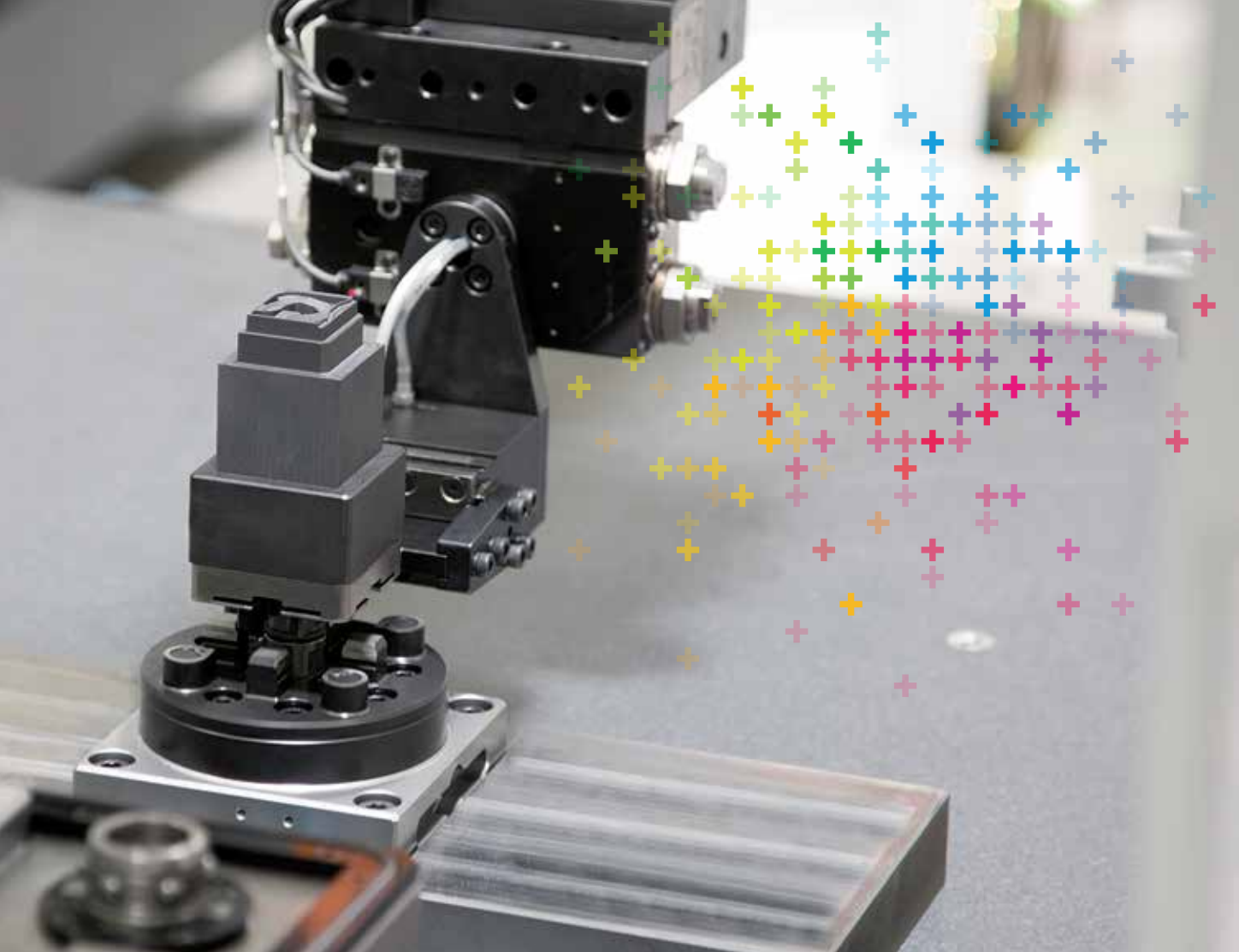
RFID chip
for effective data communications and optimized processes



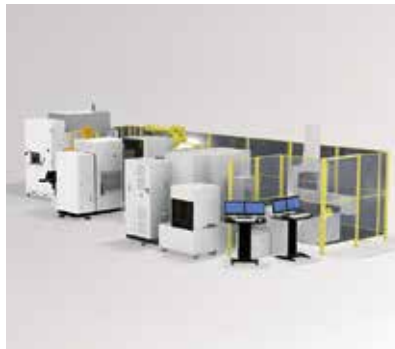
Traceability, control and process optimization



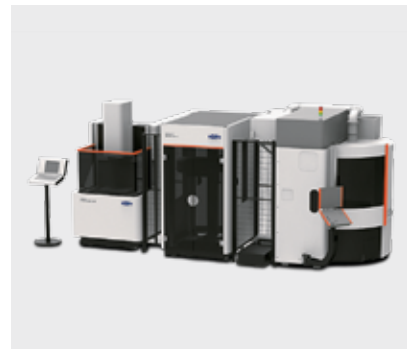
Standardized modules
for drying, draining and washing



Scalable, cost-effective Automation solutions
from a single partner: GF Machining Solutions



Cell management software
communicates with your
Manufacturing Execution System (MES)



WorkPartner
boosts productivity by housing part and Tooling
in close proximity to the machine

Customer Services



Solutions for you

Optimizing your productivity is at the heart of GF Machining Solutions' broad range of customizable Customer Services solutions. Close to you—wherever you are in the world—our local Customer Services teams speak your language and know your concerns.



More value for automotive production

Tailored solutions for Operations Support, Machine Support and Business Support

Enhance your performance

Ensure your machine reliability and quality with original parts and certified consumables to support your machine performance, technical support and preventive services.

Ensure productivity and increase machine lifetime

Our Live Remote Assistance (LRA) provides you direct access to our expert service engineers with the latest technology. rConnect positions you to reach Industrie 4.0 targets.

Improve your expertise

Our academy supports your staff development with basic to advanced skills for managing technical challenges, operating your equipment in perfect order and condition, and optimizing your uptime.



Dedicated Solutions

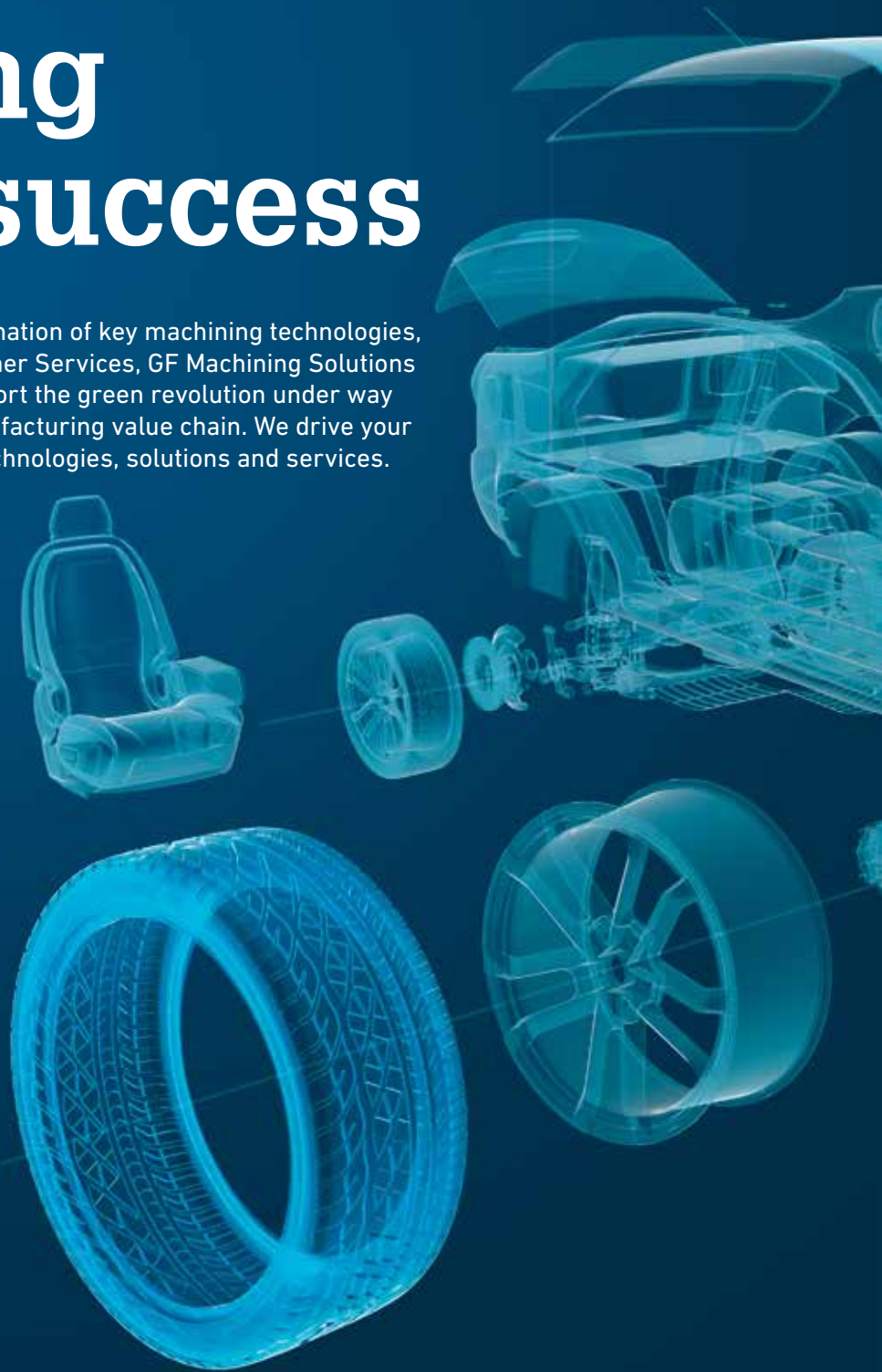
GF Machining Solutions drives your success with best-in-class technologies, solutions and services and delivers high precision, accuracy and surface quality to automotive customers.

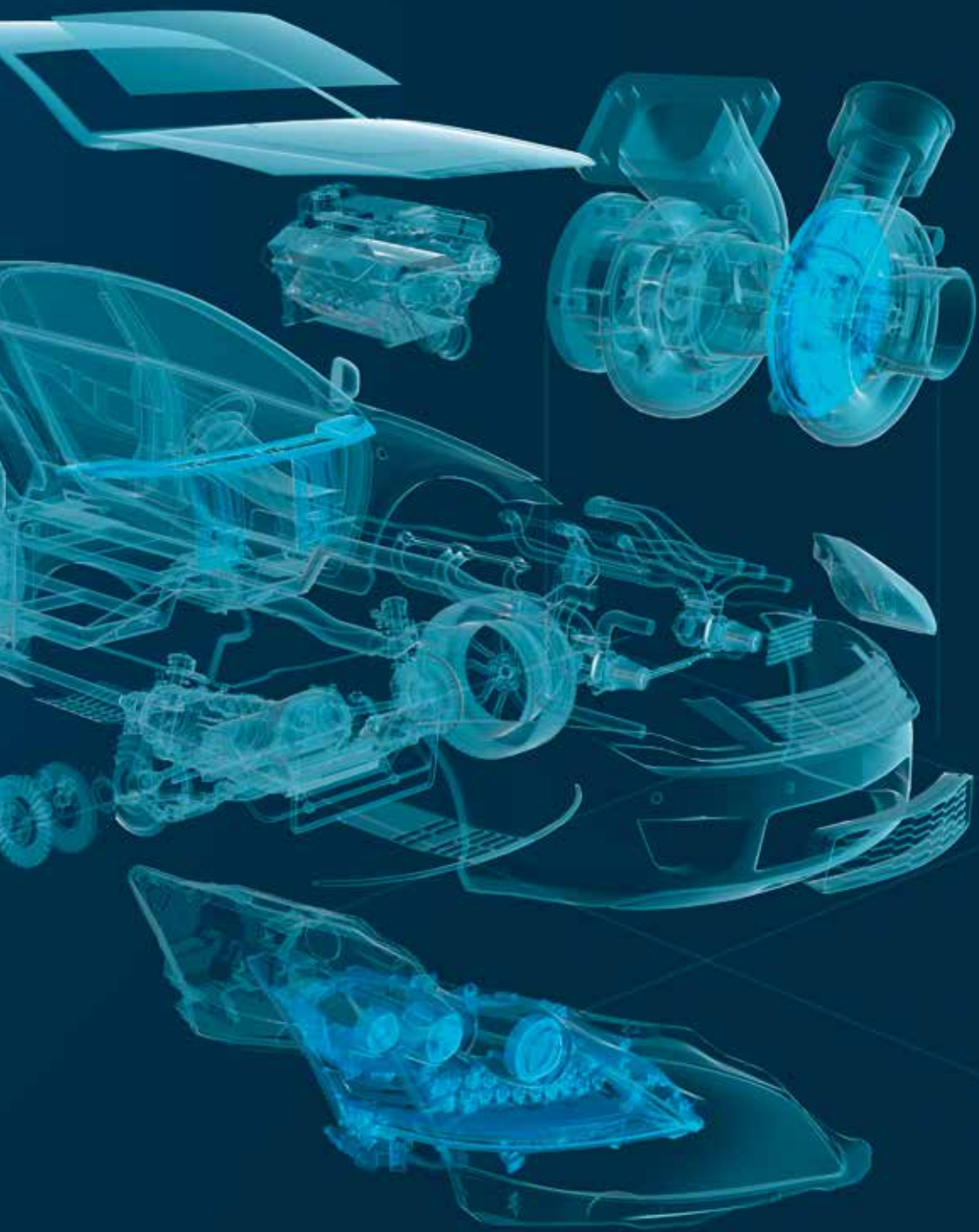




Driving your success

With our one-of-a-kind combination of key machining technologies, process expertise and Customer Services, GF Machining Solutions is uniquely positioned to support the green revolution under way all along the automotive manufacturing value chain. We drive your success with best-in-class technologies, solutions and services.





Turbocharger impeller

Machined impeller wheels at the lowest cost per part with our solutions for reliable, fast processes—without sacrificing quality for long-term productivity.

Our five-axis machines are uniquely designed to absorb vibrations and deliver fast, dynamic movement and smooth jerk. The System 3R modular fixture provides a safe process and highest rigidity.

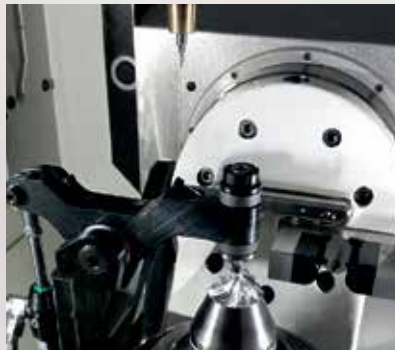
Our solutions make best use of floor space with robotic part handling effectively integrated into existing processes, therefore you get tailored solutions to meet your production requirements.

**Excellent finish and
smooth surfaces**

**Reach lowest cycle time with best
repeatability and reproducibility**



Impeller rotates at about 240,000 rpm and needs best balancing



Shortest tool overhangs for optimized processes



Reliable profile accuracies at fast cutting speeds and feeds



**Direct-drive quality and
dynamic machine construction**

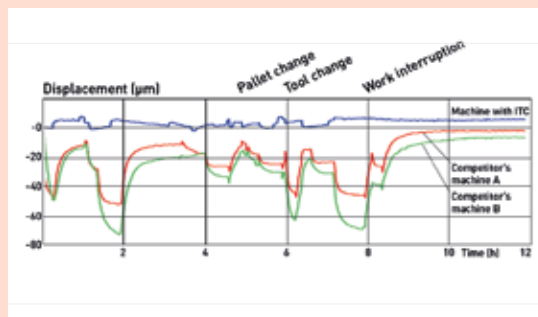
Mikron Mill five-axis Milling machines are uniquely designed with a large polymer concrete base for superb damping properties and rigidity for fast, dynamic motion.



Linear direct drives with optimal acceleration and unique cooling design for reliability.



Robustness and high dynamics increase stability and reduce jerk errors.



Smart functions: Intelligent Thermal Control (ITC) for long-term process reliability.

Tire mold

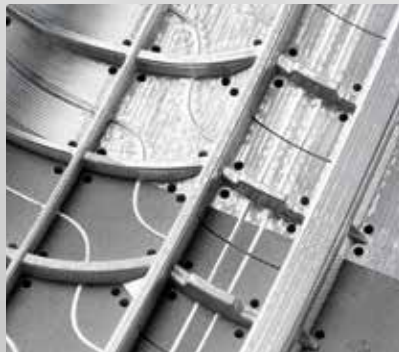
As your proven partner with decades of expertise, a broad technology portfolio and an extensive product line, GF Machining Solutions positions you for success.

With an immense range of solutions for direct machining aluminum segment molds, master molds, single-piece puzzle molds, steel segment molds for winter tires, sidewalls and more, we tirelessly innovate the solutions to help you stay ahead.

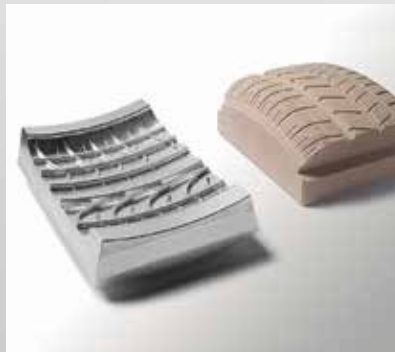
Our Laser texturing helps you add distinct value and speeds your time to market.

**Best rolling resistance,
lowest total indicated runout**

**Add functional features,
differentiate your tires**



Digitized Milling and Laser processes:
blasting, engraving, branding and more



Segment mold solutions:
System 3R pallet interface for quick change
at highest accuracy, reliability

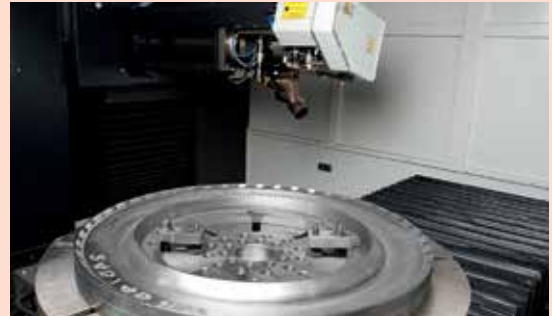


Sidewall texturing, engraving:
Fully digital, unlimited design possibilities,
no tooling inventory



**Sidewall textures, engraving;
faster time to market**

Stay ever-competitive with our complete and optimized Milling, Laser, EDM and System 3R Automation solutions for easy part handling.



Laser technology for a 100 percent repeatable process and optimal cost control.



Proven, reliable in-house Step-Tec Spindle:
best material removal rate, stable process.



Proven rotary table design with direct clamping for
access, rigidity and reproducibility.

Front and rear lighting modules

Get the reliable, secure processes and best-in-class technologies and solutions essential to navigating challenging trends such as short product life cycles, technological advancements, and the need to manufacturing demanding molds and tooling in shortest period.

Wherever you are in supply chain, our solutions—from standalone to flexible Automation solutions—link technologies and processes to keep you flexible and competent.

Our micromachining and additive post-processing come together as ideal solutions that reduce your quality-related costs.

**Uniform surface finish,
avoid polishing**



Complete and expert neon, HID, Laser, LED and OLED complete solutions



Broad portfolio for complete solutions to enhance lighting features



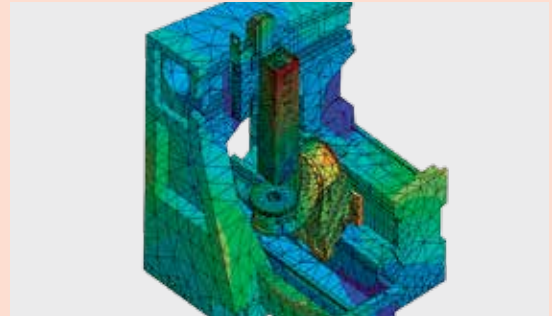
Advanced front lighting system (AFS) lens finishing machining solution with Laser technology

**Light trims:
improved injection**



**Reduce cost of quality
with uniform textures**

Machine any complex cavity geometry and achieve volumes to reach best efficiency with to our multi-technology portfolio.



Highest precision with Mikron Mill machines' damping properties, rigidity, fast dynamics.



Realize near-zero electrode wear due to EDM digital generators and onboard technologies.



Solutions for stand-alone, Automation or modular a complete process.

Electrical and electronic control modules

Changing trends and demographics combined with stringent emissions, mileage and safety standards represent huge challenges, more sensors and designs—including instrument panels and central console units—and shorter product life cycles. This calls for more flexible machine monitoring and inventory maintenance solutions to ensure your flexibility and fast reaction time.

We have strong automotive and ICT electronics know-how, ranging from small connectors to big consoles and touchscreens and for functional applications.

3DS:
better scratch resistance

Smooth sensor assembly



Ideal combination of technologies and know-how for faster time to market



Flexible solutions for fast-changing product design life cycles



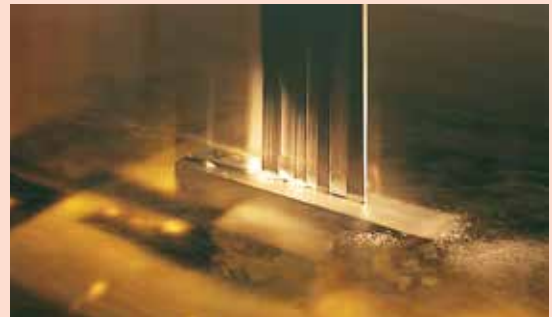
Unique solutions combined with Laser to add functional textures and match design



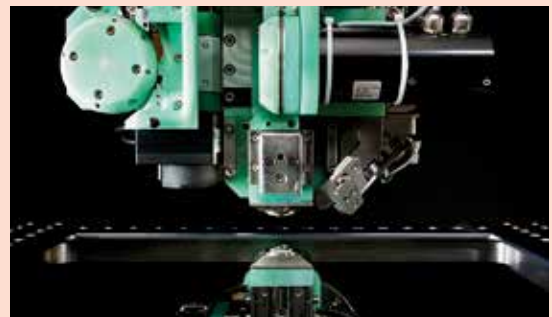
Profit from our solutions for functional properties, miniaturization and complex geometries in a high volume and product mix—with our safe, reliable processes.



Precision solutions for sharp corners and unique shapes on electrodes.



IQ technology reduces wear and improves flushing to achieve best production costs.



Unique twin wire concept optimizes production with highest accuracies. Integrated Vision Unit (IVU) used for in-process measuring and adjustments.

Additive Post-processes

Automakers are challenged to keep pace with short product life cycles, maintain mold and die manufacturing precision, and finish products for both prototype and production applications. GF Machining Solutions' Additive Manufacturing (AM) technology is the perfect match.

AM addresses more complex shapes and fine geometries and improves injection efficiencies by having cooling holes close to the injection area. From post-processes such as EDM, five-axis finish Milling and Laser texturing, we propose off-the-shelf solutions to meet new challenges.



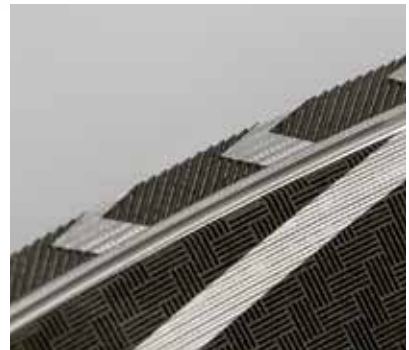
Steering stub axle
build on EOS M400
with EOS AlSi10Mg



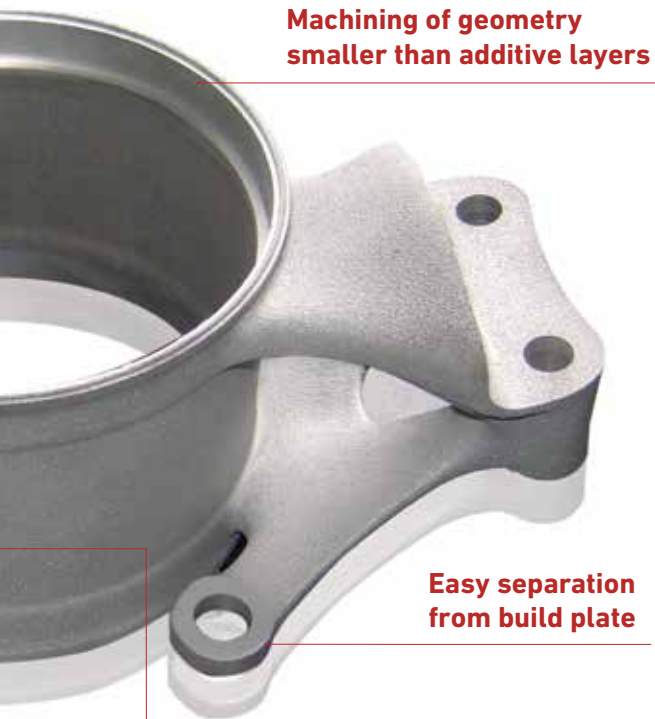
Separation from build plate is needed for 100 percent of additively manufactured parts



Improve surface finishes and small shapes requiring five-axis Milling



Five-axis Laser machining is needed for geometries smaller than AM layers

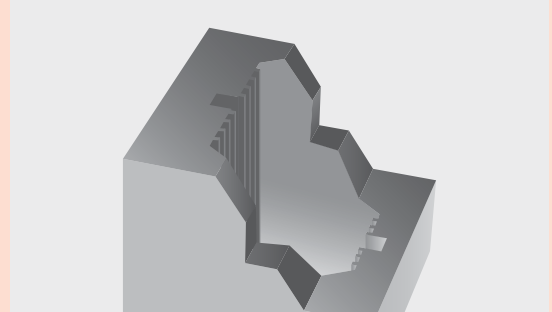


**Machining of geometry
smaller than additive layers**

**Easy separation
from build plate**

**Reduced part finishing cost
due to highly dynamic machining**

GF Machining Solutions helps you seamlessly integrate Additive Manufacturing into your manufacturing process chain to expertly address complex shapes, fine geometries and exotic materials.



POWER-EXPERT prevents wire breakage on parts with multi-cavities and trapped powder.



By accessing part from all directions, five-axis machining can finalize complex features initiated in Additive Manufacturing.



Extreme accuracy can be achieved by five-axis Laser machining during post-processes.



The driving force of your operation



Your contact

Business Development and Segmentation
dedicated.solutions@georgfischer.com

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