Mikron

MILL E 500 U
MILL E 700 U
Passion for Precision

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 unrivalled 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.
The Mikron MILL E 500/700 U high-efficiency series comprises five-axis machines in a stiff, stable, cast iron C-frame construction. With large-sized guideways and double supported rotary table, this range delivers parts quality and optimum chip removal rate—ideal for job shops and parts producers in automotive, energy and power generation, and general machinery.

Easily load workpieces up to 450 kg from the front or side—and cover a second or third shift with the available 200 kg capacity pallet changer.
Market segments and applications

Typical applications

**Aerospace**

- **PART EXAMPLE**
  - Secure process stability – Milling with no chatter marks
  - Achieve high accuracy and surface quality
  - Get ready for production ramp-up with no worries

**Medical**

- **PART EXAMPLE**
  - Get a turnkey solution
  - Reduce cost of operations
  - Achieve high surface quality

- **PART EXAMPLE**
  - Speed-up operations and reduce cost: one clamping
  - Efficient process – from roughing to finishing
  - Productive and flexible serial production

**Typical applications**

- **Plate cover**
  - Material: AL 7575
  - Wall thickness: 0.5mm
  - Surface finish: Ra 0.5μm
  - Accuracy: ± 0.05mm
  - Repeatable: 24/7 parts production

- **Surgical support device**
  - Material: AL 6061
  - Surface finish: 0.3μm
  - Processing time: 6.5h
  - Production cost reduced by 30%
  - Unique

- **Hook bone plate**
  - Material: SS 17-4
  - Surface finish: Ra 0.5μm
  - Processing time: 80min
  - Secure process stability – Milling with no chatter marks
  - Achieve high accuracy and surface quality
  - Get ready for production ramp-up with no worries

**Typical applications**

- **Aerospace**
  - Market segments and applications
    - Aerospace

- **Medical**
  - Market segments and applications
    - Medical
    - Material: AL 7575
    - Material: AL 6061
    - Material: SS 17-4
**PART EXAMPLE**

**Automotive**

Lever flexibility: many different milling processes  
Reduce cost: Mill efficiently with 5-Axis  
Secure process stability over long milling periods

**Process**

- Tool diameter: Ø4mm to Ø40mm
- Process time: 23h
- Accuracy: ±0.03mm
- Removed material: 0.021m³/min

**Airbag shooting device**  
Material: AL 6082

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**PART EXAMPLE**

**Mold and die**

Deep cavity Milling  
High surface finish  
Continuous cutting speed thanks 5-Ax simultaneous Milling

**Process**

- Tool diameter: 1.5mm
- Surface finish: Ra 0.5μm
- Accuracy: ±0.05mm
- Removed rate: ±210cm³/min

**Cookie blister**  
Material: AL 6082

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**PART EXAMPLE**

**Machinery and general mechanics**

Achieve high positioning accuracy in 5-Axes  
High material removal rate  
Variable operations on all five sides  
Multiple machining operation  
Deformation-free machining

**Process**

- Wall thickness: <1mm
- Removed rate: ±210cm³/min
- Accuracy: ±0.05mm

**Cover plate**  
Material: AL 6082

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5 Mikron MILL E 500 U / 700 U
High-efficiency Milling

The Mikron MILL E U series is a dynamic, high-efficiency machine center for entry-level five-axis machining. It provides highly efficient and productive processing for all kinds of materials, including aluminum alloys and stainless steel. This solution’s economical design saves spaces and its ergonomics make it easy for your operator to use.

- Produce your workpieces in a process-secure and precise manner.
- Increase reliability in unmanned operation.
- Boost the service life of the machine.
- Significantly reduce production costs.

Efficiency and productivity for 5-Axis machining
Solutions

The right solution—for you

Stiff machine construction
Double-supported rotary torque table
Step-Tec Spindle: 120 Nm, 20,000 rpm
Choice of HEIDENHAIN or FANUC control

Customer benefits

+ Benefit from the dynamic behavior essential to perfect part production.
+ Machine under maximum load generates minimal noise and achieves top quality on your parts.
+ Get the performance and Spindle power to execute all kinds of applications.
+ Enjoy unmanned production—nights or weekends—with your favorite Automation system.

Integrated Automation or third-party automation
Integrated palletization
Robust and precise

Mikron MILL E 500 U / 700 U
core components

+ Up to 60 tools integrated. 210 tools on a tool tower
  Easy loading during operation

+ Torque or gear drives for rotary table
  High positioning accuracy and repeatability thanks to direct drive technology

+ Large swivel range from -65° to +120°
  Allows perfect access with the optimal tool length to the part

+ 20,000 rpm motor spindle with 120 Nm
  Best surface finish for both roughing and finishing

+ Compact footprint and ergonomic access
  Highest efficiency and ergonomics on smallest space

More than 50 years legacy of machine design expertise
Axis travel
Vertical Z
MILL E 500 U: 400 mm
MILL E 700 U: 500 mm

Axis travel
Crosswise Y
MILL E 500 U: 450 mm
MILL E 700 U: 600 mm

Axis travel
Lengthwise X
MILL E 500 U: 500 mm
MILL E 700 U: 700 mm

Rotation axis
n x 360

Swivel axis
MILL E 500 U: -65° / +120°
MILL E 700 U: -65° / +120°
Benefit from an automated process

Ramp up your productivity and flexibility

Execute small, express jobs with the same efficiency and profitability as mid-size series or repeat orders.

Your progress to higher productivity:

**Step 1**
Move from three-axis, multi-clamping Milling to five-axis, one-clamping Milling.

**Step 2**
Upgrade the machine: clamping with System 3R

**Step 3**
Extend your system: pallet magazine and clamping with System 3R

+46% productivity

+20% productivity

+16h additional capacity daily

You’ll run additional shifts 24/7 at lowest cost.
+ Fast setup time
+ Lowest machine downtime
+ High profitability
+ Broad flexibility
+ Efficient productivity

Generate a fast return on invest with a Mikron MILL E 500 U with 20,000 rpm Spindle, simultaneous torque table and our own pallet Mikron Mill pallet Automation with up to seven pallets.
Enjoy unmanned production—nights and weekends
Take your productivity to new levels while reducing your costs with our superior Automation solution. The pallet magazine’s generously dimensioned door allows optimum pallet access for loading light parts by hand and heavy parts by crane. Larger windows allow a good view into the pallet area, and pallets are managed by using the machine control.

**Ergonomic door design for easy loading of parts up to 200 kg**

**Five-sided processing in one clamping**

5-Axis processing offers significant advantages for large and small components. Using 5-Axis technology, it is possible to process different shapes and surfaces with one clamping device.

- Rotary swiveling table available as a pallet version: System 3R (Dynafix/Delphin)
- Rotary swiveling table available as a generously dimensioned tabletop version (Ø 500 / 630 mm with parallel T-grooves)
- Cartesian (right-angled) arrangement of the axes results in easily understood tool/workpiece movements during the Milling process
- Direct measurement on the B and C axes
- Machine available as 5-Ax or 5-Axis simultaneous versions

**Dynafix pallet Automation**

**Delphin pallet Automation**

**Rotary swiveling table with parallel grooves**
High-performance Spindles

High-efficiency Milling and effective processing

The high-performance Spindles on the Mikron MILL E 500 U / 700 U series are designed to do heavy roughing and Milling to best surface finish all at once. With a bearing design with three preloaded hybrid ball bearings in the front and a thermally robust hybrid cylindrical roller bearing on the back, you are guaranteed a super-rigid rotating system that enables Milling with extra-long tools reaching into deep cavities. Ramp up your chip removal, thanks the feed rates made possible by this solution’s absorption of high Milling forces at the tool tip.

The 20,000 min⁻¹ Spindle features the well-proven OptiCool principle that keeps the front bearing area cool while the extra heat barrier cooling loop keeps the motor heat away from the Spindle nose. That results in a thermally balanced Spindle thus assuring a high level of precision, repeatability and surface finish.

<table>
<thead>
<tr>
<th>Spindle 20,000 min⁻¹</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Power (S₆)</td>
<td>36 kW</td>
</tr>
<tr>
<td>Torque (S₆)</td>
<td>120 Nm</td>
</tr>
<tr>
<td>Speed max.</td>
<td>20,000 min⁻¹</td>
</tr>
<tr>
<td>Acceleration</td>
<td>2.5 s</td>
</tr>
<tr>
<td>Lubrication</td>
<td>Oil-air</td>
</tr>
<tr>
<td>Tool interface</td>
<td>HSK-A63 DIN69863-1</td>
</tr>
</tbody>
</table>

- Direct Lubricating System (DLS) oil-air bearing lubrication through outer race
- Fully digital Spindle equipped with every conceivable sensor to support smart machine integration
- Through-Spindle cooling featuring rotary unions fed by all known liquid and gaseous media

The 12,000 min⁻¹ Spindle delivers sufficient performance and power for all kinds of applications. The ball bearings, which are lubricated for life, are effectively protected against incoming dirt with an air purge system. The tool is held by a spring and is released through hydraulic cylinder.

<table>
<thead>
<tr>
<th>Spindle 12,000 min⁻¹</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Power (S₆)</td>
<td>20 kW</td>
</tr>
<tr>
<td>Torque (S₆)</td>
<td>88 Nm</td>
</tr>
<tr>
<td>Speed max.</td>
<td>12,000 min⁻¹</td>
</tr>
<tr>
<td>Acceleration</td>
<td>2.5 s</td>
</tr>
<tr>
<td>Lubrication</td>
<td>Oil-air</td>
</tr>
<tr>
<td>Tool interface</td>
<td>ISO 40 / BT 40 / CAT 40</td>
</tr>
</tbody>
</table>

- Good thermal stability through OCS
- Excellent weight/performance ratio
- Integrated intelliSTEP functionality
- Spindle cone ISO 40/BT 40/CAT 40
- Infinitely variable rotation speed range—no loss of performance
- Prepared with internal cooling agent feed for production use (optional)
Spindle challenge
Slotting operation

Description
- Slotting with a depth of 1.5xD is a challenging task for the machine. The feed rate was set to a spindle load of 85%. Tests with more speed brought the machine to soar up.

Tool
- Type: Ø16 end mill
- Manufacturer: FRANKEN (2615AZ.016)

Processing parameters
- Spindle speed: 2,586 min⁻¹
- Feed rate: 1.034 mm/min
- Cutting depth: 24 mm
- Step over: 16 mm
- Material removal rate: 397 cm³/min

Machinery and general mechanics

- Faster processing
- Higher chip removal rate
- Less vibration and longer machine live time

Challenge part
Böhler K110 1.2379 (X153CrMoV12)
No wear
High dynamics
High accuracy
No backlash

The standard version of the swivelling table is ideally suited to the machining of workpieces in multiple clamping devices.
Direct torque drive technology allows excellent precision and surface finish on the workpiece. The fact that there are no mechanical transmission elements involved in the force transmission means that friction and wear as well as reduction in dynamic and rigidity are things of the past.

All rotary tables are designed and manufactured in-house by GF Machining Solutions.

**Torque drive**

- Experience high dynamics due to no mechanical transmission elements.
- Water cooling ensures optimum heat transfer.
- Fixation damping absorbs stress and vibration.
- Contactless motor system eliminates wear and ensures a long lifetime.

**Automotive**

**PART EXAMPLE**

- Ensure positioning accuracy on five-sided parts.
- Secure repeatability over series production.
- Get ready to rapidly achieve stable quality.

**Process**

- Concentricity challenge
- Dimensions of two holes: <10μm
- Bore length: 2x 150mm
- Warm-up cycle: 30min
- Thermal stability: 24/7
- Repeatability within: 10μm
We have the solution for your needs

Tool magazines

Tool magazine for big capacities
• Disc-type or chain magazine
  Up to 60 tools can be stored in the tool magazine of the machine with no influence on the footprint.
• Tool magazine
  The tool magazine is structured as a circular hanging shelf. Therefore it is almost infinitely scalable. 120, 170 and 220 tool positions are available as standard. Separation of the central gripper from the transfer handling results in a short changing time.

+ Ergonomic and user friendly
+ Ensures productivity and process reliability
+ Parallel machining and tool loading
+ Easy tool loading possibilities thanks to an ergonomic tool loading door

30 tools

60 tools
120, 170 or 220 tools
Circular magazine design with handling system
Clean machining, wet or dry

Adapted chip management

- Solution for high-volume small and light chips with lift-up scraper chip conveyor and coolant unit with fine filtration
- Solution for high-volume steel Milling chips with lift-up scraper chip conveyor and coolant filtration unit

Options

- Through-Spindle coolant
- Wash-down system
- Coolant thermal control
- Oil skimmer

+ Optimum chip flow to steep and smooth cabin walls
+ Wash-down nozzles for all corners to prevent chip accumulation
+ Professional lift-up scraper to transport 43 l/h chips out of the working area
Efficient processing with fast return on investment
Enhance your process beyond program and machine setup

This includes a range of modules collectively referred to under the generic term “smart machine” and that fulfill various functions. In order to make the Milling process “intelligent,” various requirements have to be implemented.

1st is establishing comprehensive communication between man and machine, which makes available precise information that the operator requires to assess the Milling process.

2nd is supporting the operator in the optimization of the process, which considerably improves the performance.

3rd is the machine optimizing the Milling process, which improves process safety and workpiece quality—especially important in unmanned operation.

The facts
+ Greater accuracy in shorter machining times
+ Increase in the workpiece surface quality as well as the surface and shape accuracy
+ Recognition of critical machining strategies
+ Improved process safety
+ Higher availability
+ Better operating comfort
+ Considerable increase in reliability in unmanned operation

+ Produce your workpieces in a process-secure and precise manner.
+ Increase reliability in unmanned operation.
+ Boost the service life of the machine.
+ Significantly reduce production costs.

smart machine construction kit system
Each of the modules fulfills a specific task. Just like in a construction kit, the user can select the modules that seem to him to be the best option for improving his process.

Saving energy
smart machine modules like Econowatt, saving up to 50% energy, are ecological necessities with attractive economic advantages.

Precision
smart machine modules like ITC, OSS and Kinematic opt support the precise base of your machining center to achieve an even more precise final part.

Protection
smart machine modules like PFP protect and extend the lifetime of your machine and tools.

Time
smart machine modules like OSS and software tools such as rConnect boost your productivity. OSS extreme yields up to 24 % more speed with improved surface finish and accuracy.

The facts
+ Greater accuracy in shorter machining times
+ Increase in the workpiece surface quality as well as the surface and shape accuracy
+ Recognition of critical machining strategies
+ Improved process safety
+ Higher availability
+ Better operating comfort
+ Considerable increase in reliability in unmanned operation

+ Produce your workpieces in a process-secure and precise manner.
+ Increase reliability in unmanned operation.
+ Boost the service life of the machine.
+ Significantly reduce production costs.
rConnect comprises GF Machining Solution’s modular digital services. You stay connected with your machine park, at any time and wherever you are. Select the digital service that best fits your individual needs. Our Live Remote Assistance (LRA) supports you in keeping your commitments.

Maximize your uptime
Live Remote Assistance provides you direct access to our expert service engineers with the latest technology. The LRA features audio, video, chat, whiteboard, file transfer, system access and screen sharing by using a Windows tablet or your standard PC.

Increase your flexibility
Know the status of your machines in real time at any location. The rConnect Cockpit is the user interface for your machine operator, maintenance technician or operations manager. It provides the operator with support for daily machine-related activities.

Secure connection based on the latest technology
To ensure your security, an encrypted point-to-point connection is established between your machine and GF Machining Solutions only at your request. Our remote service product is certified with the TÜViT Trusted Product Certificate.
Options

Multiple options to drive your success

Fanuc control system
Reliable and cost-performance CNC with high-end features like NANO interpolation and AI contour control

Performance and reliability
The Fanuc 0i-MD features an ultra-compact design using limited cabling to ensure highest reliability and provide easy maintenance.
Coupled with the latest Fanuc drive technology, the Fanuc 0i-MD ensures smooth machined surfaces by using a much finer resolution for position commands.
## Technical data

<table>
<thead>
<tr>
<th>Machine</th>
<th>Mikron MILL E 500 U</th>
<th>Mikron MILL E 500 U</th>
<th>Mikron MILL E 700 U</th>
<th>Mikron MILL E 700 U</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Axis travel</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lengthwise X mm</td>
<td>500</td>
<td>700</td>
<td>700</td>
<td>700</td>
</tr>
<tr>
<td>Crosswise Y mm</td>
<td>450</td>
<td>600</td>
<td>600</td>
<td>600</td>
</tr>
<tr>
<td>Vertical Z mm</td>
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<td>500</td>
<td>500</td>
<td>500</td>
</tr>
<tr>
<td>Swivel axis °</td>
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<td>-65 / +120</td>
<td>-65 / +120</td>
<td>-65 / +120</td>
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<td>Rotation axis °</td>
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<td>n x 360</td>
<td>n x 360</td>
<td>n x 360</td>
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<tr>
<td>Axes</td>
<td>3+2</td>
<td>5-Axis simultaneous</td>
<td>3+2</td>
<td>5-Axis simultaneous</td>
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<tr>
<td><strong>Spindle</strong></td>
<td></td>
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<tr>
<td>Spindle type</td>
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<td>In-line Motor</td>
<td>In-line Motor</td>
<td>In-line Motor</td>
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<tr>
<td>Max. rotations min⁻¹</td>
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<td>12,000</td>
<td>12,000</td>
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<td>20/88</td>
<td>20/88</td>
<td>20/88</td>
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<tr>
<td>Tool interface</td>
<td>ISO 40 HSK-A63</td>
<td>ISO 40 HSK-A63</td>
<td>ISO 40 HSK-A63</td>
<td>ISO 40 HSK-A63</td>
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<tr>
<td><strong>Travel speed</strong></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Rapid traverse X, Y, Z m/min</td>
<td>30 / 30 / 30</td>
<td>30 / 30 / 30</td>
<td>30 / 30 / 30</td>
<td>30 / 30 / 30</td>
</tr>
<tr>
<td>Rapid traverse B, C min⁻¹</td>
<td>17 / 28</td>
<td>17 / 28</td>
<td>17 / 28</td>
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<tr>
<td><strong>Automation</strong></td>
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<tr>
<td>Tool magazine unit</td>
<td>DT 30 / CT 60</td>
<td>DT 30 / CT 60</td>
<td>DT 30 / CT 60</td>
<td>DT 30 / CT 60</td>
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<tr>
<td>Pallet magazine unit</td>
<td>5 Delphin 400/400 or 5 MTS 400/400 or 7 Dynafix 350/350 or 7 UPC 320/320</td>
<td>5 Delphin 400/400 or 5 MTS 400/400 or 7 Dynafix 350/350 or 7 UPC 320/320</td>
<td>5 Delphin 400/400 or 5 MTS 400/400 or 7 Dynafix 350/350 or 7 UPC 320/320</td>
<td>5 Delphin 400/400 or 5 MTS 400/400 or 7 Dynafix 350/350 or 7 UPC 320/320</td>
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<tr>
<td>Pallet changing time sec.</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>30</td>
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<tr>
<td>Robot interface</td>
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<td>Available</td>
<td>Available</td>
</tr>
<tr>
<td><strong>Rotary swivel table</strong></td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>T-groove table mm</td>
<td>500</td>
<td>500</td>
<td>630</td>
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<tr>
<td>Workpiece weight (3/5) kg</td>
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<td>300 / 200</td>
<td>450</td>
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<tr>
<td><strong>Weight</strong></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Machine weight kg</td>
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<tr>
<td><strong>Control</strong></td>
<td></td>
<td></td>
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<td>iTNC 530 HSCI FS</td>
<td>iTNC 530 HSCI FS</td>
<td>iTNC 530 HSCI FS</td>
<td>iTNC 530 HSCI FS</td>
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<tr>
<td>Fanuc (12,000 min⁻¹)</td>
<td>0i-MD</td>
<td>-</td>
<td>0i-MD</td>
<td>-</td>
</tr>
</tbody>
</table>
Mikron MILL E 700 U with pallet magazine
Mikron MILL E 500 U with pallet magazine and tool magazine 120, 170 or 220 tools

Mikron MILL E 700 U with pallet magazine and tool magazine 120, 170 or 220 tools
GF Machining Solutions

EDM (electrical discharge machining)
AgieCharmilles wire-cutting, die-sinking and hole-drilling machines
For over 60 years we have been at the forefront of every EDM development: designing and refining the EDM process and building machine tools that deliver peerless part accuracies, surface finishes, cutting speeds and process reliability. Today, our AgieCharmilles wire-cutting, die-sinking and hole-drilling machines are recognized throughout the world as the best in the business. Our continuous research and development in digital generator technology, control systems and integrated Automation systems are evidence of our commitment to keeping your EDM operations on the leading edge of technology.

Milling
Mikron MILL S (high-speed Milling), Mikron MILL P (high-performance Milling) and Mikron MILL E (high-efficiency Milling)
Customers operating in the mold, tool and die and precision component manufacturing sectors stake their reputations on being able to quickly and cost-competitively meet their customers’ demands. That’s why they invest in GF Mikron machines. Incorporating the latest and most advanced technologies and premium-performance components, Mikron MILL S, Mikron MILL P and Mikron MILL E machines help you increase your production capabilities and improve your productivity. Designed and built for speed, accuracy and reliability, the machines, like you, are proven performers.

Laser
AgieCharmilles Laser texturing machines
Laser texturing is a fully-digitized surface engineering process that has huge potential. The technology enables precise 2D and 3D textures or engravings to be machined accurately and directly onto complex parts or molds to improve and alter their aesthetic appeal, functionality and performance. The process is infinitely repeatable and offers many distinct environmental and economic advantages over conventional texturing processes.

Laser Additive Manufacturing (AM)
GF Machining Solutions has partnered with EOS, the global leader for high-end AM solutions, to integrate this innovative technology and further develop it into its current solutions to fully benefit the mold industry, by focusing on injection efficiency: optimized cooling design to reduce cycle time, lower energy consumption, higher quality of plastic parts.

Tooling and Automation
System 3R Tooling, Automation and software
Productivity is the key to manufacturing success, and automating a manufacturing process is a proven method of increasing its efficiency, effectiveness, quality and reliability. System 3R’s integrated Tooling, Automation and software solutions ranging from simple workpiece pallet and electrode changers through to flexible manufacturing and robot handling systems are guaranteed to help you increase their competitive advantage.

Customer Services
Operations Support, Machine Support and Business Support
To help you get the most and the best from your machine tools and equipment, we offer three levels of support. Operations Support covers our range of original wear parts and certified consumables (EDM wires, filters, resins, electrodes etc.) to ensure that your machines are performing at the highest levels. Machine Support maximizes, through our best-in-class technical support, preventive services and quality spare parts, your machine tool uptime. Business Support is designed to help you make a real step-change in your productivity and performance with solutions tailored to your specific needs.
GF Machining Solutions

At a glance

We enable our customers to run their businesses efficiently and effectively by offering innovative Milling, EDM, Laser, Additive Manufacturing, Spindle, Tooling and Automation solutions. A comprehensive package of Customer Services completes our proposition.

www.gfms.com