Mikron
MILL S
200 U
Becoming better every day – since 1802

GF Machining Solutions
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 unmatched Electrical Discharge Machining (EDM), Laser texturing, Laser micromachining, Additive Manufacturing and first-class Milling and Spindles to Tooling and Automation, all of our solutions are backed by unrivaled customer service and expert GF Machining Solutions training. Our AgieCharmilles, Microlution, Mikron Mill, Liechti, Step-Tec and System 3R technologies help you raise your game—and our digital business solutions for intelligent manufacturing, offering embedded expertise and optimized production processes across all industries, increase your competitive edge.

We are Mikron Mill.  
We are GF Machining Solutions.
The Mikron MILL S 200 U has been designed for the highest precision and surface quality. These vertical high-speed machining centers are therefore offered for both tool and mold-making and the production of high-quality parts. They incorporate the full technical competence of the Swiss machine manufacturer.

GF Machining Solutions
Applications

Complex parts
Various materials
Watch-making industry / micro mechanics
+ Form and position accuracy
+ Extremely small geometries
+ Part-specific handling systems

Electrodes
Tungsten-copper / graphite
Tool and mold-making
+ Surface quality
+ Dimensional accuracy
+ Very small geometric features

Prostheses and implants
Titanium / CoCr
Medical technology
+ Powerful torque
+ 5-axis simultaneous machining
+ Perfect surfaces and working accuracy

Fluidics
Aluminum
Automobile industry
+ 5-axis simultaneous machining
+ Shortest machining time
+ Excellent surface quality

Reflectors
Powder-metallurgical tool steel
Tool and mold-making
+ 5-axis machining
+ Specular surface quality
Perfect 5-axis machining without restriction.

Drive with ball screw

Drive with linear direct motor
Highlights

Precision and quality for tool- and mold-making, as well as exact parts production

Mikron MILL S 200 U

- Table design as 5 axes
- Robust tool spindle with 50,000 rpm
- Minimal distance from laser to workpiece
- Machine hood for thermal and acoustic insulation
- Tool magazine with 30/60/150 tools
- Suction
- Machine base made of polymer concrete with 3-point assembly
- Automatic table clamping chuck with optional media feedthrough
- Chip tray
- High-performance machine control

Additional features:
- APS (Advanced Process System)
- PFP (Power Fail Protection)
- ITC (Intelligent Thermal Control)
- OSS (Operator Support System)
- RNS (Remote Notification System)
For uncompromising demands. Dynamics and precision brought together in one unit.

Ergonomics
The spacious work area door enables the quick changing of externally equipped workpieces.

Chip management
Machining chips fall into the central chip shaft below the machining table. With low chip volumes, chips are caught in a chip drawer. With high chip volumes, the chips are discharged via an external system together with the cooling lubricant.

Dust management
Machining dust is sucked away centrally below the machining point. Two suction shafts integrated into the machine bed enable a generously proportioned suction cross section.

Short power flow, short tolerance chain
With high-speed milling machines, most important prerequisites for very high precision and surface quality are damping and the stability of the machine structure. The revolutionary axis concept of the Mikron MILL S 200 U therefore consists of the following:

+ Polymer concrete machine base with strong damping properties and heavy static weight
+ Optimized force application and transmission within a slide construction
+ Linear axes with recirculating roller guides 35 mm wide (X, Y, and Z axes)
+ High dynamic rigidity of the linear direct drives
+ Water-cooled direct drives in all axes: X, Y, Z, B, C
+ Highly compact and extremely rigid axis assembly made of steel with thermal conductivity and expansion behavior
+ All guides above the machining area
+ Suction openings for graphite
+ Chip drawer
Heidenhain TNC 640 control

Optimal machining efficiency is at your fingertip

The Heidenhain TNC 640 control provides flexibility and efficiency from job preparation until part is milled. Mounted on a pivot arm to give more operator’s accessibility, the touchable screen allows the operator to quickly navigate through the control. Thanks to an user-friendly and practical interface in combination with several functionalities, the Heidenhain TNC 640 support operators in their daily job giving to them more availability for other tasks.

AMC (Automated Machine Calibration)

Higher precision from the beginning

AMC
Every MILL S 5 axis machine is featuring the new Automated Machine Calibration (AMC). This new calibration tool comes with the complete Calibration Hardware on a pallet and allows calibrating at any time the kinematic of the machine. Program it or release it manually simply by pressing the start button. Beside the machine kinematic, it will also automatically calibrate touch probe and tool measuring system when needed.

Before calibration

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<table>
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<tr>
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<tbody>
<tr>
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<td>0</td>
<td>0</td>
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<tr>
<td>-0.01</td>
<td>-0.01</td>
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After calibration

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<td>0.01</td>
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<td>0</td>
<td>0</td>
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<tr>
<td>-0.01</td>
<td>-0.01</td>
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</table>
smart machine

Enhance your process beyond program and machine setup

The smart machine functionalities gathers a range of modules that offers various features in order to make the Milling process "intelligent."

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

- 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

**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 and OSS support the precise base of your machining center to achieve an even more precise final part.

**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.

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

With the new smart machine package for 5 axis machines GF Machining Solutions combines some of the most powerful smart machine modules for your targeted applications and market needs. This tuning package will support you to get the best out of your machines according to your customer base.

For the 5 axis machines the included AMC extended corrects beside any position errors of the 4th and 5th axis also the angle errors of the swivel and rotary axis.

smart machine classic package

Find your market and tune your machine accordingly
Table variants

As flexible as required

Fully automatic production of small batches
Avoid unproductive periods during the production of small batches through
+ Automated changing of pallets or pallet-bound, part-specific zeropoint clamping systems
+ Automated changing of customer-specific individual parts through the employment of part-specific, zeropoint clamping systems

A solution for all automation projects
Wide selection of simple or complex pallet designs
+ System 3R GPS 120
+ System 3R GPS 120 with up to 4 additional media on the pallet surface (can be activated via the M function and the pressure adjusted variably via the cycle, e.g. for System 3R TwistLock)

Automatic zero-point clamping system for pallets

GPS 120

Options for automatic zero-point clamping systems for customized parts

GPS 120 with 4× media
System 3R TwistLock
Watch plates

Automatically changeable collets
Automatically changeable expanding mandrel
Precision

Core components: Static and dynamic precision

Static precision

Swiss thoroughness
Prior to delivery, each Mikron MILL S machine undergoes a comprehensive quality inspection in our air-conditioned assembly hall according to GF Machining Solutions acceptance guidelines.

Dynamic precision

Position sensor systems
All Mikron MILL S 200 U machines are equipped with direct position sensor systems in the linear and rotary axes as standard.

+ Resolution in the nanometer range
+ Protected by sealing air
Precision

Core components: Thermal precision and component precision

**Thermal precision**

**Cooling concept and reserve capacity**
The Mikron MILL S 200 U leads precision machining into a new era. Sophisticated cooling management for heat discharge of the electrical drive groups.

All linear axes and the circular-swivel unit feature a separate cooling circuit.

Five separate cooling circuits for the motors of the drives in the X, Y, Z, B/C axes, and the spindle motor.

**Component precision**

**Micro machining made easy**
The workpiece and tool measuring systems are especially suited for micro machining.

- Low tactile forces allow for damagefree and highly precise measurement of geometric features
- Precision laser optics for highly precise measurement of very small tool diameters

Low tactile forces and high temperature stability – 0.8 N of tactile force in the Z direction on thermo lock interface (hexagon / m&h)

Precise measurement of very small tool diameters from 25 μm to 20 mm

Primary and secondary part mounted on a large cooling plate.
Automation

More parts in less time at lower costs

With the Mikron MILL S 200 U, automatic production is ensured by the low-cost integration of the pallet magazine.

+ Repetitive machining is executed without interruption in multi-shift operation
+ The machine’s efficiency is increased with an accordingly higher profit
+ System 3R GPS 120 14 pallets
+ System 3R MacroMagnum 12 pallets
+ System 3R Macro 70 20 pallets
+ System 3R Macro 54 20 pallets
+ Erowa ITS 148 12 pallets
+ Erowa ITS 115 14 pallets
Increased profitability is indispensable today
High-tech HSC spindle

Core components of Step-Tec

Tool spindles for demanding machining
With a Mikron MILL S 200 U machine you get the latest tool spindle technology.

+ 50,000 rpm HSK E-32
+ High torque up to 20,000 rpm
+ Low spindle heating increases working accuracy
+ Highly stable double-ceramic hybrid bearings in an “O” configuration for very high radial capacity and rigidity during machining
+ Contact-free 3-chamber labyrinth seal for optimum sealing of the spindle nose
+ Vector control for full torque in the lower speed range
+ Oil/air lubrication system with extraction of the consumed oil
+ Very short acceleration time – 2 seconds from 0 to 50,000 rpm
+ Thread cutting without compensating chuck in steel up to M6 (CK45)

smart machine
Supplied in the package is the APS (Advanced Processing System) smart machine module for the reliable recording and display of vibrations during the milling process.

Step-Tec
Since 1995, Step-Tec has been developing, producing, selling, and repairing precise, high-performance spindles for leading manufacturers of machining centers for milling and drilling applications.

Schematic diagram of three-chamber labyrinth

Contact-free sealing system
Bearings

Environment
Oil chamber

External sealing environment
Oil, oil mist

Internal sealing environment

Finish, dirt, dust

Speed

Since 1995, Step-Tec has been developing, producing, selling, and repairing precise, high-performance spindles for leading manufacturers of machining centers for milling and drilling applications.

Schematic diagram of three-chamber labyrinth

Contact-free sealing system
Bearings

Environment
Oil chamber

External sealing environment
Oil, oil mist

Internal sealing environment

Finish, dirt, dust

Speed
Tool magazine

Tailored to your needs

Tool storage in many configurations
+ Disk magazine with 30, 60 or 150 tool positions
+ Reliable and extremely quick double-gripper change system
+ Chip-to-chip time in 4.4 seconds (TC 30 and 60)
+ Secure orientation of the measuring sensor through a firmly assigned magazine space

Productivity and process safety
+ User-friendly tool feeding
+ Simple feed monitoring through a large glass panel
+ Secure access even during full automation
+ Feeding during machining possible

Double-gripper change system
Chip and dust management

Clean work area

<table>
<thead>
<tr>
<th>Customer requirements</th>
<th>Configuration</th>
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<tbody>
<tr>
<td>Cutting lubricant (Combination)</td>
<td>Autonomous chip volume</td>
</tr>
<tr>
<td>+ Minimal quantity lubrication (MQL) + Air blow off external / dry</td>
<td>Chip drawer with closed bottom part</td>
</tr>
<tr>
<td>+ Emulsion</td>
<td>Small</td>
</tr>
<tr>
<td>+ Dust extraction</td>
<td>Large</td>
</tr>
<tr>
<td>+ Minimal quantity lubrication (MQL) + Air blow off external / dry</td>
<td>Chip drawer with opened bottom part</td>
</tr>
<tr>
<td>+ Supply air</td>
<td>Chips with emulsion</td>
</tr>
<tr>
<td>+ Chips</td>
<td>Chips</td>
</tr>
<tr>
<td>+ Air with dust</td>
<td>Emulsion</td>
</tr>
<tr>
<td>+ Emulsion</td>
<td>Band filter unit 400 l with chip container</td>
</tr>
<tr>
<td>+ Dust extraction</td>
<td>Dust extraction with a suction performance of 1,900 m³ / h</td>
</tr>
<tr>
<td>+ Chip drawer with water-permeable bottom part and integrated fine filter</td>
<td></td>
</tr>
<tr>
<td>+ Chip drawer with closed top layer</td>
<td></td>
</tr>
<tr>
<td>+ Chip drawer with closed bottom part</td>
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</table>
Chips, graphite, emulsion. Always a solution!

Supply air for dust extraction

Suction openings for dust

Drawer with opened bottom part for emulsion operation with large chip volume

Chip drawer with water-permeable bottom part and integrated fine filter
### Technical data

**MILL S 200 U**

<table>
<thead>
<tr>
<th><strong>Workarea</strong></th>
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<tbody>
<tr>
<td>Longitudinal X mm</td>
<td>160</td>
</tr>
<tr>
<td>Cross Y mm</td>
<td>160</td>
</tr>
<tr>
<td>Vertical Z mm</td>
<td>200</td>
</tr>
<tr>
<td>B-axis °</td>
<td>+30/-120</td>
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<tr>
<td>C-axis °</td>
<td>n x 360</td>
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<tr>
<td>Number of simultaneous axis</td>
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<tr>
<th><strong>Feed drive</strong></th>
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<tbody>
<tr>
<td>Feed rate X, Y, Z m / min</td>
<td>42</td>
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<tr>
<td>B, C min⁻¹</td>
<td>150 / 220</td>
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<tr>
<td>Acceleration X, Y, Z m/sec²</td>
<td>up to 14</td>
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<tr>
<td>B, C rad/sec²</td>
<td>up to 165 / 418</td>
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<table>
<thead>
<tr>
<th><strong>Accuracy (Standart)</strong></th>
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<tr>
<td>Accuracy A µ</td>
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<tr>
<td>Repeatability B µ</td>
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<table>
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<tr>
<th><strong>Work table</strong></th>
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<td>Clamping surface mm</td>
<td>according Pal.</td>
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<tr>
<td>Max. table load kg</td>
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<table>
<thead>
<tr>
<th><strong>Tool magazine</strong></th>
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<tbody>
<tr>
<td>Configuration</td>
<td>Positions 30, 60, 150</td>
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<table>
<thead>
<tr>
<th><strong>Weight</strong></th>
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<tbody>
<tr>
<td>Including Pallet magazine approx. kg</td>
<td>3600</td>
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<table>
<thead>
<tr>
<th><strong>Options</strong></th>
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<tbody>
<tr>
<td>Laser Tool Measuring</td>
<td>+</td>
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<tr>
<td>Coolant tank 80l / 400l</td>
<td>+</td>
</tr>
<tr>
<td>Mist extraction</td>
<td>+</td>
</tr>
<tr>
<td>Dust extraction</td>
<td>+</td>
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<table>
<thead>
<tr>
<th><strong>Spindle</strong></th>
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<tr>
<td>50'000 rpm Power 40% ED kW</td>
<td>8.5</td>
</tr>
<tr>
<td>HSK E32 Torque 40% ED Nm</td>
<td>3.4</td>
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<table>
<thead>
<tr>
<th><strong>Pallet magazine</strong></th>
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<tbody>
<tr>
<td>GPS 120 Pallet</td>
<td>14</td>
</tr>
<tr>
<td>MacroMagnum, Macro 70, 54 Pallet</td>
<td>14, 20, 20</td>
</tr>
<tr>
<td>ITS 148, 115 Pallet</td>
<td>12, 14</td>
</tr>
</tbody>
</table>
Tailor-made equipment

Options

- External coolant supply via two nozzles
- Spray ring with up to nine individually adjustable nozzles
- Coolant tank 80 l
- Rotating window
- Mist extraction
- Dust extraction
- Air through spindle/spindle slots
- Automation interface
- Touch probe m&h 40.40 LF/TI
- Touch probe Renishaw OMP400
- Signal lamp

Heidenhain TNC640
About GF Machining Solutions

Multi–technology solutions provider

Our commitment to you and your specific applications is proven by the value-adding intelligence, productivity and quality delivered by our multi-technology solutions. Your success is our chief motivator. That’s why we are continuously advancing our legendary technical expertise. Wherever you are, whatever your market segment and whatever the size of your operation, we have the complete solutions and the customer-centric commitment to accelerate your success—today.

EDM (Electrical Discharge Machining)

Wire-cutting EDM
GF Machining Solutions’ wire-cutting EDM is fast, precise and increasingly energy efficient. From ultraprecise machining of miniaturized components down to 0.02 mm to powerful solutions for demanding high-speed machining with respect to surface accuracy, our wire EDM solutions position you for success.

Die-sinking EDM
GF Machining Solutions is revolutionizing die-sinking EDM with features like iGAP technology to dramatically boost machining speed and reduce electrode wear. All of our die-sinking systems offer fast removal and deliver mirror finishes of Ra 0.1 μm (4 μin).

Hole-drilling EDM
GF Machining Solutions’ robust hole-drilling EDM solutions enable you to drill holes in electrically conductive materials at a very high speed—and, with a five-axis configuration, at any angle on a workpiece with an inclined surface.

Milling

Precision tool and mold manufacturers enjoy a competitive edge with our Mikron MILL S solutions’ fast and precise machining. The Mikron MILL P machines achieve above-average productivity thanks to their high performance and Automation. Customers seeking fastest return on investment benefit from the affordable efficiency of our MILL E solutions.

High Performance Airfoil Machining
Our Liechti turnkey solutions enable the highly dynamic manufacturing of precision airfoils. Thanks to the unique performance and our expertise in airfoil machining, you increase productivity by producing at the lowest cost per part.

Laser texturing
Aesthetic and functional texturing is easy and infinitely repeatable with our digitized Laser technology. Even complex 3D geometries, including precision parts, are textured, engraved, microstructured, marked and labeled.

Laser micromachining
GF Machining Solutions offers the industry’s most complete line of Laser micromachining platforms optimized for small, high-precision features to meet the increasing need for smaller, smarter parts to support today’s leading-edge products.

Laser Additive Manufacturing (AM)
GF Machining Solutions and 3D Systems, a leading global provider of additive manufacturing solutions and the pioneer of 3D printing, have partnered to introduce new metal 3D printing solutions that enable manufacturers to produce complex metal parts more efficiently.

Milling Advanced manufacturing

Digitalization solutions
To drive its digital transformation, GF Machining Solutions acquired symmedia GmbH, a company specialized in software for machine connectivity. Together, we offer a complete range of Industry 4.0 solutions across all industries. The future requires the agility to adapt quickly to continual digital processes. Our intelligent manufacturing offers embedded expertise, optimized production processes, and workshop Automation: solutions for smart and connected machines.

Tooling and Automation Software Service + Success

We take you to new heights
Our Success Packs are designed to maximise your return on investment and empower you in your quest for success across all industrial segments. Our subscription packs feature a comprehensive range of services that guarantee the access and support you need to get the most out of your assets today, while preparing for the challenges of tomorrow. Our trusted experts backed by our latest cutting-edge, intelligent Digital Solutions, provide a full range of services.
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 services completes our proposition.

www.gfms.com