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.

+ We are Mikron Mill.
+ We are GF Machining Solutions.
The Mikron MILL P 500 U / 800 U are 5-Axis high performance machines for both precision part manufacturers active in the aerospace, machinery and defence industries, general mechanic industries and precision mold makers active in industries such as automotive and home appliance.
Market segments and applications

Mold and Die

Automotive

Home appliances
Part production

General machinery

Aeronautics and Power generation
Technology

High-Performance Milling: Powerful parts and tools machining

+ High material removal rate
+ Performant with tough materials
+ Dynamic Milling of heavy duty parts
+ Meant for productive purpose

Accurate parts achieved with dynamic performance
Solutions

Productive and accurate machining of parts up to 800 kg

+ Gantry concept with shortest force flow which results in outstanding machining stability
+ Solid, vibration-damping machine bed
+ Thermo-symmetrical design and water-cooled components for long-term accuracy
+ Extremely compact construction
+ Big work area with user-friendly access
+ Step-Tec Spindle with powerful and flexible power/speed range characteristics
+ Wide range of compact tool magazines
+ Machine and Spindle Protection (MSP) along all axis
+ Integrated or third-party Automation in smallest footprint
+ Siemens or Heidenhain control enhanced by GF’s smart machine
+ Integral connectivity opening the path to Internet of Things integrations
+ Ready for modular digital services

• Ensures best-in-class accuracy on parts and process reliability
• Provides highest business efficiency from multiple setups to automated production, through dynamic machining
• Achieves state-of-the-art productivity by maximizing uptime, from setup to maintenance through process control
MSP
Machine and Spindle Protection

The world’s only Spindle protection that works in all directions

Collisions usually occur when a new computer numerical control (CNC) program is first executed. MSP offers the best security for this.

How it works
The Spindle is deflected when the force acting on the tool during a collision would damage the Spindle bearing. With this deflection, the axis drives gain the space required for automatic emergency braking. Braking distance depends on travel speed and is allowed within the clearance gained. Thus, damage-free braking is made possible up to 12 m/min. MSP works regardless of direction and with no impact on machining speed in most materials.

Use the M-function M304 to simply run the machine within the safe speed limits (e.g., first run of a machining program): up to 12 m/min. along X, Y, Z linear axes and up to 2,250°/min. respectively 3,150°/min along A- resp. C-rotary Axis. After it has successfully run through the process, the fast feed rate limitation can be disabled with M305.

The protection is always active even if the machine runs faster than 12 m/min., and the maintenance-free MSP system works without wear.

With the M304 function activated, the Spindle is damage-free during a tool or toolholder collision, and all crash events. M304/M305 events are duly recorded within the CNC.

Statements
Insurances company:
“In a machine lifetime there are in average 2-3 spindle crashes.”

Finance department:
“The investment into MSP is paid off already with the first spindle crash.”

Relaxed operators:
“It really works.”

Facts
• Protected machine geometry
• Reduced machine downtime
• Full cost control
• Reduced machine-breakage insurance premium
• To restart after crash only 10 min production interruption

• The protection is always active
• Available on 20,000 min⁻¹ Spindle
• Unlimited roughing performance
• M304/305 safety speed limit
  - X/Y/Z axes up to 12 m/min./472 in/min
  - C axis up to 3,150°/min. (8.75 min⁻¹)
  - A axis up to 2,250°/min. (6.25 min⁻¹)
Crash protection by MSP
Machine and Spindle Protection in every direction

Verify geometrical accuracy with KinematicsOpt or other tools

+ Same Spindle without repairs
+ Without machine realignment
+ Without machine downtime

- Spindle damaged
- Machine geometry misaligned
- Machine downtime
- Significant costs

This part was machined after 200 crashes
smart machine

Enhance your process beyond program and machine setup

This includes a range of modules that are collectively referred to under the generic term “smart machine” and that fulfill various functions. For the Milling process to become intelligent, it must:

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

... support the operator in the optimization of the process, which considerably improves the performance.

... optimize the Milling process, which improves process safety and workpiece quality—especially important in unmanned operation.

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 fits best to improve his process.

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

Also available in Heidenhain

KinematicsOpt, Power Fail Protection (PFP), Adaptive Feed Control (AFC), DXF file import, DNC remote network access on control

Included in Siemens control

MDynamics

Precision

ITC, OSS and KinematicsOpt support the precise base of your machining center to reach an even more precise final part down to 2 μm.

Protection

MSP, PFP or ISM protect and extend the lifetime of your machine and tools.

Time

OSS, ISM and software tools such as rConnect boost your productivity. OSS Extreme = Up to 24% faster with improved surface finish and accuracy.

Saving energy

Econowatt saving up to 50% energy, is a ecological necessity with attractive economic advantages.
Simply better results with the smart machine

- Intelligent Thermal Control: With ITC the machine has the thermal process knowledge. Automatic recalibration.
- Intelligent Spindle Monitoring System: React adequately to the given situation.
- Machine and Spindle Protection: The intelligent system adjusts as necessary for the workpiece.
- Econowatt: Saving energy: an ecological necessity and an economic advantage.
- Operator Support System: The intelligent system adapts the dynamic behavior exactly as necessary for the workpiece.
- Power Fail Protection: Protects against power failures and voltage drops through a controlled process.
- Surface Quality: Accuracy, Time, Surface Quality, and Surface Accuracy.
Accuracy and productivity from base machine

The benchmark for precision machining and agile productivity

+ ±2 μm precision in X/Y plane
  Constant dimensional precision and 24/7 process reliability

+ 365 days per year flexibility
  Dynamic machining and broad performance versatility

+ ~10 minutes to resume full production
  after a crash thanks to Machine and Spindle Protection (MSP)

+ 250 percent higher productivity
  Increased profit thanks to integrated Automation

+ Your most competitive business center
- Lower production costs through a reliable and dynamic machine on a small footprint
Automation

Automated pallet handling: ideal accessibility to the workpiece

The Mikron MILL P 500 U / 800 U machines have been designed to accommodate automated pallet handling.

In the loading station, the raw parts are set up on the pallet while the machine is machining the workpiece on the other pallet. This greatly increases the productivity of the machine.

+ Very good access to the workpiece
+ The pallets in the loading station can be manually rotated 360 degrees.

Small footprint
24/7 production
Efficient machining for highest productivity
Best total cost of integration and ownership

To increase your autonomy, there are very compact pallet magazines available which can be loaded with up to 12 pallets with optimal ergonomics.

+ With every Automation solution the pallets can be loaded up to 500/600 kg
+ Multiple workpieces in the pallet magazine require multiple tools
+ The three pallet dimensions are available with thread holes
+ Additionally, the sizes 500 x 630 mm and 500 x 500 mm come with T-slots
+ Optionally, the pallet in the loading station can be hydraulically raised for manual rotation
+ 30 to 245 tools can be selected with this scalable solution

Standardized robot interface

The Mikron Mikron MILL P 500 U / 800 U can be linked to System 3R robot systems as well as operated with robot systems from other well-known suppliers.

Regardless of the handling system used, the machine offers comfortable accessibility when integrated into a line.

Direct robot loading
Loading station
Mikron MILL P 800 U

Pallet magazine
Mikron MILL P 800 U
Table variants, Tooling and Automation

As flexible as needed

Mikron MILL P 500 U
200 kg

Mikron MILL P 500 U
400 / 600 kg

Mikron MILL P 500 U
Table
Ø 500 mm

Mikron MILL P 800 U
500 kg

Mikron MILL P 800 U ST
800 kg

Mikron MILL P 800 U
Table
Ø 500 mm
Ø 631 mm

System 3R GPS 240
240x240 mm

EROWA UPC
320x320 mm

System 3R Dynafix
280x280 mm
350x350 mm

EROWA MTS
400x400 mm

System 3R Delphin
400x400 mm

7 Pallets
7 Pallets
7 Pallets
5 Pallets
5 Pallets

16  Mikron MILL P 500 U / 800 U
High-tech Spindles

Tool Spindles for demanding machining

**OptiCool**
Step-Tec’s OptiCool Spindle series ensures not only that the Spindle remains thermally stable, but that natural heat transfer to the Spindle support (e.g., Z-Axis) is limited to the lowest amount possible, in order to preserve the machine’s geometry.

**CoolCore**
Where conventional stator cooling reaches its limits, Step-Tec’s CoolCore Spindle goes beyond the ordinary to lower the temperature and minimize temperature fluctuations in the rotating shaft.

### OptiCool
- Precise high-performance
- Available with or without internal coolant supply
- Compressed air blow through Spindle

### CoolCore
- Cooled shaft reduces the natural thermal shaft growth by half
- Greatest thermostability and highest precision due to lower temperature fluctuations down to the tool tip
- Significant reduction of thermal recovery time resulting in a productivity gain

### Additional advantages of CoolCore
- Satisfies the toughest requirements in surface finish, repeatability and reliability

### 20,000 min⁻¹ / HSK-A63
- Precise high-performance
- Available with or without internal coolant supply
- Compressed air blow through Spindle

### 28,000 min⁻¹ / HSK-A63
- Water-cooled rotor shaft (CoolCore) which stabilizes the temperature and consequently the expansion in the rotor shaft
- Very accurate machining, because it minimizes thermal influences of the Spindle
- Through-tool coolant is an available option

### 36,000 min⁻¹ / HSK-E50
- Precise high-performance for use in the tire mold field
- Available with or without internal coolant supply (TSC)
- Compressed air blow through Spindle

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**The Spindle is the heart of our machines.**
Beyond Step-Tec Spindle performance, we ensure a comprehensive set of services and maintenance options. Ask us.

Check our website: [www.step-tec.com](http://www.step-tec.com)
Chip management

Clean machining, wet or dry

Optimum chip clearance due to steep, smooth cabin walls. Washer jets prevent chip accumulation.

• Reliable production process through a trouble-free chip flow

Adapted chip management

• Solution for high-volume aluminum Milling chips. With slat band lift-up chip conveyor and coolant unit with fine filtration
• Solution for high-volume steel Milling chips with scraper lift-up chip conveyor and coolant filtration unit

Options
• Through-Spindle coolant
• Wash down system
• Coolant thermal control
• Oil skimmer
Dynamic and stable
Easy to use
Tool magazines

Rapid tool provision

- Better overview allows faster preparation and maintenance
- Whatever your requirement, the most suitable tool magazine is available

All tools visible

Tools are visible through a window on the front of the magazine. Damaged tools can be quickly identified and replaced. If tools are required on other machines, you can see straight away where each tool is.

Smooth and swift

The magazine chain (60 tools) is moved and positioned by a controlled drive. The tools therefore glide swiftly and smoothly to the changing position. This means that tools can be made available much more quickly. Vibrations that could have a negative impact on the Milling process are also prevented.

HSK-A63
- Up to 80/160 mm diameter
  (depending on magazine type)
- Max. length 350 mm

30 tools

60 tools

120 - 215 tools

245 tools

• Better overview allows faster preparation and maintenance
• Whatever your requirement, the most suitable tool magazine is available
Mikron MILL P 500 U - Tire mold dedicated package

Ready for tire mold production

Better fit with tire mold parts and applications
Tires must be produced in narrower geometric tolerances in order to generate less friction and reduce fuel consumption and CO2. To make that possible, the molds for these “green” tires must be made on a machine that fulfills the certain precision and surface quality requirements. The size of the machine in combination with high axis feed rate, a high-dynamic rotary tilting table and a high-speed Spindle give this machine the ability to deliver best surface finish on precise tire molds.

+ Slim shape tilt rotary table for small interfering contour when Milling slots on the edge of the mold segments with highest dynamic 75 / 120 rpm by 55 rad/s² / 130 rad/s²
+ Travel with 36,000 min⁻¹ Step-Tec-Spindle: 75-625 mm above table surface
+ Workpiece up to 150 kg and up to Ø 860mm, fitting for not only segments but also complete side walls machining in aluminum and steel
+ Heidenhain TNC 640 control in combination with a CAD/CAM system from OPEN MIND is an excellent solution

Improved productivity: one-touch strategy
Thanks to our Step-Tec Spindle, your process goes from roughing to finishing on the same machine, in a single process step.
+ 36,000 min⁻¹ / 21.3 Nm Step-Tec Spindle for performance machining up to high-speed applications
+ Fully automated tool changer with 30 positions up to 290 mm tool length

Dry or wet machining: dedicated environments
The integrated dust extraction system for resin machining and dedicated Knoll chip management provide a tire mold machining-ready environment.
+ High-efficiency dust extraction system for synthetic materials, with air return (closed loop system)
+ Slim Spindle nose shape for best access to the workpiece with dust extraction fully integrated in the Z sledge for best results
+ Reliable high-performance chip management for all steel/aluminum applications with lots of options

• The ideal solution answering to the latest tire performance regulatory requirements
• The only machine allowing a smooth evolution from indirect wood (resine) positive to direct aluminum/steel mold Milling
• The Milling dedicated package for tire mold production is part of GF Machining Solutions dedicated offer: From Laser to EDM, through Automation for above-average performances and profits

Complete solutions – for you
Dedicated option for perfect dust removal through the Z sledge

Closed loop suction system

+ The tire-mold-dedicated dust suction system collects the dust right at the source
+ Suction nozzle in plastic with pipe diameter of 200 mm surrounding the Spindle nose
  It can be trimmed if necessary
+ Equiped with a clean air return and provides constant airflow in the work area
Mikron MILL P 800 U ST - Milling and Turning


Quick and precise
Complete machining on the Mikron MILL P 800 U ST quickly produces more accurate workpieces. Unnecessary rechucking results in a more precise runout, faster workpiece handling and setup time.

Most compact
Reduced investment and operating costs, thanks to space-saving, complete machining center.

Perfect Automation
Optimal integration into production thanks to various Automation solutions compatible with the Mikron MILL P 800 U series either from the front or from the back.

Quality
Simultaneous turning allows a permanent positioning of the tool in its optimal cutting position, perpendicular to the workpiece surface. This ensures the best precision and surface quality.

Productivity
Automated pallet handling without restriction of access to work area.
The pallet changer passes through the machine.

Complete and automated simultaneous machining in one setup

- Meet challenging requirements in an easier and faster manner: Reduce your setup hurdle by more than 50% and convert it into billable production time
- Reduce your cost: Rough faster by turning while achieving savings on tool cost with a ratio of 1/100
- No compromise on process productivity and precision: Our safe enclosure does not impact the axis motion performance: 1.7g all the way!

Production service package
Specific services and maintenance options are to be considered for this solution, in relation to safety and continuous operation matters.
Ask us.
Visit our website: www.gfms.com
Options

Geared up for a multitude of options

- Infrared touch probe
- Laser measuring system
- Minimum quantity cooling lubrication
- Through-Spindle cooling
- External coolant supply
- Optional nozzle ring
- Flushing nozzle system
- Band filter system
- Lift-up slat band chip conveyor or lift-up scraper type chip conveyor
- Coolant thermal control
- Mist extraction
- Automatic cabin roof
- Rotating viewing window
- Signal light
- MSP (Machine and Spindle Protection)

ISM Econowatt
ITC
ITC 5X
OSS
OSS extreme
PFP
RNS
smart machine
System 3R - Pallet and tool management software

**JTM**

**JobToolManager**

User friendly software for one machine with integrated pallet changer.
Assign NC programs to pallet position by drag and drop on a touch screen, close to the pallet changer.

**Advantages**

+ Easy to change priorities when the machine is working
+ Add or remove jobs while machining
+ Jobs where cutters are missing will not be started
+ Estimated and present machining time for the magazine content are calculated.

**Assign NC file, check tool capacity, schedule**

By selecting the NC program, JobToolManager registers the tools used in the program.
Time is stored if the NC program defines the time for the entire machining or if each tool has its use time.

If the program has been used earlier, it automatically displays the last recorded time.

**Manage tools upon jobs to be done**

Each time a new job is started, JobToolManager checks the machine tool table to see the availability of tools.
If a tool is broken and no sister tool is available, will the job be blocked.
# Technical data

## Mikron MILL P 500 U

<table>
<thead>
<tr>
<th>Working range</th>
<th>Mikron MILL P 500 U</th>
<th>Mikron MILL P 800 U</th>
<th>Mikron MILL P 800 U ST</th>
</tr>
</thead>
<tbody>
<tr>
<td>Longitudinal / Cross / Vertical X x Y x Z mm</td>
<td>500 x 600 x 450</td>
<td>800 x 800 x 550</td>
<td>800 x 800 x 550</td>
</tr>
<tr>
<td>A-Axis °</td>
<td>+91/-121°</td>
<td>+91/-121°</td>
<td>+91/-121°</td>
</tr>
<tr>
<td>C-Axis °</td>
<td>n x 360°</td>
<td>n x 360°</td>
<td>n x 360°</td>
</tr>
<tr>
<td>Number of simultaneous axes pce.</td>
<td>5/5 simultaneous</td>
<td>5/5 simultaneous</td>
<td>5/5 simultaneous</td>
</tr>
</tbody>
</table>

## Feed Drives

<table>
<thead>
<tr>
<th>Feed rate / (D) Rapid traverse X, Y, Z m/min</th>
<th>A, C min⁻¹</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>45 / (61)</td>
<td>25, 35 / (50, 60)</td>
<td>45 / (61)</td>
<td>25, 35 / (50, 60)</td>
</tr>
</tbody>
</table>

## Working spindle (40% ED, S6)

| 20,000 min⁻¹, HSK-A63 / HSK-T63 kW/ Nm | 36 / 120 | 36 / 120 | 36 / 120 |
| 28,000 min⁻¹, HSK-A63 kW/ Nm | - | 36 / 36 | - |
| 36,000 min⁻¹, HSK-E50 kW/ Nm | 33 / 21 | 33 / 21 | - |

## Accuracy XYZ ISO 230-2(97)

| Accuracy A μ | 8 | 8 | 8 |
| Repeatability R μ | 5 | 5 | 5 |

## Work table

| Clamping surface Ø mm | 500 | 500 / 631 | 550 / 730 |
| Peak torque C-Axis Nm | - | - | 1750 |
| Max. workpiece weight kg | 200 / 400 / 600 | 500 / 800 | 800 |

## Automation

| Tool magazine Positions | 30, 60, 120, 170, 215 | 30, 60, 120, 170, 215 | 60, 120, 170, 215 |
| Laser tool measurement | Option | Option | Option |
| Infrared touch probe Option | Option | Option | Option |
| Pallets (see page 16/17) pce. | 4, 5, 7 | 2, 7, 9, 12 | 2, 7, 9, 12 |

## Weight

| Machine weight (60 tools) kg | 11,100 | 15,500 | 16,500 |

## Options

| MSP Machine and Spindle Protection | + | + | + |
| Coolant sump, chip conveyor | + | + | + |
| Minimum-quantity cooling lubrication | + | + | + |
| Mist extraction unit, etc. | + | + | + |
| Compressed air blow through Spindle | + | + | + |

## Ancillary services

| Programming courses | + | + | + |
| Technology courses | + | + | + |
| Service training courses | + | + | + |

## Control unit

| Heidenhain TNC 640 | + | + | + |
| Siemens 840D sl | + | + | + |
Mikron MILL P 500 U - Workarea

Ø 707 mm

Spindles

20,000 min⁻¹
HSK-A63
HSK-T63

28,000 min⁻¹
HSK-A63

36,000 min⁻¹
HSK-E50

Mikron MILL P 800 U - Workarea

Ø 860 mm

Spindles

20,000 min⁻¹
HSK-A63
HSK-T63

28,000 min⁻¹
HSK-A63

36,000 min⁻¹
HSK-E50
Mikron MILL P 500 U / D

30 / 60 tools

Robot

Mikron MILL P 500 U

120-215 tools

Mikron MILL P 500 U / D

30 / 60 tools

Robot

Mikron MILL P 500 U

120-215 tools
Mikron MILL P 500 U
5/7 pallets
120 - 215 tools

Mikron MILL P 500 U
4 pallets
120 - 215 tools
Customer Services

New digital service possibilities

GF Machining Solutions Customer Services continues to push technological boundaries to deliver the future of services to you—today.

rConnect is the digital services platform available for all GF Machining Solutions technologies. Following a modular approach, rConnect comprises a range of services that empower you to increase your manufacturing productivity. Certified with the TÜV IT Trusted Product Certificate.

rConnect Messenger, we deliver machine data to your mobile device to keep you constantly informed about your production. You can supervise your workshop from your smartphone.

rConnect Live Remote Assistance (LRA), our expert engineers rapidly respond to your service requests. LRA allows effective face-to-face assistance using audio, video, chat and many more functionalities.
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.

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 their unique performance and our expertise in airfoil machining, you increase productivity by producing at the lowest cost per part.

Spindles
As part of GF Machining Solutions, Step-Tec is engaged in the very first stage of each machining center development project. Compact design combined with excellent thermal and geometric repeatability ensure the perfect integration of this core component into the machine tool.

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.

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.
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