Mikron

High-speed Milling graphite solutions
Passion for Precision

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 Services 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.
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Based on Mikron MILL S and HSM machines, the GRAPHITE series is dedicated to the machining of glass molds and electrodes. From information and communications technology (ICT) and automotive to electronic components, manufacturers must cope with a variety of graphite machining challenges. These range from material specifications to requirements for highest precision and surface quality. Whatever your application, GF Machining Solutions has the right solution.
Market segments and applications

Glass molds

High quality graphite molds to shape the glass for ICT and automotive markets

The emergence of new end products, like high-end curved touch screens, requiring molded glass drives an increasing need for machining of graphite molds—an application that presents specific manufacturing challenges in terms of precision, surface finish, and long machining times.

Challenges

Molds for glass manufacturing are made of graphite and present their own distinct manufacturing challenges. They require up to ±5 μm precision, Ra 0.4 μm surface finish and as many as five hours of machining (depending on the application) in wet or dry conditions. These molds must have absolutely no milling marks.

Solution

GF Machining Solutions’ Milling machines ensure the process stability, parts quality and shop floor productivity to support machining of graphite molds for glass end products.

As ambient workshop temperatures fluctuate and machining speed changes, process stability is maintained, due to Mikron Mill machines’ intelligent thermal management system and thermostabilized machine body.

Step-Tec’s completely tight Spindle brings the precision and stability to the tool tip.

ICT

Automotive
Electrodes

Fast production of electrodes for subsequent EDM process

Graphite machining has never been so attractive—and challenging. Precise graphite electrodes boost die-sinking electrical discharge machining’s productivity and reduce costs.

**Challenges**
Manufacturers require speed in their mold manufacturing as lead times are becoming shorter; automated and reliable processes are requested to maintain precision, flexibility, higher productivity and reduce the cost per electrode.

**Solution**
GF Machining Solutions’ Milling machines are genuine high-speed Milling solutions due to both their high-speed Spindle and their unparalleled process dynamics. This is enhanced by integrated Automation from GF Machining Solutions, positioning mold makers for above-average agility, productivity and return on investment.

Furthermore, these solutions deliver more process capabilities, allowing mold makers to machine graphite and a wide variety of other materials.
Mikron MILL S 400 / 500 GRAPHITE

Fast track – no trace

Master precision over time and perfect surface finish on 3D graphite mold

Drive your graphite business to meet the challenging and booming demand of graphite molds for glass end products. Demand for high-end, glass touch screens is soaring due to the emergence of new information and communications technology (ICT) products such as smart phones featuring near field communication (NFC) and wireless battery loading.

- **Ra 0.4 µm** surface finish, no milling marks
- **± 5 µm** accuracy
- **25%** higher productivity vs. well-known competitors
- **24/7** reliable process with ±1 µm repeatability thanks to S3R reference systems
Dry and wet machining

Beyond the market requirements, operating a graphite machining shop presents specific challenges.

Establishing a process, ensuring its stability, and sustaining productivity while reducing running cost are paramount. Furthermore, maintaining a clean environment is necessary for both process quality and employees’ health.

GF Machining Solutions offers two different solutions to best suit your specific environment and process requirement.

**Dry**

- Increased tool lifetime, reduced cost
- Clean process
- Dust-free air
- Also capable of copper and hard milling
- 450-liter filter system

**Wet**

- Well-established process
- Simple and compact solution
- Free of graphite slurry accumulation

**Benefits**
Graphite machining has never been so attractive—and challenging. While graphite electrodes boost die-sinking electrical discharge machining’s (EDM’s) productivity and reduces costs, the graphite-based glass mold market is quickly growing, with new requirements in terms of surface finish, precision and machining speed.

The HSM 500 Graphite provides the ideal answer to these challenges. It combines the well-established HSM 500 that set a benchmark in terms of speed and surface finish with a dedicated high-precision Step-Tec Spindle. Additional benefits are its improved dust exhaust unit in a black enclosure and integration of the System 3R WPT1+.

The fast-track machine has been transformed into the perfect graphite solution that leaves no trace on your parts or in your workshop.

40% cost reduction per part vs. well-known competitors

± 7 µm accuracy

24/7 reliable process with ±1 µm repeatability thanks to S3R reference systems
Automated processes

Highest productivity and flexibility per $m^2$

24/7 reliable automated process

WPT1+ with up to 70 pallets
1x HSM 500 GRAPHITE
= 10.4 $m^2$

2x more production capacity

WPT1+ with up to 70 pallets
2x HSM 500 GRAPHITE
= 18.5 $m^2$

+100% more flexibility

WPT1+ with up to 70 pallets
1x HSM 500 GRAPHITE
1x FORM P 350
= 19.5 $m^2$
Dust extraction

**Up to 2940 Pa suction**
**3600m³/h**

- Clean processing
- Clean environment
- Reliable Machining
High-speed Step-Tec Spindle

42,000 / 30,000 min⁻¹
High speed, precision

**Benefits**

+ Best thermal stability and polar temperature behavior with less than 1.7 K around the Spindle mantle thanks to sophisticated design and OptiCool principle (OCS)
+ Dust dry Spindle nose
+ Consistently high surface quality thanks to Intelligent Spindle Monitoring (ISM). It constantly monitors vibrations along each axis as well as temperatures of hot spots (bearings, motor) and ambient air.

**Spindle nose**
**Twin-air sealing system**

- Protecting air
- Dirt
- Oil

### Dimensions
- Ø 140 mm x 492 mm

### Tool Interface
- HSK-E40 DIN69063-1

### Power (S6)
- 13.5 kW

### Torque (S6)
- 8.8 Nm

### Speed max.
- 42,000 min⁻¹ / 30,000 min⁻¹

![Graph showing power and torque vs. speed](image)
EDM and Customer Services

Our Solutions – for you

Increase your productivity and optimize your costs and time.

Graphite’s extraordinary characteristics make it the perfect material for electrodes and glass molds. Graphite is largely used for electrical discharge machining (EDM) in production and other applications fields like mold making, general engineering and micromachining. It offers many advantages, including low wear, easy machining and thermostability to provide very high cost-effectiveness.

GF Machining Solutions offers various grades of graphite with a wide range of performance characteristics. Each grade can be dedicated to a specific range of applications.

Achieve high performance, extend the scope of your parts production operations, take on new applications, and enjoy vast Automation capability with the AgieCharmilles FORM P 350.

GF Machining Solutions’ die-sinking EDM know-how is fully embedded in the FORM P series through its EDM process management.

The die-sinking iGAP feature varies spark power between the fronts and sides of electrodes to enable outstanding material removal and push your productivity ahead.
For a single machine with integrated Automation

**Job Tool Manager (JTM) - bring agility back to the shop floor**

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 register the tools used in the 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, the job will be blocked.
Intelligent Manufacturing Solutions from CAD to part

T.R.U.E. PRECISION

Just as GF Machining Solutions’ rConnect platform leverages connectivity-enabled machine communication to deliver machine data to your mobile device to ensure access to our remote service centers, our innovative, intelligent T.R.U.E. (True Response to User Expectation) PRECISION fully digital manufacturing solution accelerates your Industry 4.0 readiness—today. With our proprietary Multi-Process Preparation (MPP) software component at its heart, T.R.U.E. PRECISION optimizes your die-sinking electrical discharge machining (EDM) process based on the real 3D shape of the electrode. Experience a highly accurate, fully predictable machining process that yields greater accuracy with T.R.U.E. PRECISION.
T.R.U.E. PRECISION

True Response to User Expectation
T.R.U.E. PRECISION is an innovative manufacturing solution for optimizing the die-sinking EDM process based on true geometry of the electrode. T.R.U.E. PRECISION ensures perfectly secure digital data utilization through an uninterrupted workflow for highest accuracy and consistency, from CAD and computer-aided manufacturing (CAM) to execution of the final part.

MPP

Multi-Process Preparation
MPP solves the significant manufacturing challenge of complete process chain optimization and gives you full control of your DSEDIM process. In just six steps, MPP outlines the full DSEDIM tool or part production process and, based on the 3D geometry of the truly active portion of the electrode, enhances your die-sinking EDM process to advance your efficiency, productivity and quality.

Your benefits
- High accuracy due to true digital geometry of electrode
- Predictable machining time
- Simulation and time/cost overview
- Optimized and increased the electrode usage
- Optimized machining sequence for each electrode
- Improve quality with the digital process with an accurate offset measurement within 2 μm
- Optimization of the die-sinking EDM process based on the true geometry of the electrode
- Best use of the Milling/die-sinking EDM ratio
rConnect: Live Remote Assistance

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.
## Technical data

<table>
<thead>
<tr>
<th>Machine</th>
<th>Mikron MILL S 400 GRAPHITE</th>
<th>Mikron MILL S 500 GRAPHITE</th>
<th>Mikron HSM 500 GRAPHITE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Basic machine</strong></td>
<td>Linear drives, Ambient robust</td>
<td>Linear drives, Ambient robust</td>
<td>Ball screw</td>
</tr>
<tr>
<td><strong>Work area</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Longitudinal X mm</td>
<td>500</td>
<td>500</td>
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<tr>
<td>Lateral Y mm</td>
<td>450</td>
<td>450</td>
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<tr>
<td>Vertical Z mm</td>
<td>360</td>
<td>360</td>
<td>350</td>
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<tr>
<td><strong>Feed rate</strong></td>
<td>Rapid traverse X, Y, Z m / min</td>
<td>61</td>
<td>61</td>
</tr>
<tr>
<td><strong>Working spindle (40% ED, S6)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>42,000 min⁻¹, HSK-E40 kW / Nm</td>
<td>13.5 / 8.8</td>
<td>13.5 / 8.8</td>
<td>13.5 / 8.8</td>
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<tr>
<td>30,000 min⁻¹, HSK-E40 kW / Nm</td>
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<td>13.5 / 8.8</td>
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<tr>
<td><strong>Work table</strong></td>
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<td></td>
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<tr>
<td>Table mm</td>
<td>-</td>
<td>590 x 450</td>
<td>550x450</td>
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<tr>
<td>Pallet/clamping surface mm</td>
<td>Dynafix 280x280/350x350</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Pallet/clamping surface mm</td>
<td>GPS 240x240</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Pallet/clamping surface mm</td>
<td>UPC 320x320</td>
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<td>-</td>
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<tr>
<td>Max table load kg</td>
<td>120</td>
<td>200</td>
<td>200</td>
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<tr>
<td><strong>Tool magazine</strong></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>HSK-E40 piece</td>
<td>18 / 36 / 68</td>
<td>18 / 36 / 68</td>
<td>18 / 36</td>
</tr>
<tr>
<td><strong>Weight</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Machine kg</td>
<td>6'800</td>
<td>6'800</td>
<td>5'500</td>
</tr>
<tr>
<td><strong>Control unit</strong></td>
<td></td>
<td></td>
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<tr>
<td>Heidenhain</td>
<td>iTNC 530 HSCI</td>
<td>iTNC 530 HSCI</td>
<td>iTNC 530 HSCI</td>
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<tr>
<td><strong>Dust extraction (Amano)</strong></td>
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<tr>
<td>Weight kg</td>
<td>300</td>
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<tr>
<td>Power kW</td>
<td>3.7</td>
<td>3.7</td>
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</tr>
<tr>
<td>Suction Pa</td>
<td>980 - 2940</td>
<td>980 - 2940</td>
<td>980 - 2940</td>
</tr>
<tr>
<td>Largest gas receive amount m³/h</td>
<td>3600</td>
<td>3600</td>
<td>3600</td>
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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 P 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.

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.

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.

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 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 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.

Tooling
Our customers experience complete autonomy while maintaining extreme accuracy, thanks to our highly accurate System 3R reference systems for holding and positioning electrodes and work pieces. All types of machines can easily be linked, which reduces set-up times and enables a seamless transfer of workpieces between different operations.

Automation
Together with System 3R, we also provide scalable and cost-effective Automation solutions for simple, single machine cells or complex, multi-process cells, tailored to your needs.

Worldwide for you
Ensuring the best performance throughout the lifetime of our customers’ equipment is the goal of our three levels of support. Operations Support offers the complete range of original wear parts and certified consumables. Machine Support includes spare parts, technical support, and a range of preventive services to maximize machine uptime. Business Support offers customer-specific business solutions.

EDM (electrical discharge machining)

Milling

Advanced manufacturing

Laser texturing

Laser micromachining

Milling Advanced manufacturing

EDM (electrical discharge machining)

Digitalization solutions

Customer Services

Tooling and Automation

Software

Worldwide for you

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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