GF Machining Solutions

Mikron

MILL S
400 / 400 U / 500
600 / 600 U / 800

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, Mikron, Liechti, Step-Tec and System 3R technologies, help you raise your game and increase your competitive edge.

Swiss design and quality

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For more than 15 years, GF Machining Solutions has been pioneering the High Speed Milling (HSM) technology with its GF Mikron machines. The Mikron MILL S series is the result of this continuous development and brings together the utmost features that make it the reference solution within the industry.

The Mikron MILL S are 3-Axis and 5-Axis sensational High Speed Milling solutions for mold and die manufacturers. From automotive to ICT, through packaging and electrical components, these solutions serve manufacturers looking for high accuracy tools, highly repeatable multi-cavity molds, perfect surface quality expected as finished. Its “Plus”: delivering all this at unbeaten productivity thanks to its machining dynamic and integrated Automation.

Market segments and applications

3-Axis applications

5-Axis applications

Technology

High-speed milling: precision and quality for tool- and moldmaking

+ Precision
+ Fastest process speed
+ Best surface finish
+ Dynamic accuracy

“The best arguments are just best results”

Solutions

We have the right solution - for you

- Master the challenge of delivering speed and quality at the highest level
- Unbeatable flexibility in 3- and 5-Axis applications
- Advanced Milling solution to substitute or minimize subsequent process steps
- Highest productivity per square meter

+ Reliable process due to sophisticated thermal management system
+ Best damping characteristics due to mineral cast machine base
+ Direct linear and rotative drives for highest dynamic process
+ Unrivaled accessibility, with or without Automation
+ Integrated or third-party Automation in smallest footprint
+ smart machine modules for precision, protection, time and saving energy
+ Remote line assistance
+ Step-Tec Spindle
+ Heidenhain control

Ambient Robust

Put a smile on mold and die makers' faces

Machine is in perfect condition - on time
Energy savings and highest accuracy right from the beginning.
Perfect starting position with Econowatt.

1 Warm up without losing time and save energy

Keep cool about precision
Highest mechanical requirements in combination with perfect machine calibration ensures the perfect basis for high-precision production.

2 Start the Milling process with required precision

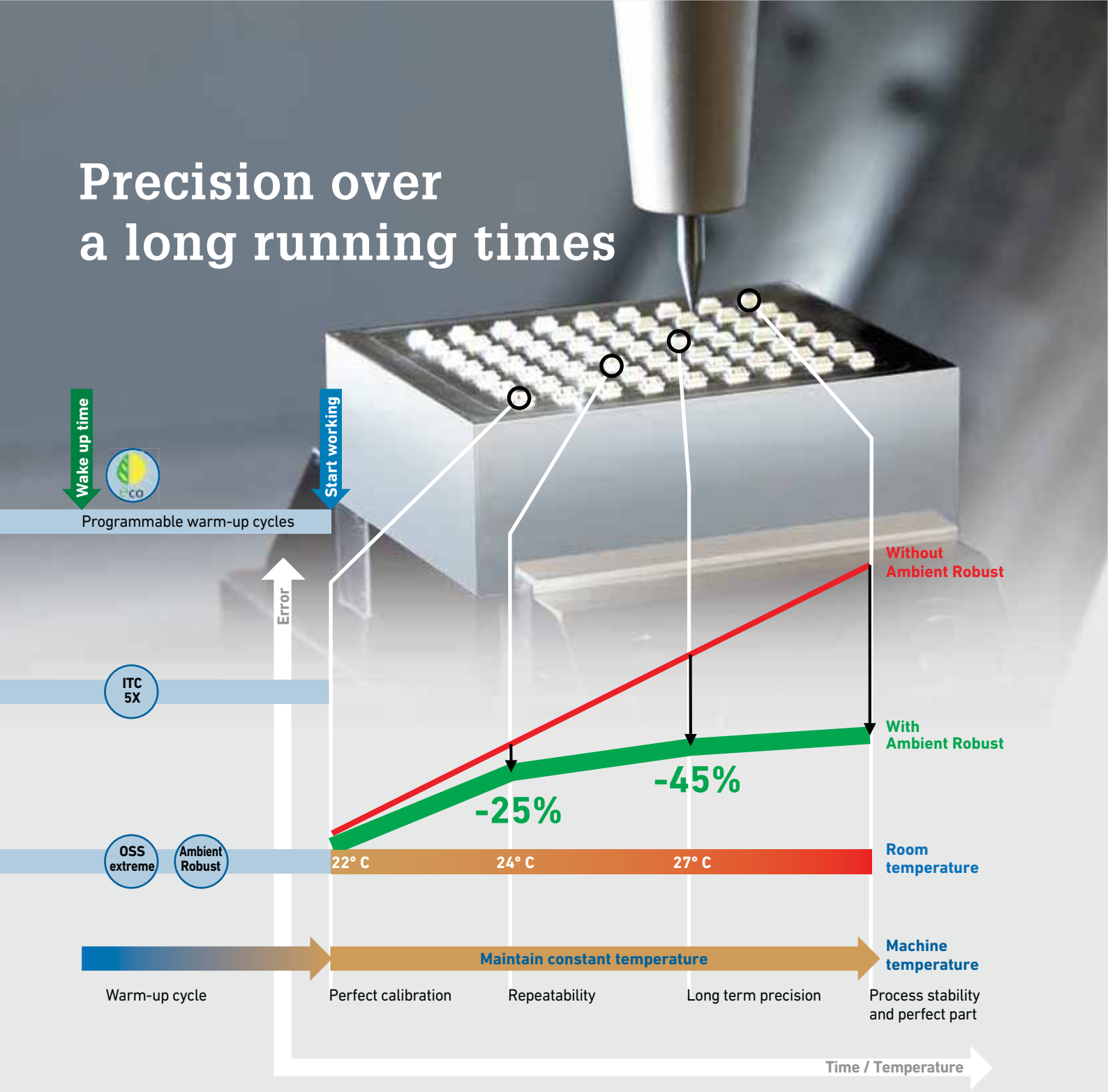
Achieve precision despite variations in ambient temperature and speed
Process stability due to thermostabilized body.
Reduced production time with OSS extreme.

3 No negative impact due to ambient temperature

Unleash full performance at one finger tip
OSS extreme provides higher precision and surface quality.
Reliable milling process due to tool monitoring with ITM.

4 Fastest 5-Ax HSM precision solution

Precision over a long running times

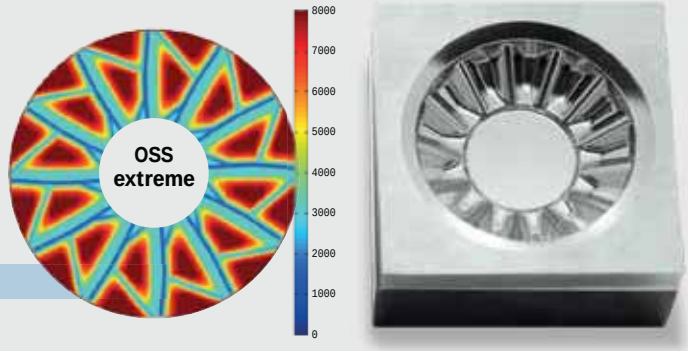


OSS extreme for higher precision, better surface quality and up to 25% shorter machining time

Better surface finish thanks to smoother movement (homogeneous colors).

Reduced production time thanks to higher overall high federate (dark colors).

OSS extreme ITM



smart machine

The new dimension in modern production

This includes a range of modules that are collectively referred to under the generic term “smart machine” and that fulfil 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.

smart machine construction kit system

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.

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.**

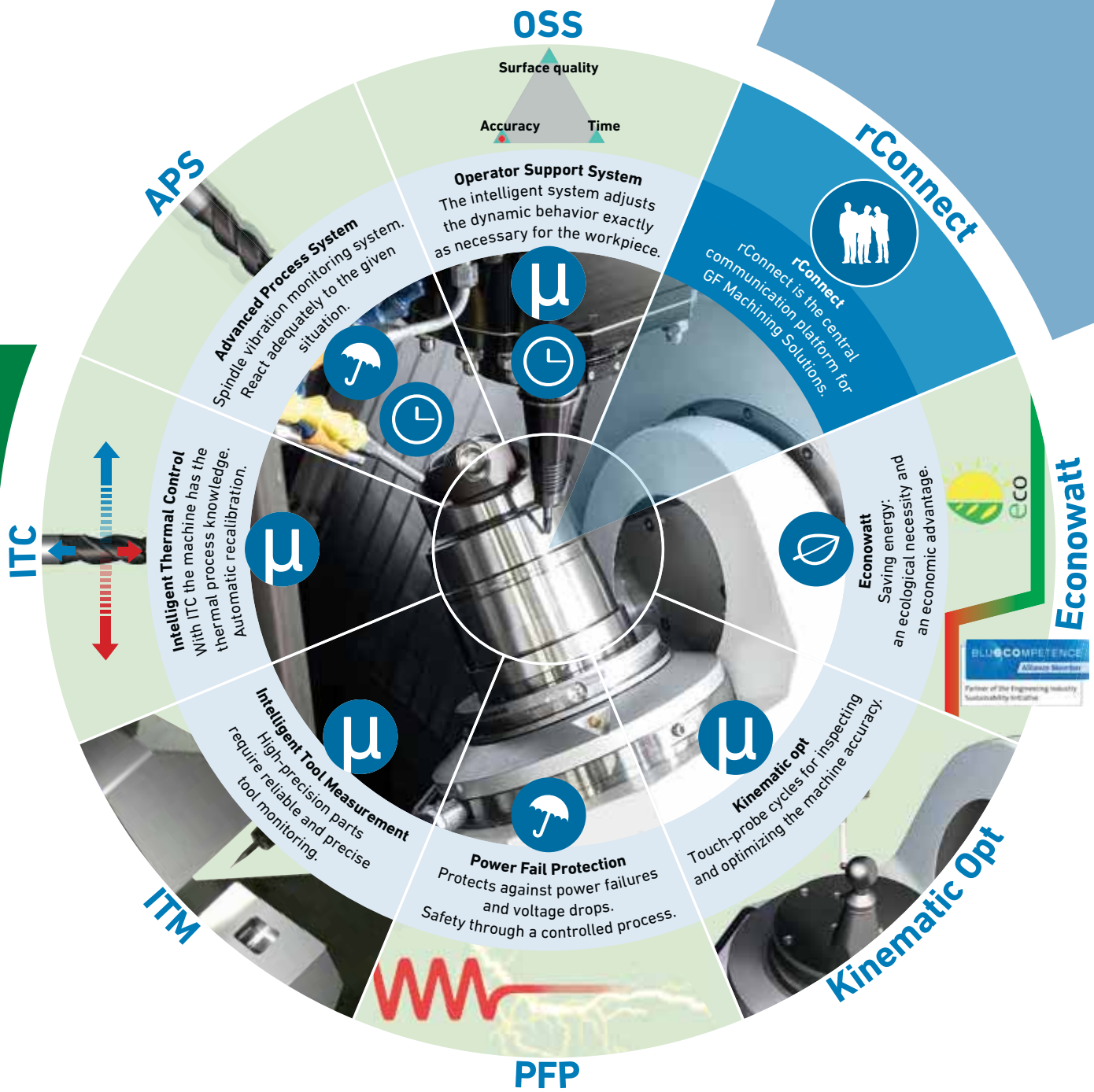
Precision
smart machine models like ITC, ITM, OSS and Kinematic opt support the precise base of your machining center to reach an even more precise final part for your customers.

Protection
smart machine models like PFP or APS protect your machine and process.

Time
smart machine models like OSS, APS and software tools such as rConncet or CAMplete boost your productivity.

Saving energy
smart machine models like Econowatt are ecological necessities with attractive economic advantages.

Better results with smart machine



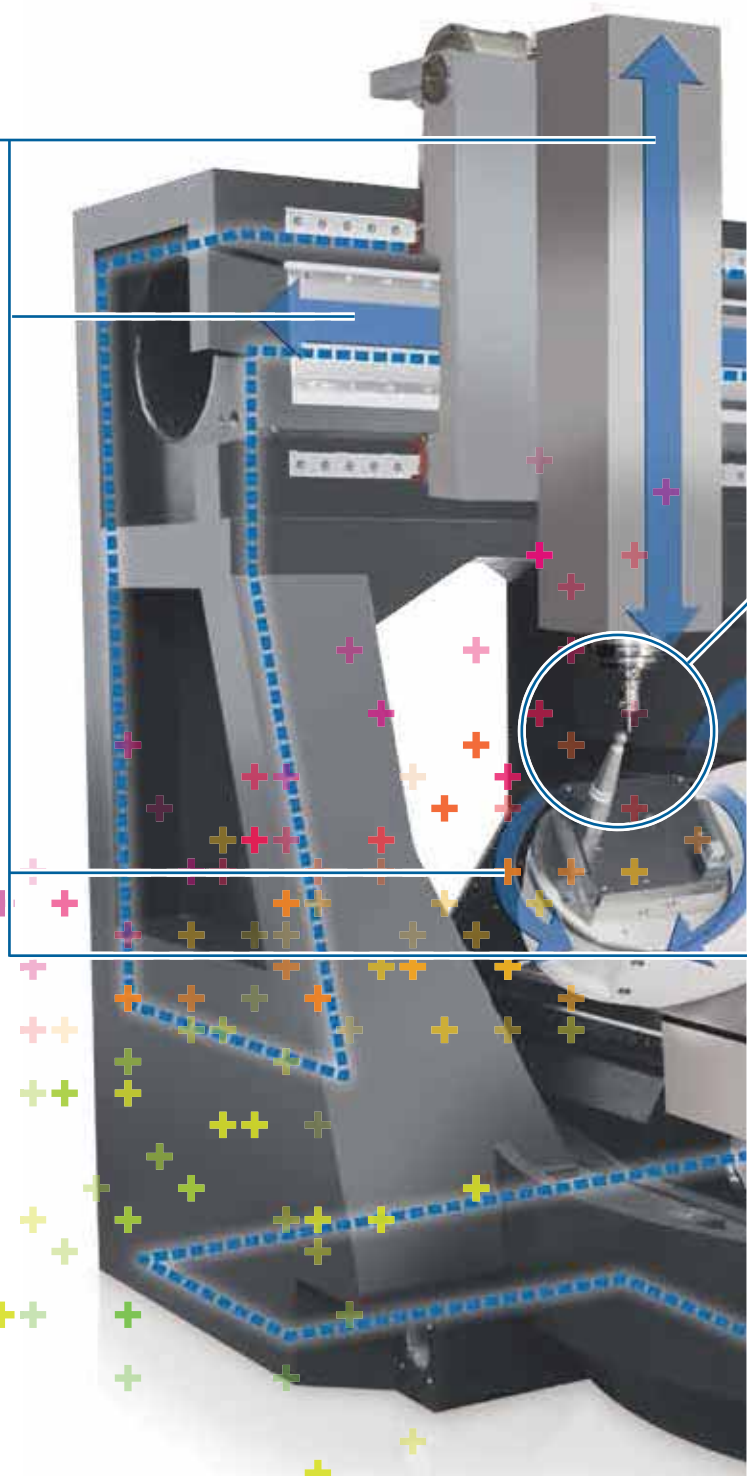
HSM core components

Static accuracy

Perfect machine design with highest mechanical requirements provides the basis for a high-precision machine.

Moreover, GF Machining Solutions spares no effort to implement state-of-the-art components to create the best package for your Milling applications.

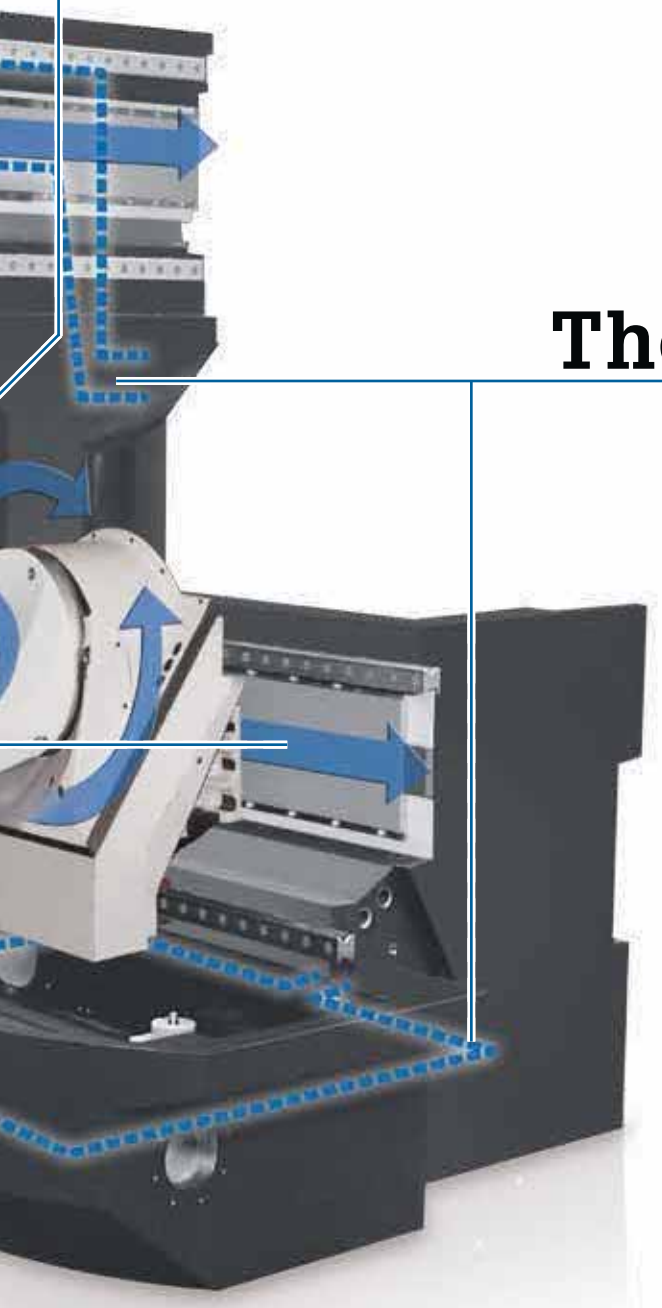
- **Comprehensive and reliable Milling solution for mold and die applications as a result of machine design, core components and complete process know-how.**



Dynamic accuracy

Stability, high dynamic drives and ingenious software are primary prerequisites for maximum precision and best workpiece surface quality.

- Concrete polymer with high thermal inertia and excellent damping properties
- Optimized force distribution within castings
- High-precision direct drives and guides for high dynamics and rigidity
- Direct path measurning system in the linear and rotational axis
- Intelligent software compensation



Thermal accuracy

The Mikron MILL S series leads precision machining into a new era.
Sophisticated temperature management system comprises separate and independent cooling circuits of all heat sources and machine body as follows:

- X, Y, Z, B, C drives
- Machine body
- Spindle with Opticool or CoolCore technology
- Electronics cabinet

Highest part precision is the ultimate result of this solution's active stabilization enabling highest stability and process reliability.

High-tech motor Spindles

HSM core components from Step-Tec

	30'000 min-1 HSK-E40 Opticool	36'000 min-1 HSK-E50	42'000 min-1 HSK-E40 Opticool	42'000 min-1 HSK-E40 Cool Core	60'000 min-1 HSK-E32 Opticool
Mikron MILL S 400	+		+	+	+
Mikron MILL S 400 U	+		+	+	+
Mikron MILL S 500	+		+	+	+
Mikron MILL S 600	+	+	+	+	
Mikron MILL S 600 U	+	+	+	+	
Mikron MILL S 800	+	+	+	+	

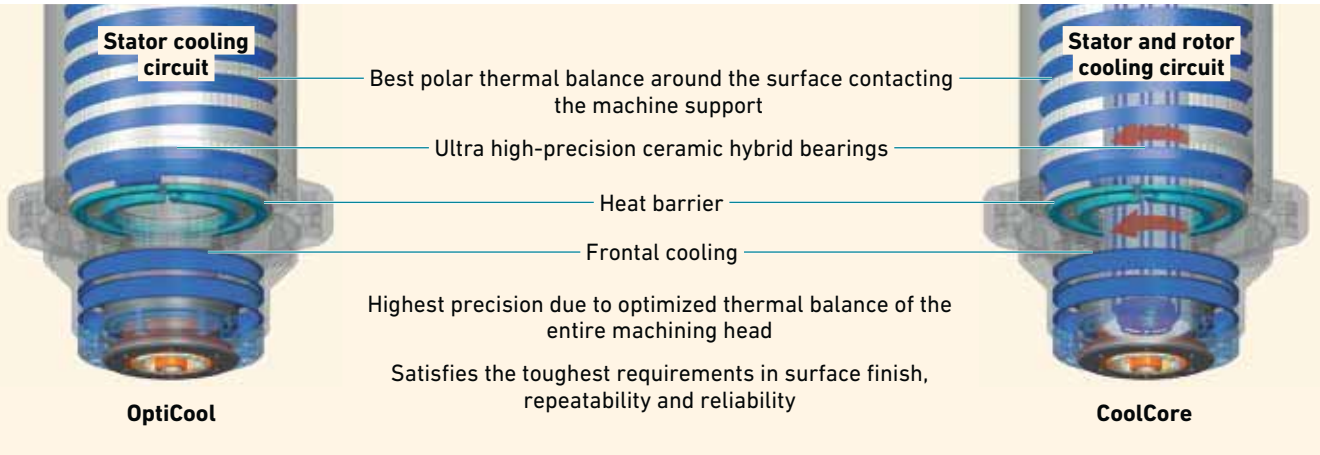
- **Your reliable and stable Milling process is secured, thanks to an ingenious temperature control system**

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.

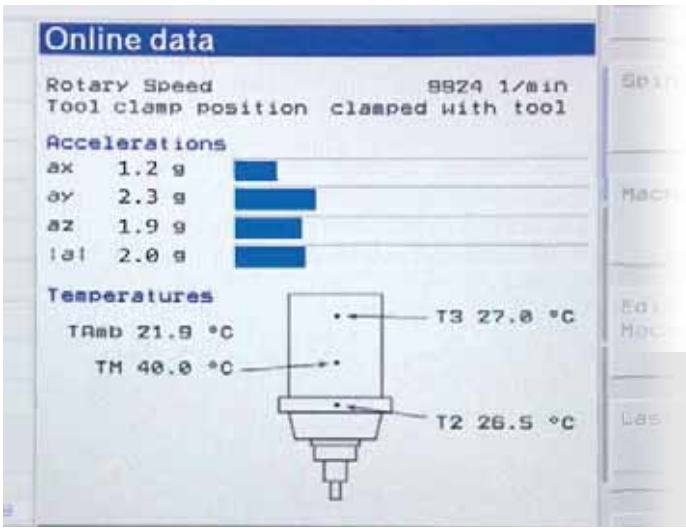
CoolCore

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.



Additional avantages of 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

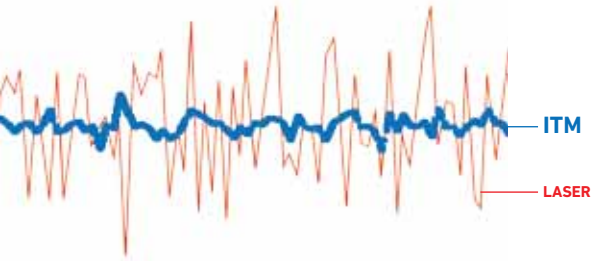


Cutting conditions monitoring

+ Vibration monitoring along each axis
+ Temperature monitoring of hot spots (bearings, motor, ambient temperature)

Tool monitoring

ITM: the breakthrough in tool measuring



- **Precise and stable production through accurate and reliable tool monitoring**

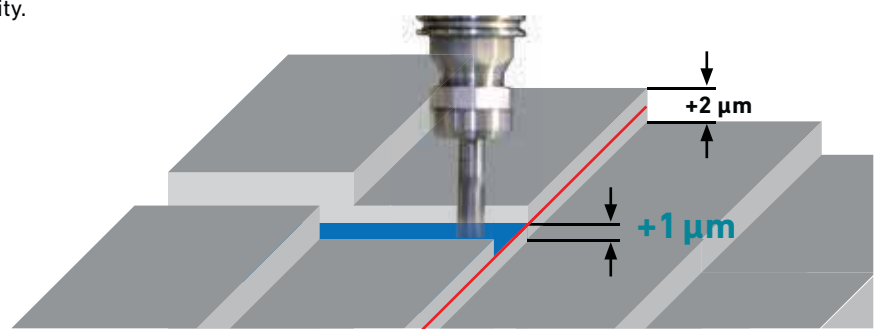
ITM

Your production of high-precision parts depends on perfect tool monitoring. GF Mikron's ITM improves your process reliability and reduces measurement uncertainties.

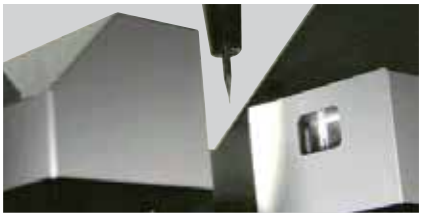
ITM tool measurement registers the entire tool tip up to Ø 12 mm thanks to modern vision sensors. Special software digitally removes all tool contamination (e.g., drops, dirt, chips) and measures the captured tool geometry.
ITM makes it possible to measure tools on a GF Mikron machine with micrometer range repeatability.

Application to prove reliability of ITM

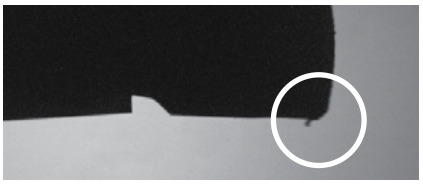
- Starting position at step 0 µm.
- Lift tool by 1 µm and mill orthogonal to the steps and observe the Milling marks on step 0 and +2µm.
- Regardless of tool type, you see marks on step +2 µm and no marks on step 0 µm.
- This proves that ITM ensures a reliable and repeatable tool measuring accuracy of < 2 µm.



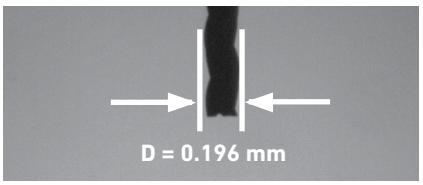
Measuring process

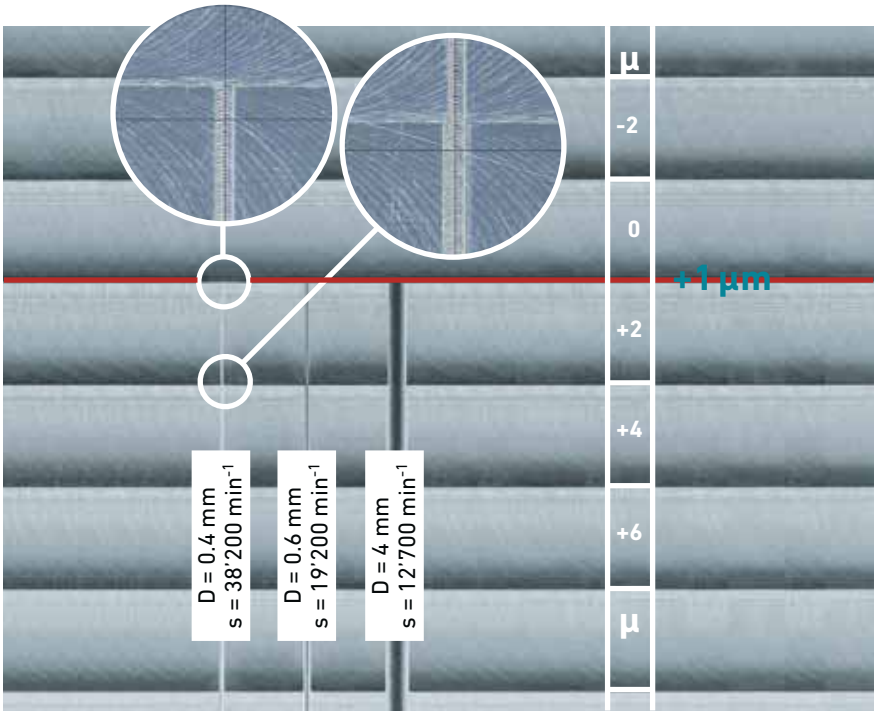


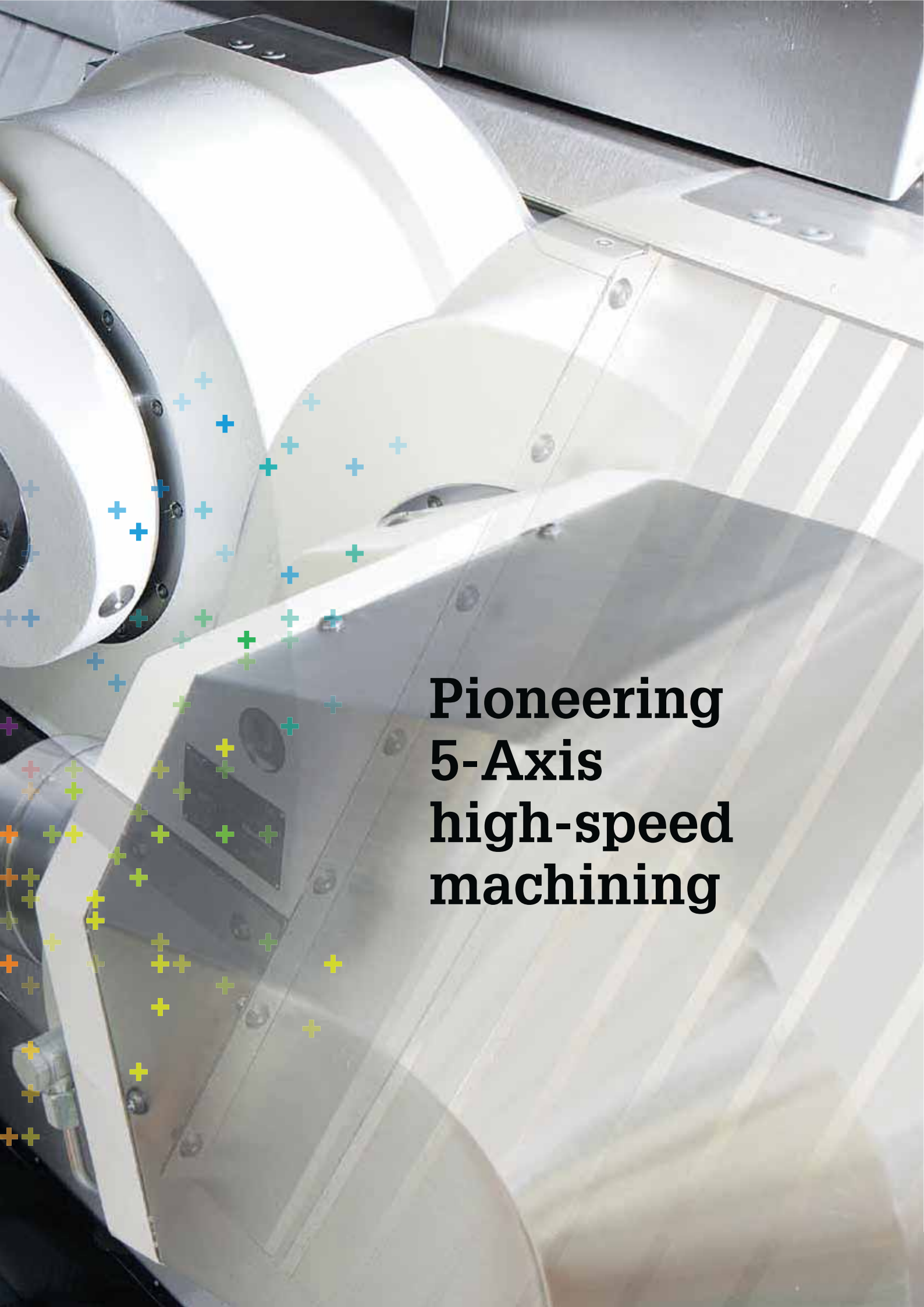
True tool measurement thanks to digital cleaning of foreign objects (particles and chips).
Partial tool breakage detection thanks to complete capture and control.



Measurement of smallest tool diameters







Pioneering 5-Axis high-speed machining

Table variants, Tooling and Automation

As flexible as needed

System 3R	System 3R	System 3R	System 3R	GF Mikron
Macro Magnum	**GPS**	**Dynafix**	**Dynafix**	**OEM**
Ø 156 mm	240 x 240 mm	280 x 280 mm	350 x 350 mm	600 x 600 mm

Machine workarea
X, Y, Z: 500 x 240 x 360 mm

Mikron MILL S 400 U 25 kg

Machine workarea
X, Y, Z: 500 x 450 x 360 mm

Mikron MILL S 400 120 kg

Mikron MILL S 500 200 kg

Table 590 x 450 mm

Machine workarea
X, Y, Z: 800 x 600 x 500 mm

Mikron MILL S 600 U 120 kg

Machine workarea
X, Y, Z: 600/800x600x500 mm

Mikron MILL S 600 500 kg
Mikron MILL S 800 800 kg

Mikron MILL S 600 500 kg
Mikron MILL S 800 1000 kg

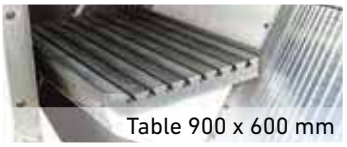
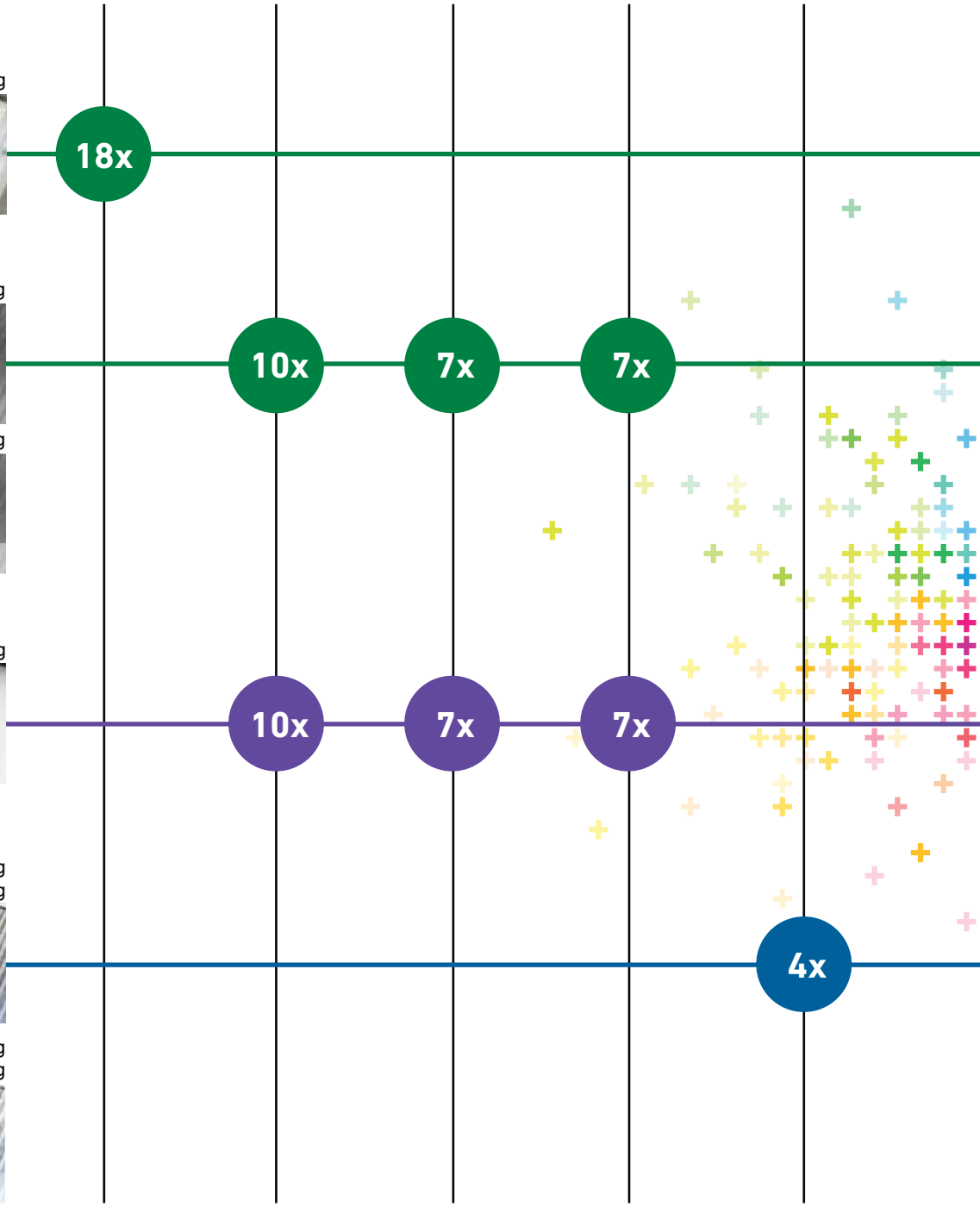
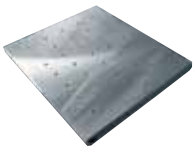


Table 900 x 600 mm



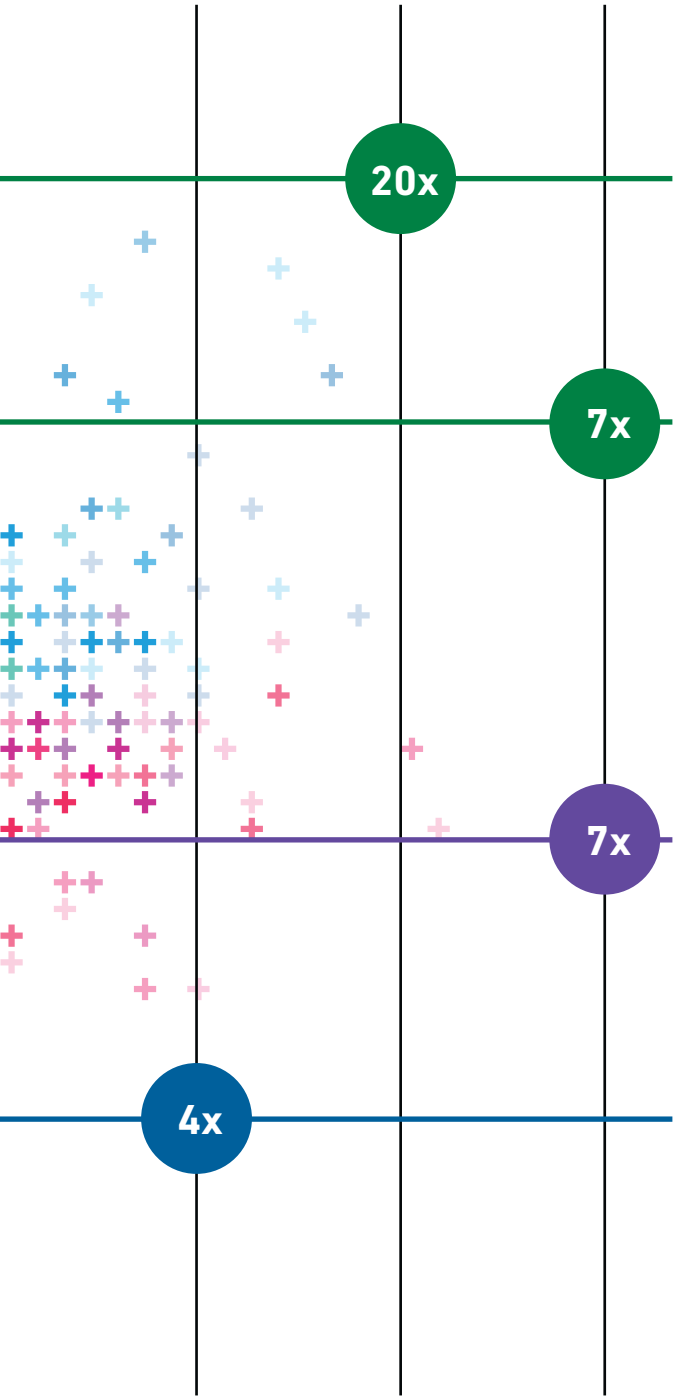
- **Increase your productivity by reducing your setup time with a zero point clamping system**
- **Increase your quality by improving repeatability with tooling and Automation**



GF Mikron
OEM
800 x 600 mm

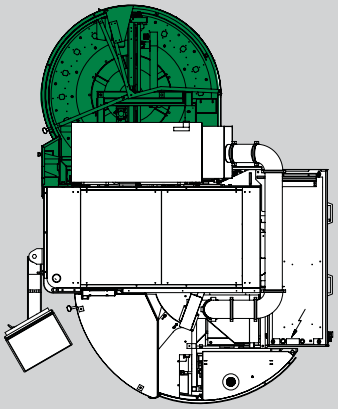
Erowa
ITS
Ø 148 mm

Erowa
UPC
320 x 320 mm

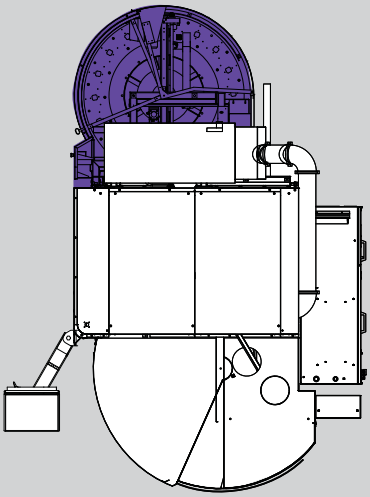


Easy loading and unloading of pallet magazine during the machining process

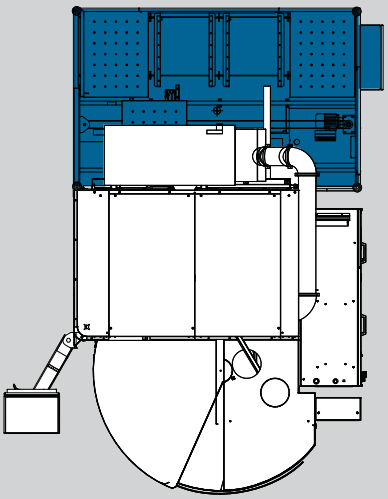
Mikron MILL S 400 / 400 U: disc-type magazine



Mikron MILL S 600 U: disc-type magazine



Mikron MILL S 600 / 800: linear-type magazine



Tool magazine

Individual solutions tailored to your production needs

Tool Automation in every configuration level

+ Simple or double-row disc magazine
+ Reliable "pick-up" changing system
+ Feed control via light beam
+ Capacity of up to 68 tools with magazines internal to the machine's standard footprint
+ Orientation of the touch probe

Optionally available in a variety of capacities:

Mikron MILL S 400	Mikron MILL S 600
Mikron MILL S 400 U	Mikron MILL S 600 U
Mikron MILL S 500	Mikron MILL S 800
HSK-E40:	HSK-E50:
18; 36; 68 tools	15, 30, 60 tools
HSK-E32:	HSK-E40:
20; 40 tools	18; 36; 68 tools

User-friendly tool feeding

Productivity and process reliability are ensured by lateral tool feeding

+ Simultaneous machining and feeding
+ Simple feed monitoring through large glass panel
+ Ergonomic access

Double-row HSK-E40 magazine internal to the machine's standard footprint with a capacity of 68 tools.

Chip, mist and dust management

Clean machining, wet or dry

Adapted chip, mist and dust management

The form and volume of the chips are determined by the machined material as well as the processing strategy. The options offered range from a coolant tank with chip flushing to models with cooling oil and coolant temperature stabilization.

Chip conveyors

Coolant tank with chip flushing system

Additionally mist and dust management systems are available according to your needs.

Graphite extraction with powerful suction system

Lift-up chip conveyor and basket or band filter system

+ Solution for aluminum milling chips. With slat band lift-up-chip-conveyor and coolant unit with fine-filtration
+ Solution for steel milling chips with scraper lift-up chip conveyor and coolant filtration unit

Depending on machine equipment and processing strategy, 450- and 950-liter filter systems are available.

+ Coolant tank with chip flushing system
+ Chip auger
+ Lift-up scraper type conveyor
+ Lift-up slat band chip conveyor
+ Pump back station
+ Lift pump station
+ 450-liter band and basket filter system
+ 950-liter band filter system
+ Wash-down system

We deliver best results

Additive Manufacturing - for mold inserts

A clever combination with our other technologies

Efficient cooling channels
Additive Manufacturing

Perfect surface
HSC Milling / die sinking

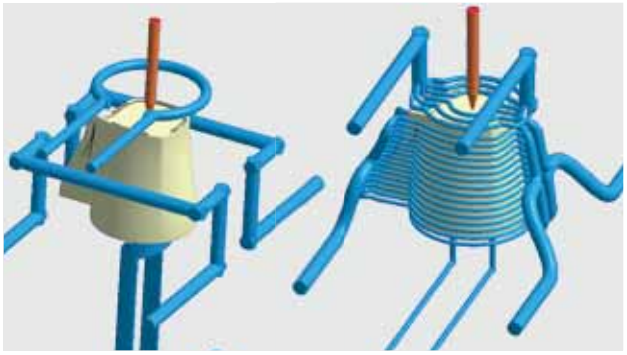
Innovative product design
Laser texturing

Additive Manufacturing (AM) describes the technologies that build 3D objects by adding layer upon layer of material like plastic or metal.

AM equipment translates data from the computer-aided design (CAD) file and deposits successive layers to fabricate a 3D object.

GF Machining Solutions offers the AgieCharmilles AM S 290 Tooling to build 3D-printed mold inserts and develops solutions to integrate the machine in the whole manufacturing process chain.

Differences between conventional and conformal channels



Conventional cooling

Tempering by conformal cooling channels

AM is uniquely suitable for the generation of 3D conformal cooling systems and adds the geometrically complex portion to the simple base manufactured using a Milling machining center.
The resulting hybrid mold insert is the most economical solution for parts characterized by geometrically simple and complex sections.

- **Complete freedom of design of cooling channels**
- **Increased productivity of injection molding and die casting processes**
- **Improved quality of injected/cast parts**
- **Accelerate your production by simplifying multi-technology setup, thanks to our unique integrated chuck.**

A complete cell - configured for you

Your future is our job

Customized solutions

In addition to our portfolio of machines, customer-specific solutions are among our core competencies.

Let's talk about how we can take your operation to the next level.

Automation interface

Thanks to a standardized robot interface, the Mikron MILL S series can be linked to System 3R robot systems as well as operated with robot systems from other well-known suppliers.

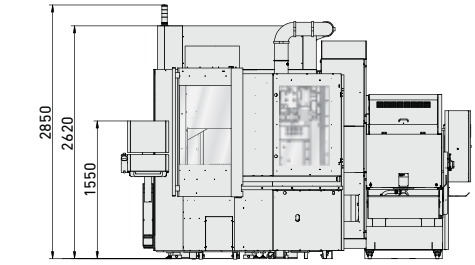
Regardless of the handling system used, the machine offers comfortable accessibility when integrated into a line.

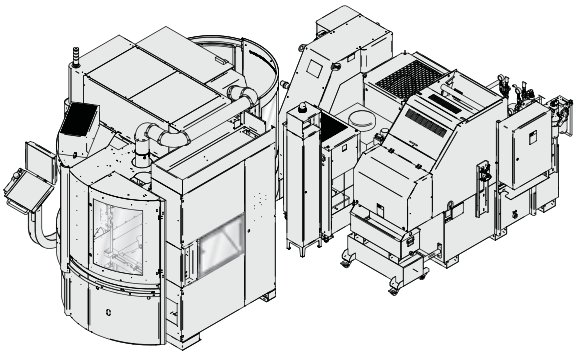
Technical data

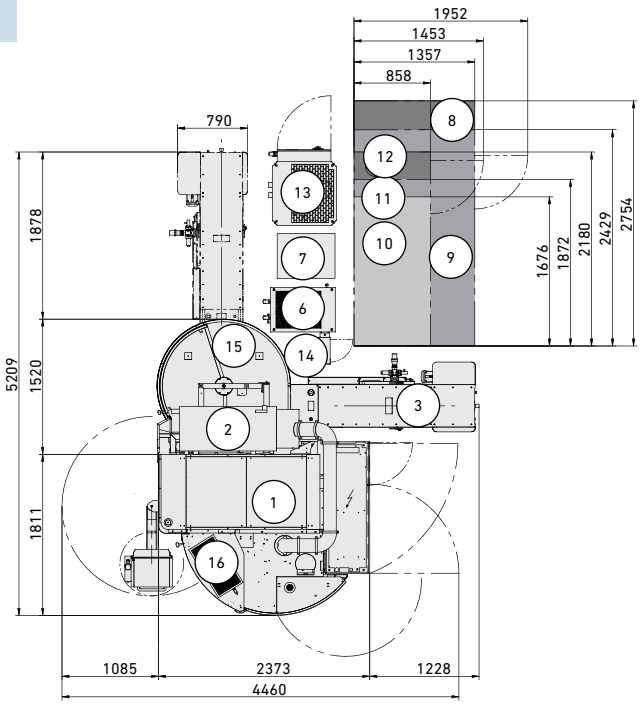
Machine			Mikron MILL S 400	Mikron MILL S 400 U	Mikron MILL S 500
Workarea					
Longitudinal	X	mm	500	500	500
Lateral	Y	mm	450	240	450
Vertical	Z	mm	360	360	360
Swiveling axis		°	-	+110/-110	-
Rotary axis		°	-	n x 360	-
Feed rate					
Rapid traverse	X, Y	m/min	61	61	61
Rapid traverse	Z	m/min	61	61	61
Rapid traverse (swivel)		min^{-1}	-	165	-
Rapid traverse (rotary)		min^{-1}	-	250	-
Working spindle (40% ED, S6)					
60,000 min^{-1}, HSK-E32		kW / Nm	8.5/ 3.5	8.5 / 3.5	8.5 / 3.5
42,000 min^{-1}, HSK-E40		kW / Nm	13.5/ 8.8	13.5 / 8.8	13.5 / 8.8
30,000 min^{-1}, HSK-E40		kW / Nm	13.5/ 8.8	13.5 / 8.8	13.5 / 8.8
Work table					
Table		mm	-	-	590 x 450
Pallet/clamping surface		mm	Dynafix 280x280/350x350	MacroMagnum 156	-
Pallet/clamping surface		mm	GPS 240 x 240	ITS 148	-
Pallet/clamping surface		mm	UPC 320 x 320	-	-
Max. table load		kg	120	25	200
Tool magazine					
HSK-E32		tool holder	20/40	20/40	20/40
HSK-E40		tool holder	18 / 36 / 68 / 168 / 308	18 / 36 / 68 / 168 / 308	18 / 36 / 68 / 168 / 308
Automation					
Pallet size / Number		Piece	UPC/Dynafix / 7x	M.M. 156/18x	-
Pallet size / Number		Piece	GPS 240/10x	ITS 148/20x	-
Maximum additional load		kg	90	25	-
Weight					
Machine		kg	6'800	7'000	6'800
Pallet changer		kg	900	900	-
Control unit					
Heidenhain			iTNC 530 HSCI	iTNC 530 HSCI	iTNC 530 HSCI

Machine			Mikron MILL S 600	Mikron MILL S 600 U	Mikron MILL S 800
Workarea					
Longitudinal	X	mm	600	800	800
Lateral	Y	mm	600	600	600
Vertical	Z	mm	500	500	500
Swivelling axis		°	-	+ 30/-110°	-
Tilting axis		°	-	n x 360°	-
Feed rate					
Rapid traverse	X, Y	m / min	61	61	61
Rapid traverse	Z	m / min	61	61	61
Rapid traverse (swivel)		rpm	-	60	-
Rapid traverse (rotary)		rpm	-	150	-
Working spindle (40% ED, S6)					
42,000 rpm, HSK-E40		kW / Nm	13.5/ 8.8	13.5/ 8.8	13.5/ 8.8
36,000 rpm, HSK-E50		kW / Nm	33 /21	33 /21	33 /21
30,000 rpm, HSK-E40		kW / Nm	13.5/ 8.8	13.5/ 8.8	13.5/ 8.8
Work table					
Table		mm	900 x 600	-	900 x 600
Pallet/clamping surface		mm	-	Dynafix 280x280/350x350	-
Pallet/clamping surface		mm	-	GPS 240 x 240	-
Pallet/clamping surface		mm	600 x 600	UPC 320 x 320	800 x 600
Max table load		kg	500	120	1000
Tool magazine					
HSK-E40		piece	18 / 36 / 68 / 168 / 308	18 / 36 / 68 / 168 / 308	18 / 36/ 68 / 168 / 308
HSK-E50		piece	15/30/60/120/170/220	15/30/60/120/170/220	15/30/60/120/170/220
Automation					
Pallet size / Number		- / piece	600 x 600/4x	UPC/Dynafix / 7x	600 x 600/4x
Pallet size / Number		- / piece	800 x 600/4x	GPS 240/10x	800 x 600/4x
Max. load		kg	500	90	800
Weight					
Machine		kg	9,900	9,900	9,900
Pallet magazine		kg	900	900	1,800
Control unit					
Heidenhain			iTNC 530 HSCI	iTNC 530 HSCI	iTNC 530 HSCI

Mikron MILL S 400 / 400 U / 500

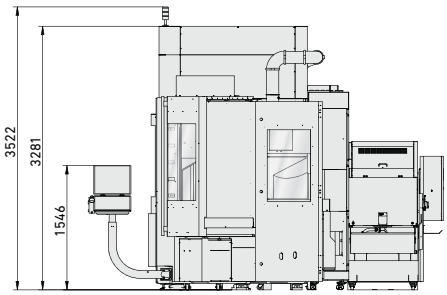


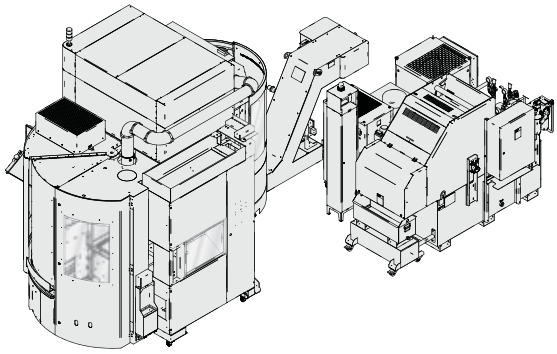


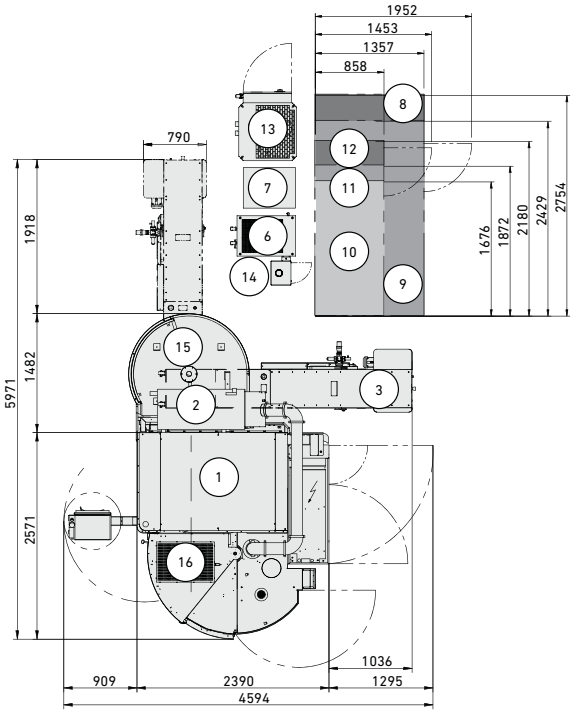


1. Machine
2. Mist extraction unit
3. Lift-up chip conveyor (scraper and slat band-type)
6. Cooling unit
7. CoolCore cooling unit
8. Endless belt filter system (950 liters)
9. Band filter system 950 liters)
10. Basket filter system 450 liters)
11. Band filter system 450 liters)
12. Endless belt filter system 450 liters)
13. Coolant thermal control
14. CO^2 fire extinguishing system
16. Pressure-relief damper

Mikron MILL S 600 / 600 U / 800







Customer Services

rConnect

**rConnect comprises GF Machining Solutions' modular digital services.
Select the digital service which fits the best to your individual needs. From Live Remote Assistance to ensure maximum machine uptime via process improvement modules to predictive maintenance and monitoring, rConnect keeps you connected, at any time and wherever you are.**

Certified by TÜViT Trusted Product

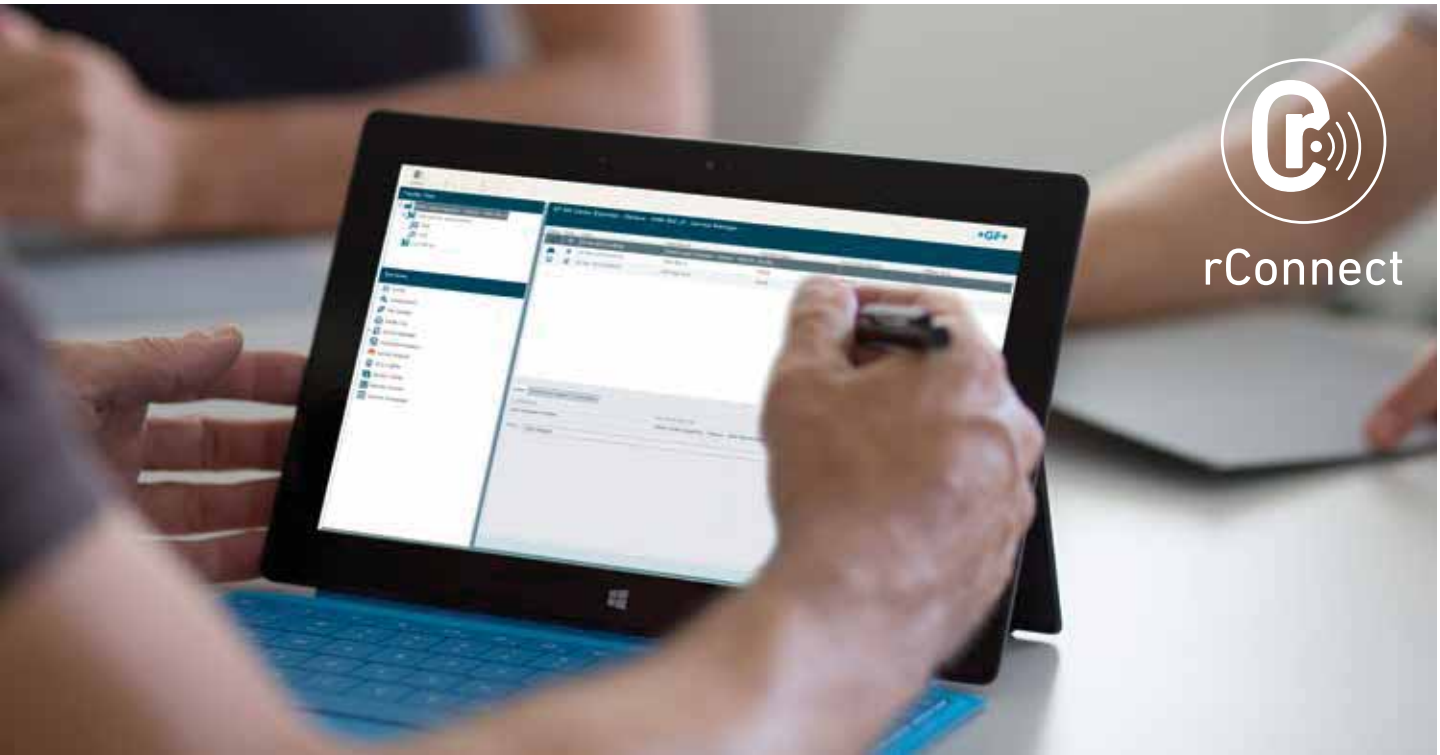
Improve machine availability

Our **Live Remote Assistance (LRA)** supports you in keeping your commitments. Our LRA provides you direct access to our expert service engineers with the latest technology.

Increase your flexibility

Know the status of your machines in real time at any location. The **rConnect Cockpit** is the user interface for the machine operator, maintainer or operations manager. It not only enables central access to GF Machining Solutions' digital services but also provides the operator with support in the daily maintenance of his machine. For example, it provides an overview of all maintenance due on his machine. You can view current status messages and can call up machine performance reports.

With the **Messenger** module you can even get your machine park data on your mobile device. Features are machine status message, alarm message, programmed messages in the NC program and sending of a service request.



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.

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.

Milling

Mikron high-speed (HSM), high-performance (HPM) and high-efficiency (HEM) Milling centers

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 HSM, HPM and HEM 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.

Liechti dedicated aerospace and energy machining centers

Aerospace and power generation turbine manufacturers increasingly turn to Liechti dedicated five- and six-axis machining centers to machine complex, high-precision airfoils on blades, disks, blings, blisks/IBRs and impellers. It's easy to see why because these machines, with their specific profile machining technology, specialized CAD/CAM software and engineering competence for ultra-dynamic machining in titanium, Inconel, nimonic, titanium-aluminide and high-alloy steels, yield productivity gains as much as 30 percent, thanks to reduced machining times. In the globally competitive aerospace and power generation manufacturing sector, that's definitely worth shouting about.

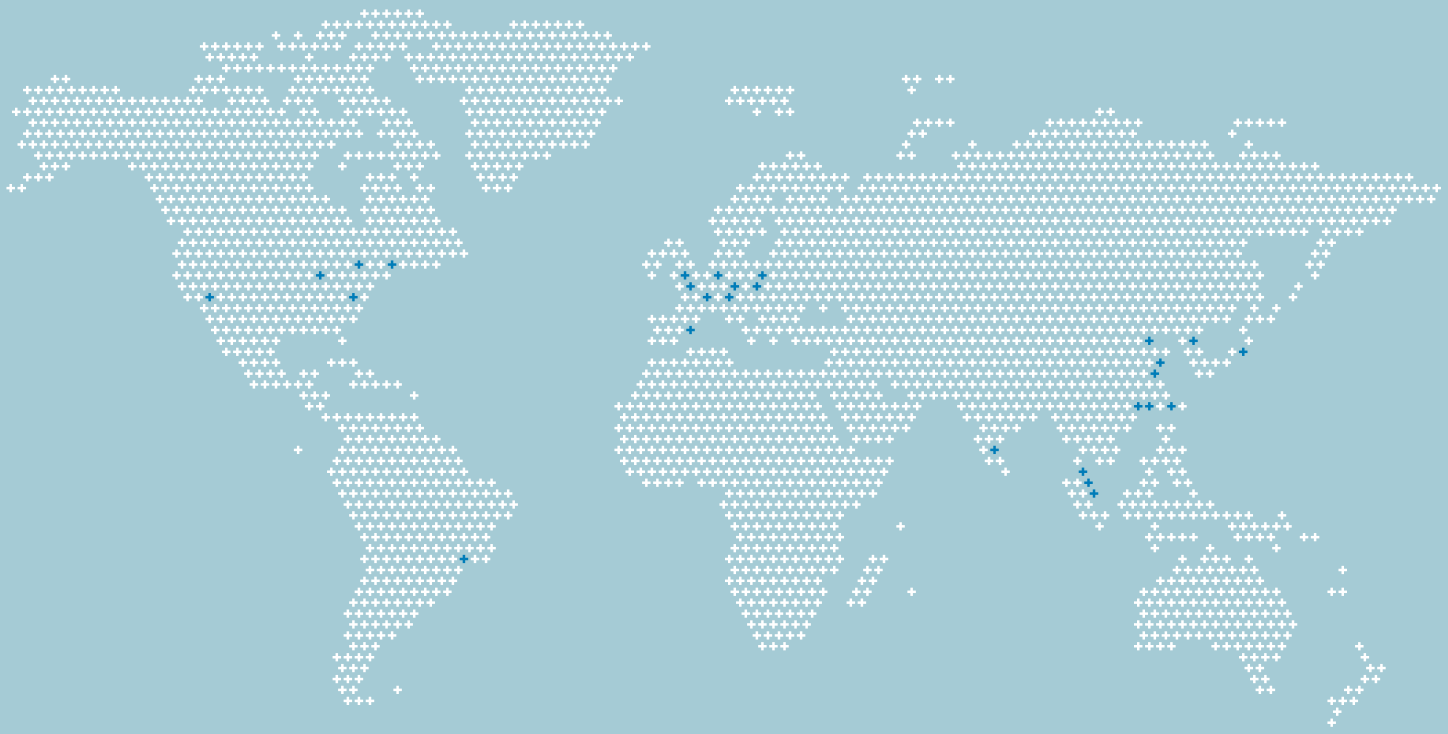
Step-Tec Spindles

At the heart of every GF Mikron machining center is high-performance Step-Tec Spindle. Step-Tec Spindles are essential core components of our machining centers. Highly accurate and thermally stable Step-Tec Spindles ensure that our machines can handle everything from heavy-duty roughing to fine-finishing operations.

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

259.806.332

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

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