

**Mikron**

# **HSM 500**

# **HSM 700**



### **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 Milling, electrical discharge machines (EDM) and Laser texturing machine tools through to first-class Automation, Tooling and software systems—all backed by unrivaled Customer service and support—we, through our Mikron, Liechti, AgieCharmilles and System 3R technologies help you raise your game and increase your competitive edge.

# Swiss design and quality

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## GF Machining Solutions

### High speed milling has never been so easy...

Mikron's HSM 500 and HSM 700: The unique concept of the HSM line designed to meet mold- and toolmakers requirements.

### No compromises

Highest accuracy, extreme dynamic and best surface quality. Incomparable accessibility, best ergonomics, and a user friendly handling of the machine.

### Consistent quality

Every machining centre "made by Mikron" has been assembled in our air-conditioned assembly shops by qualified personnel. Inspecting according to ISO 230/97, extensively testing to meet quality goals.

The results are logged and handed over with the machine to the customer.

GF Machining Solutions.

## Applications

# As flexible as your production is...

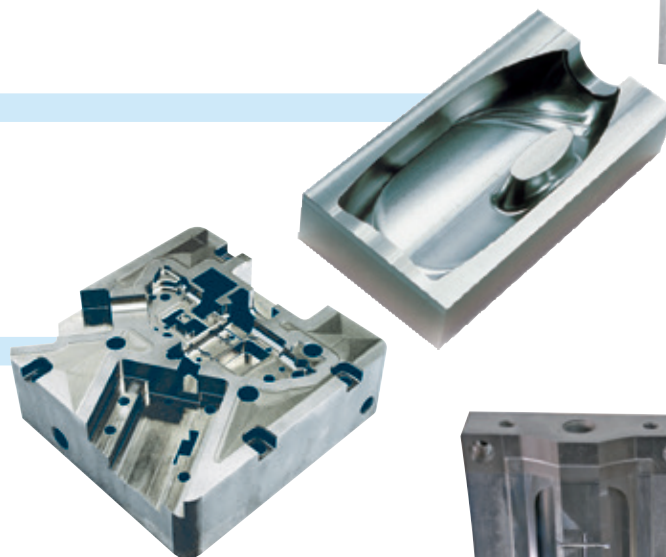
### Thin walled part

Material Aluminum  
Time 27 min.  
Machine HSM 500



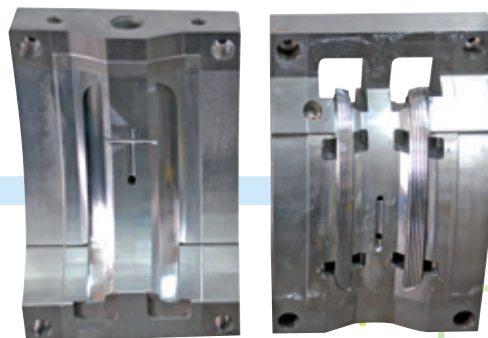
### Bottle mold

Material 1.2316  
Hardness 35 HRC  
Priority Surface  
Time 420 min.  
Machine HSM 500



### Mold core

Material 1.2379  
Hardness HRC 58  
Priority Precision  
Time 288 min.  
Machine HSM 500



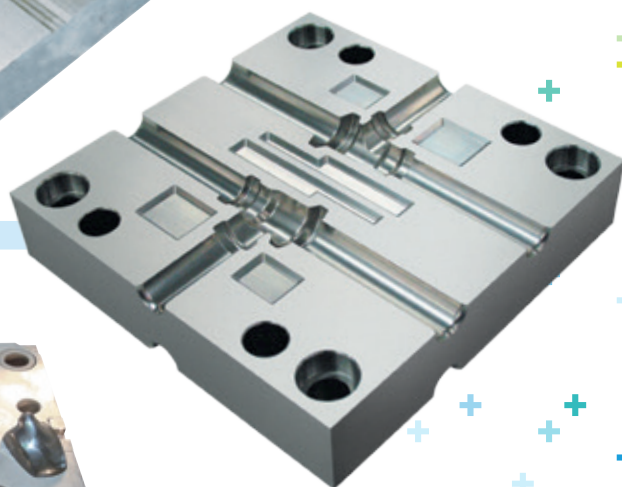
### Car light mold

Material Assab S136  
Hardness HRC 50  
Time 240 min. per cavity  
Machine HSM 500



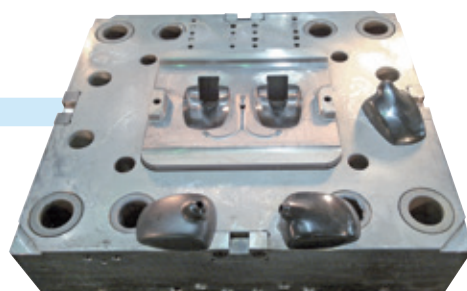
### Mobile phone mold

Material NAK 80  
Hardness 40 HRC  
Time 416 min.  
Machine HSM 700



### Hot pressing die for fittings

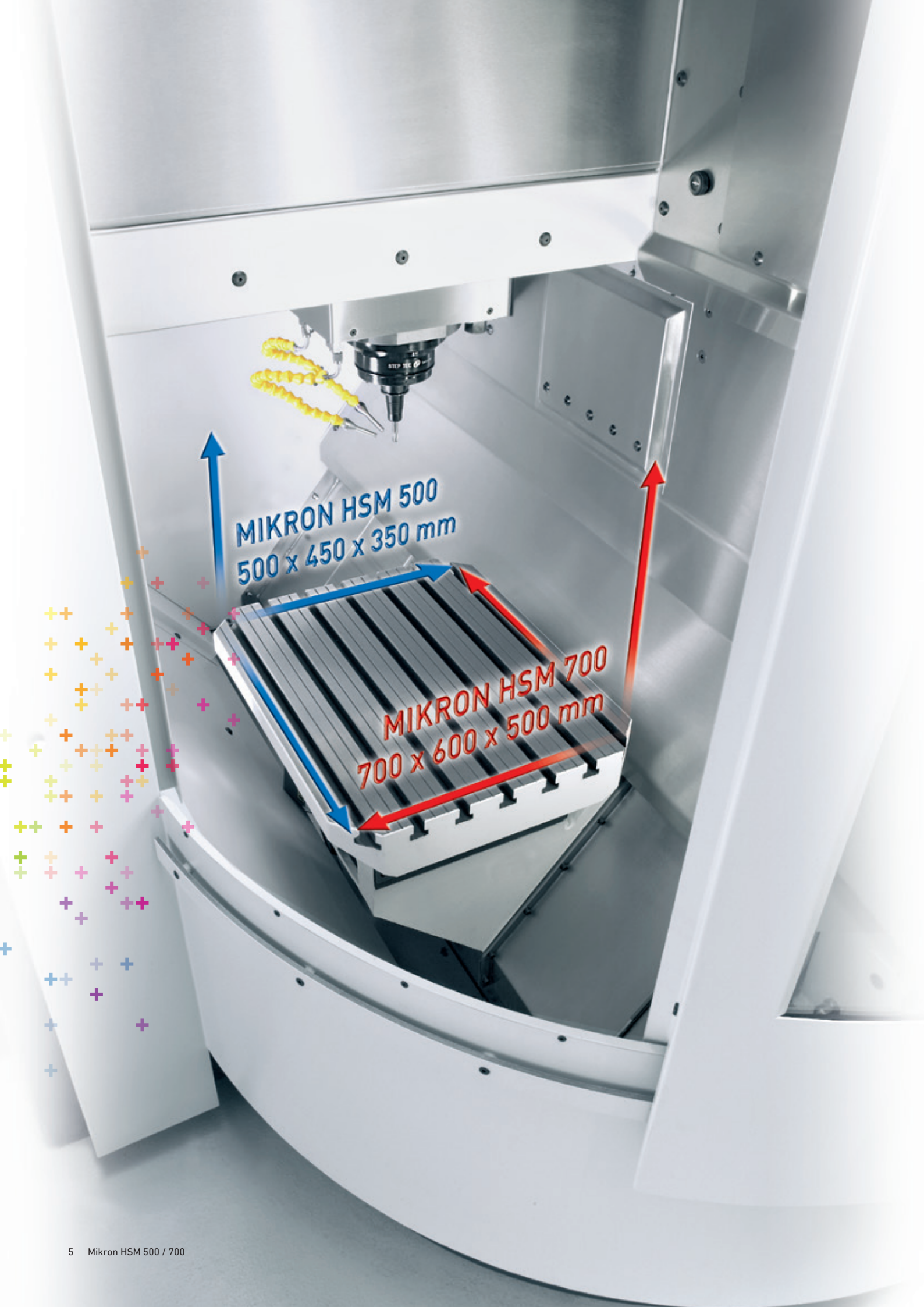
Material 1.2344  
Hardness 25 HRC  
Time 216 min.  
Machine HSM 700



### Car antennas mold

Material Assab S136  
Hardness HRC50  
Time 60 min. per cavity  
Machine HSM700





MIKRON HSM 500  
500 x 450 x 350 mm

MIKRON HSM 700  
700 x 600 x 500 mm

## Highlights

# Precision and quality for tool and mold making

Trapezoidal window for a clear view of the machining process



Dynamic tool spindle with vector regulation and ceramic-hybrid bearings

Effortless crane loading



Protected tool magazine and tool measurement area.

One sliding door with a large window

Powerful machine control system



Full table size available for work

Integrated tank and chip management



Software modules for efficient, controlled working

GF AgieCharmilles machining centers feature extraordinary ergonomics. Unparalleled accessibility regardless of the respective machine configuration.

## Machine base

# Sophisticated concept for maximum rigidity

### Pyramid-shaped design

The pyramid-shaped arrangement ensures stability and rigidity.

### Closed structure

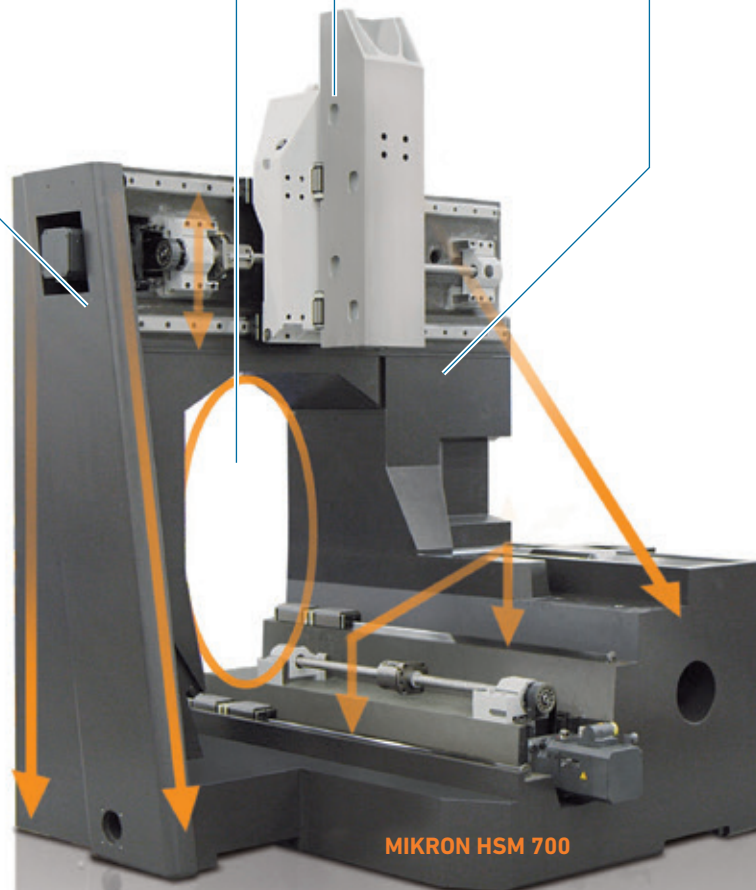
The O-shaped portal increases the structural dampening characteristics

### Cross slide

The cross slide is weight-optimised to meet highly dynamic machine tool motion requirements.

### Polymer cast machine base

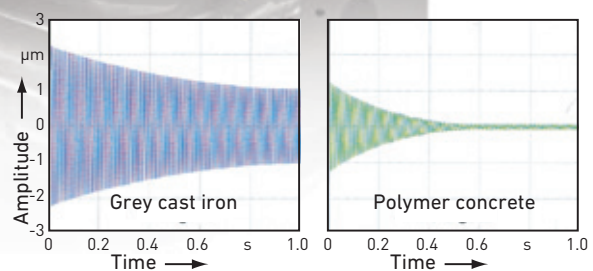
Portal construction for high rigidity and compact foot-print.



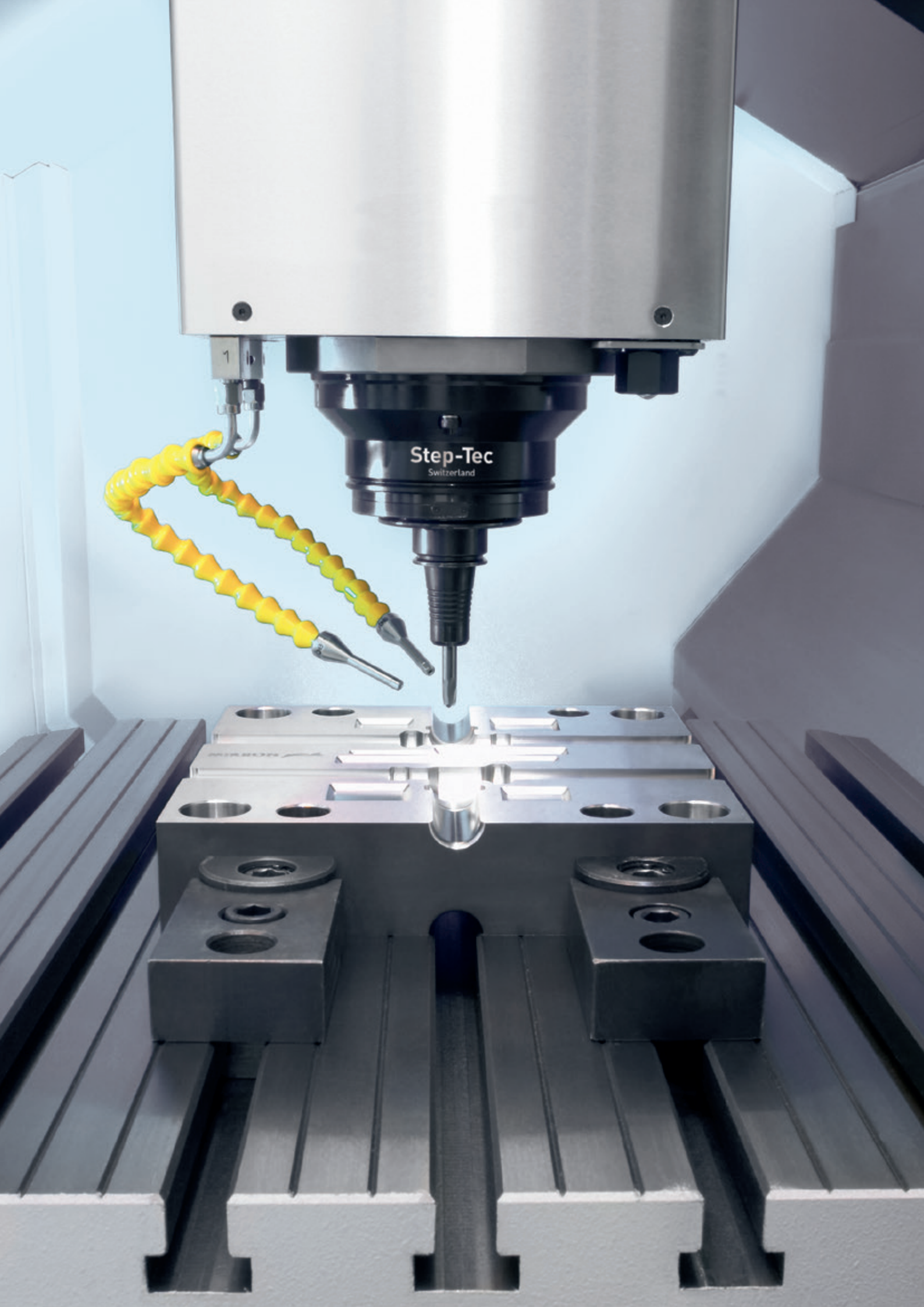
### Polymer concrete

Striking features of polymer concrete include high thermal resistance and outstanding damping characteristics. It is not susceptible to oil or cooling lubricants and does not undergo an aging process.

Up to 6 times better damping characteristics than grey cast iron.



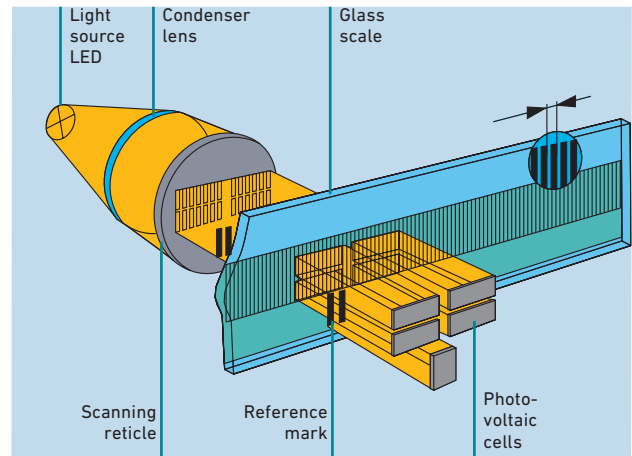






## Accuracy

# Maximum accuracy through optical linear scales, cooled drives and consistent quality control



### Accuracy

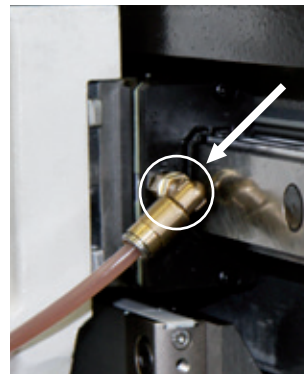
Precision as a standard ...

- + Absolute optical linear scales on X, Y, and Z axis operating with a measuring step of 20 nanometers for incomparable positioning precision
- + Better thermal inertia of machine base due to the polymer concrete
- + All feed motors, the electrical cabinet and the motor spindle are liquid-cooled
- + Highly accurate probing

### High speed spindle

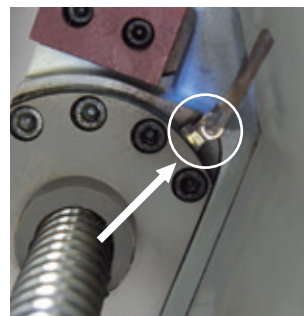
A key factor in a high speed milling machine...

- + Vector controlled motor spindle for short run-up and brake times and high torques at low speed
- + Ceramic hybrid ball bearings with oil-air minimal lubrication
- + Liquid-cooled stator jacket and bearings
- + HSK interface



### Automatic central lubrication

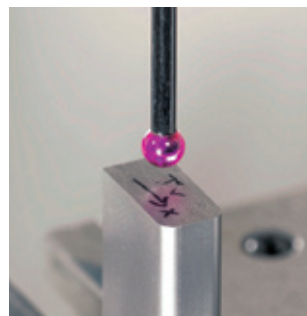
The automatic central lubrication system supplies the recirculating ball screws and the linear guides with grease at precisely defined intervals. This increases the service life of the feed units and reduces maintenance costs.



### Touch probe

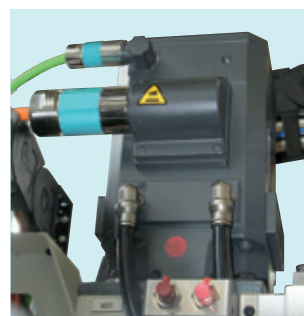
A compact and extremely accurate touch probe is available as a standard option.

- + Easy set-up
- + In process calibration
- + Measurement in the machine



### Quality control

Every MIKRON HSM machine is validated in our air-conditioned assembly shop with highly accurate laser measuring systems.



### Water-cooled

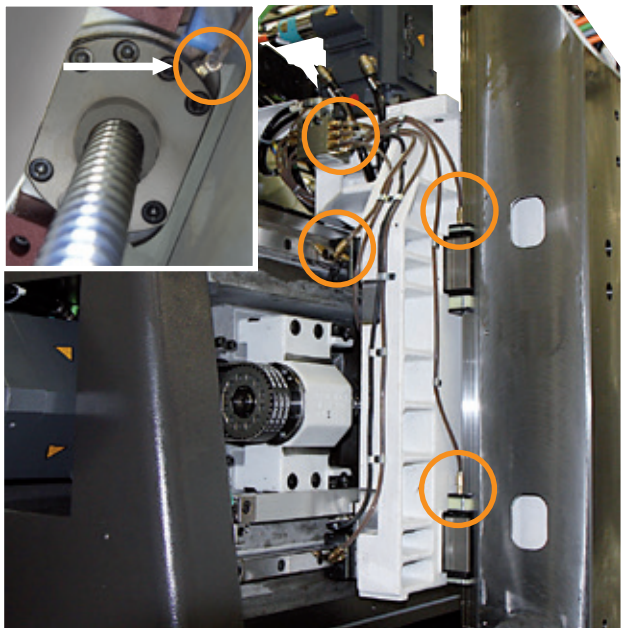
All heat sources in MIKRON HSM machines are as standard watercooled.

- + Drives
- + High speed spindle
- + Electrical cabinet

MIKRON HSM 500 / 700

# With high speed to EDM

Graphite electrodes, like high-speed machines, are both designed to increase productivity and customer values. The high speed milling of graphite electrodes requires not only a high reliability and performance spindle, it also requires exceptional vibration damping and repeating machine accuracy.



## Advantages

- + Absolute optical linear scales on X, Y, and Z axis operating with a measuring step of 0.02 guarantees incomparable positioning precision
- + Better thermal inertia of machine base due to the polymer concrete
- + All feed motors, the electrical cabinet and the motor spindle are liquid-cooled
- + No heat source in the machines structure

## Vacuum removal of graphite

- + All axis fully covered and protected (machine hood)
- + Automatic central lubrication with grease on all linear guides and ball screws
- + Powerful Amano suction unit with two separate dust bins

## High speed spindle

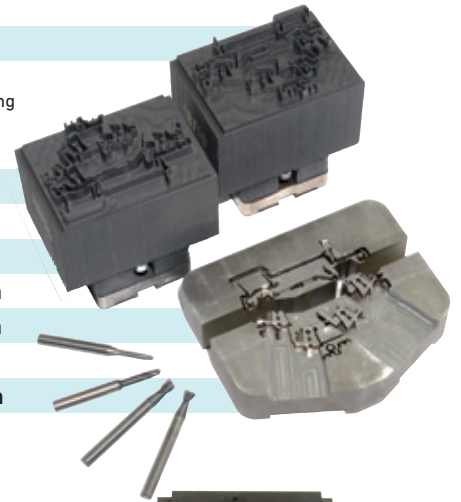
- + Maximum operating speed 42.000 rpm
- + Vector controlled motor spindle for short run-up and brake times and high torques at low speed
- + Ceramic hybrid ball bearings with oil-air minimal lubrication
- + Liquid-cooled stator jacket and bearings
- + HSK interface

## Applications in graphite

# Efficient production in universal applications

**Material: Graphite R8710**

		Diameter <b>D</b>	Spindle speed <b>n</b>	Feed rate <b>v<sub>f</sub></b>	Radial cutting depth <b>a<sub>e</sub></b>	Axial cutting depth <b>a<sub>p</sub></b>	Machining time <b>t</b>
<b>Operation</b>	<b>Tool</b>	<b>[mm]</b>	<b>[rpm]</b>	<b>[mm/min]</b>	<b>[mm]</b>	<b>[mm]</b>	<b>[min]</b>
Roughing	toric	6	22'000	4'000	4	0.5	6 min
Prefinishing	toric	3	30'000	2'500	2	0.3	7 min
Roughing	toric	1.5	30'000	2'000	1	0.2	21 min
Prefinishing	ball nose	1	30'000	1'800	0.2	0.05	29 min
Finishing	ball nose	0.6	30'000	1'500	0.1	0.1	5 min
<b>Total</b>							<b>68 min</b>



**Material: Graphite R8710**

		Diameter <b>D</b>	Spindle speed <b>n</b>	Feed rate <b>v<sub>f</sub></b>	Radial cutting depth <b>a<sub>e</sub></b>	Axial cutting depth <b>a<sub>p</sub></b>	Machining time <b>t</b>
<b>Operation</b>	<b>Tool</b>	<b>[mm]</b>	<b>[rpm]</b>	<b>[mm/min]</b>	<b>[mm]</b>	<b>[mm]</b>	<b>[min]</b>
Roughing	toric	6	18'000	4'000	2.5	0.5	3.5 min
Prefinishing	toric	2	27'000	2'000	1.5	0.5	1 min
Roughing	ball nose	1	30'000	800	--	0.2	6 min
Finishing	ball nose	0.6	30'000	500	--	0.08	14 min
Slotting	toric	0.3	30'000	500	0.03	0.03	1.5 min
<b>Total</b>							<b>26 min</b>

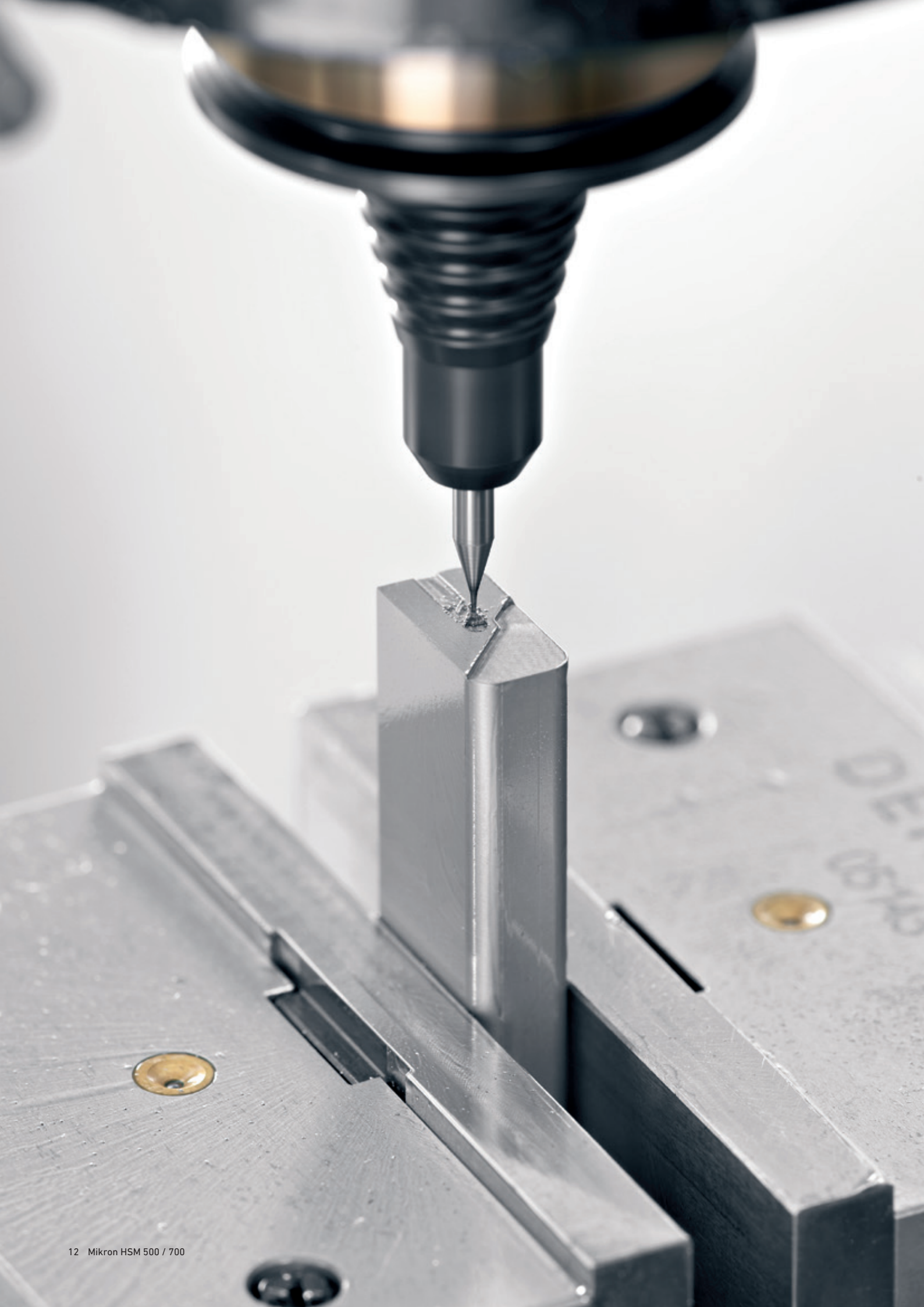


**Material: Graphite R8710**

		Diameter <b>D</b>	Spindle speed <b>n</b>	Feed rate <b>v<sub>f</sub></b>	Radial cutting depth <b>a<sub>e</sub></b>	Axial cutting depth <b>a<sub>p</sub></b>	Machining time <b>t</b>
<b>Operation</b>	<b>Tool</b>	<b>[mm]</b>	<b>[rpm]</b>	<b>[mm/min]</b>	<b>[mm]</b>	<b>[mm]</b>	<b>[min]</b>
Roughing	toric	6	20'000	6'000	3.5	1.5	8 min
Prefinishing	ball nose	2	29'000	3'500	0.5	0.4	5 min
Roughing	ball nose	1	30'000	2'000	0.08	0.08	8 min
Finishing	ball nose	1	30'000	4'000	0.05	0.05	29 min
<b>Total</b>							<b>50 min</b>

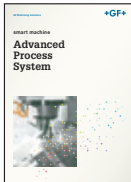






smart machine

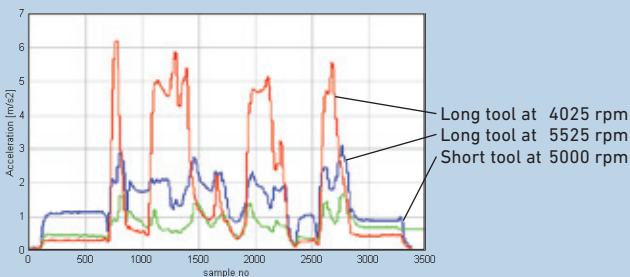
# Brings intelligence into the milling process



## Advanced Process System



Protection



### The unique vibration monitoring system

With the help of this system, vibrations that occur during a milling process can be made visible as a “G-load”. So it is possible to intervene selectively in the process and optimise it.

#### Your benefit

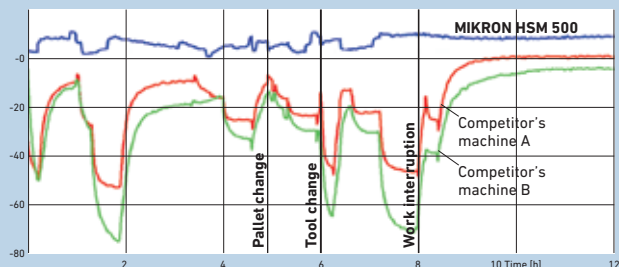
- + Increase the life-time of the spindle (reduction in the machine’s hourly rate)
- + Improve quality (Recognition of critical machining strategies)
- + Increased tool life (Improvement over all process reliability and cost)



## Intelligent Thermal Control



Precision



### The unique in-process compensation

Usually, the machine operator has to wait for the machine to settle to a thermal steady-state for a couple of hours. With the Intelligent Thermal Control, the operator can directly start with precision work.

The machine actively compensates for thermal displacement of the tool center point. Excellent accuracy is the result on the workpiece.

#### Your benefit

- + Higher productivity
- + Higher accuracy
- + Increased process reliability



## Operator Support System



Productivity



### Time, Surface, Accuracy

The operator can access the internal parameters of the CNC controller using a simple and understandable interface to set the target value.

The system adjusts the dynamic behavior of the machine tool motion exactly according to your needs.

#### Your benefit

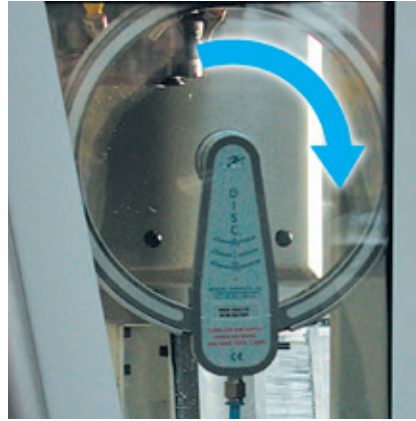
- + Shorter machining times
- + Better surface quality
- + Higher accuracy

## Options

# Options for all needs



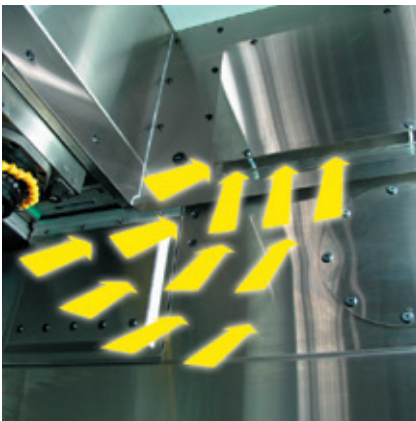
Coolant



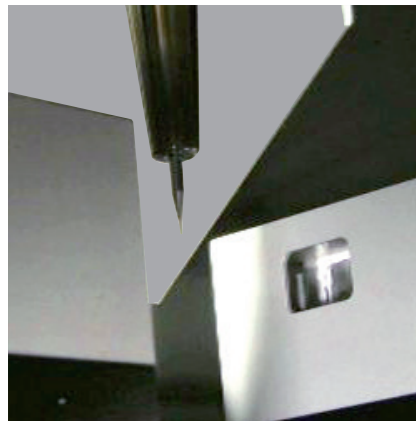
Rotating window



Minimum quantity lubrication



Oil mist extraction



ITM - Intelligent Tool Measurement



Laser tool measuring



Mobile handwheel

APS  
CAMplete  
Econowatt  
SIGMA FMC  
ITC  
ITC 5X  
ITM  
OSS  
OSS extended  
OSS extreme  
PFP  
RNS  
SPS

smart machine



smart machine

# The new dimension in modern production

**Bringing intelligence into the milling process is the intended aim of “smart machine”.**

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. First of all, establishing comprehensive communication between man and machine, which makes precise information that the operator requires to assess the milling process available to him. Secondly, supporting the operator in the optimisation of the process, which considerably improves the performance. Thirdly, the machine optimises the milling process, which improves the process safety and the quality of the workpiece - above all in unmanned operation.

## The facts

- + Greater accuracy in shorter machining times
- + Increase in the workpiece surface quality as well as the surface and shape accuracy
- + Recognition of critical machining strategies
- + Improvement in the process safety
- + Reduction of the machine set due to longer service life
- + Higher availability
- + Better operating comfort
- + Considerable increase in reliability in unmanned operation

## smart machine construction kit system

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

## Your benefit

Producing the workpieces in a process-secure and precise manner, increasing the reliability in unmanned operation, increasing the service life of the machine and significantly reducing production costs.



Saving energy



Protection



Precision



Productivity

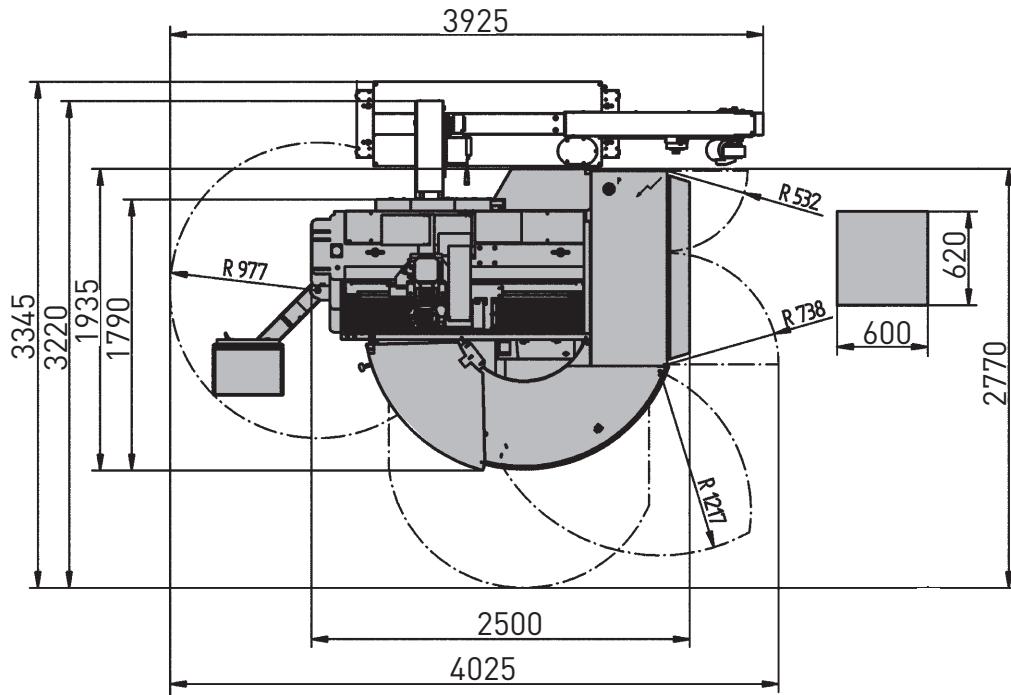
The smart machine is constantly being further developed. The currently available modules can be found at [www.gfms.com](http://www.gfms.com)

## Technical data

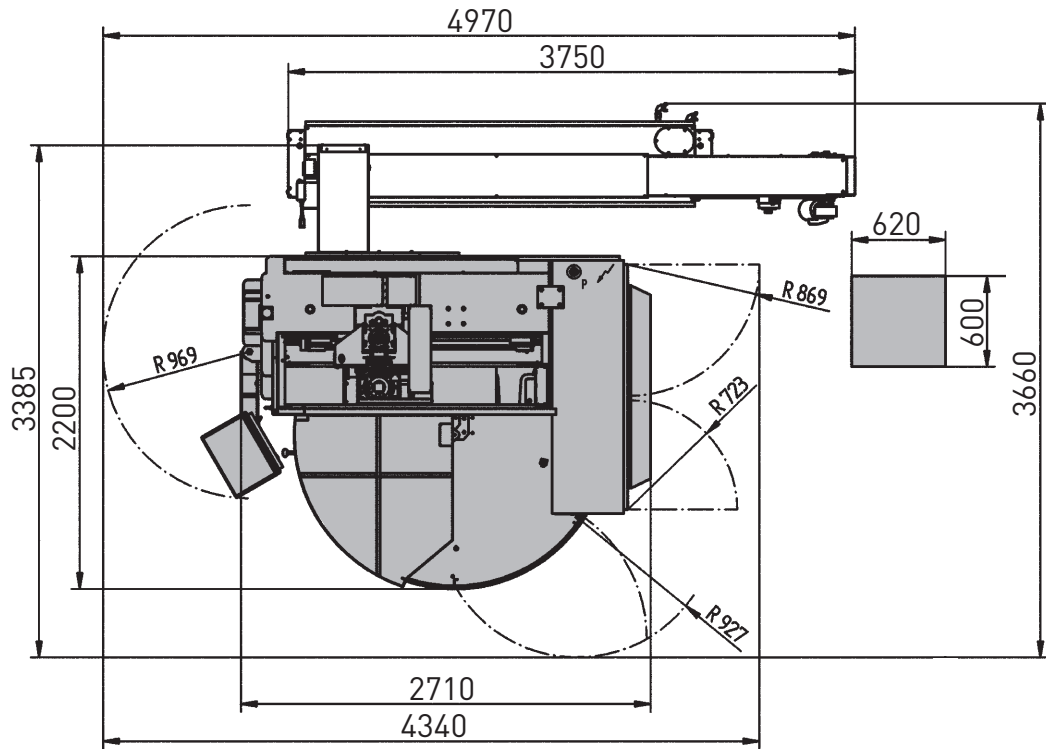


			MIKRON HSM 500	MIKRON HSM 700
<b>Workarea</b>				
Longitudinal	X	mm	500	700
Lateral	Y	mm	450	600
Vertical	Z	mm	350	500
<b>Working spindle (40% ED, S6)</b>				
42,000 rpm	HSK-E40	kW / Nm	13.0/ 4.2	13.0/ 4.2
30,000 rpm	HSK-E40	kW / Nm	12.0/ 8.8	12.0/ 8.8
36,000 rpm	HSK-E50	kW / Nm	-	32.0/ 20
<b>Feed rate</b>				
Vorschub /Eilgang	(X, Y)	m / min	20/42	20/42
Vorschub /Eilgang	(Z)	m / min	20/42	20/42
<b>Work table</b>				
Clamping surface		mm	550x450	900x630
Max table load		kg	200	800
<b>Tool magazine</b>				
HSK-E40		Capacity	18/36	18/36
HSK-E50		Capacity	-	15/30
<b>Standard equipment</b>				
Control Heidenhain iTNC 530			+	+
Interface Ethernet			+	+
25 GB Harddisk capacity			+	+
3 user-definable M codes			+	+
Step-Tec High-Speed Spindle			+	+
Vector drive (high torque)			+	+
Rigid tapping			+	+
Optical linear scales with compressed air protection			+	+
Liquid cooled spindle, drives, electrical cabinet			+	+

MIKRON HSM 500



MIKRON HSM 700





# 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.



## Automation

**System 3R Automation, Tooling 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 Automation, Tooling and software solutions—simple workpiece pallet and electrode changers and flexible manufacturing and robot handling systems— increase your 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 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, blisks, 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.**

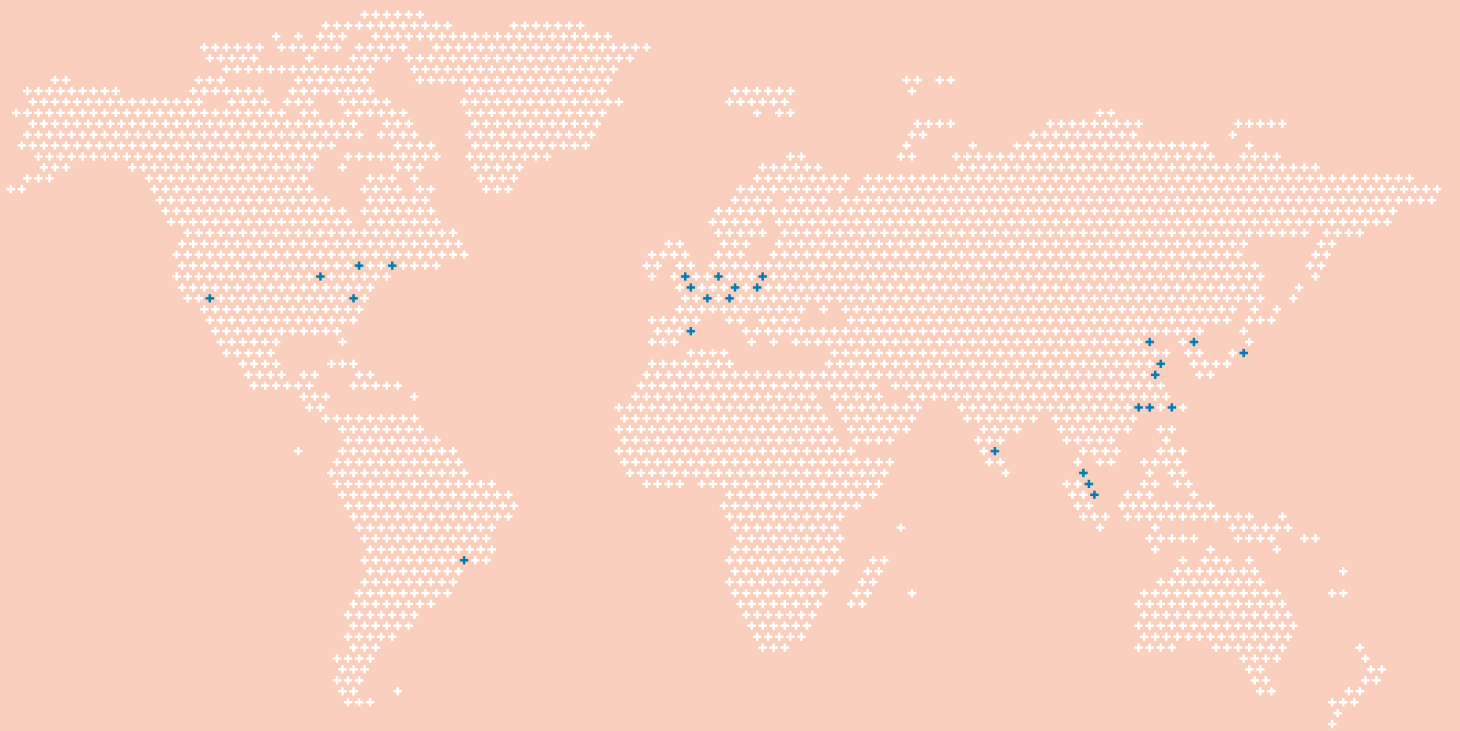
At the heart of every Mikron machining center is high-performance Step-Tec Spindle. Step-Tec Spindles are essential core components of our machining centers. Highly accurate and thermally stable Step-Tec Spindles ensure that our machines can handle everything from heavy-duty roughing to fine-finishing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



## Customer Services

**Operations Support, Machine Support and Business Support.**

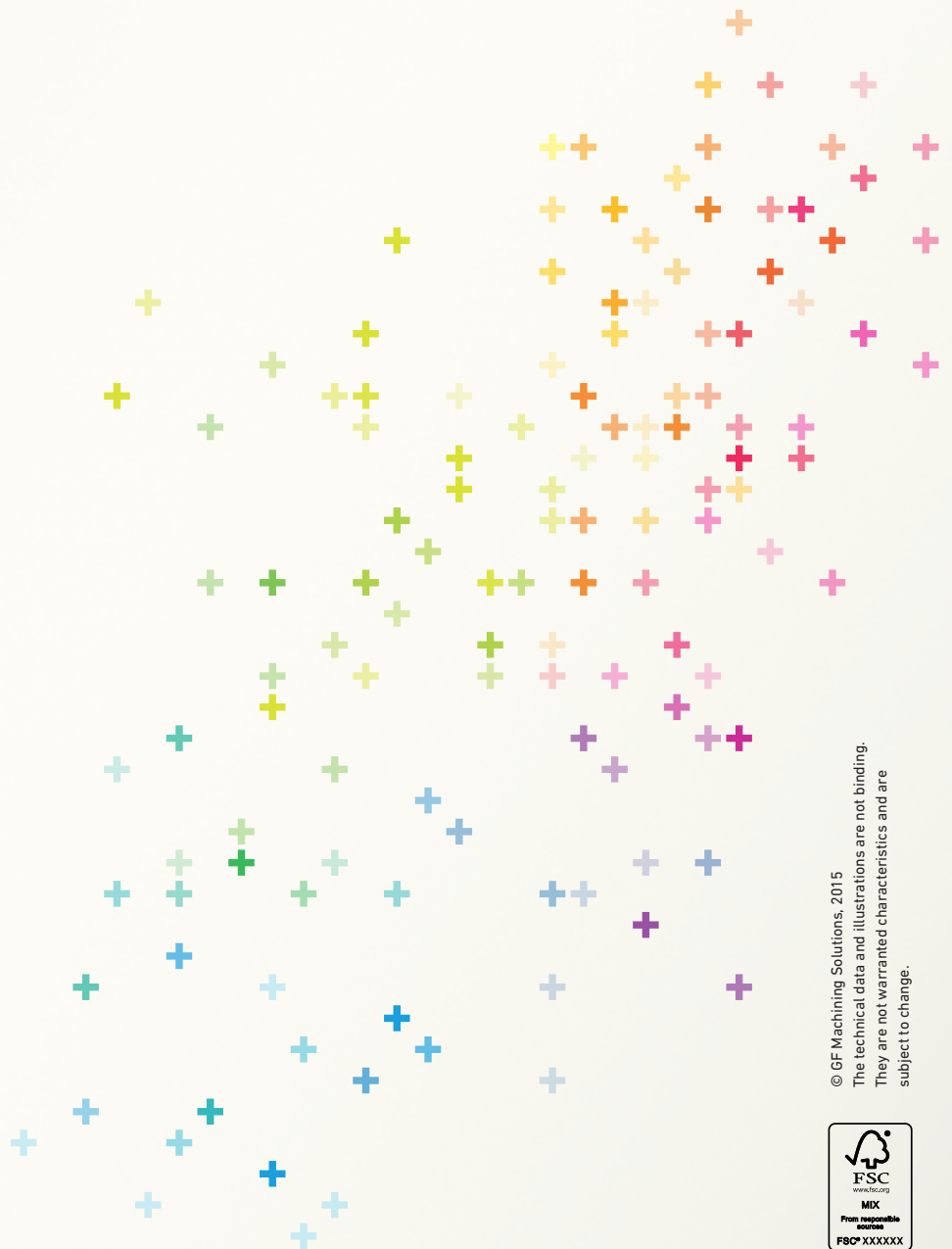
To help you get the most and the best from your machine tools and equipment, we offer three levels of support. Operations Support covers our range of original wear parts and certified consumables (EDM wires, filters, resins, electrodes etc.) to ensure that your machines are performing at the highest 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.



# At a glance

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

[www.gfms.com](http://www.gfms.com)



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They are not warranted characteristics and are  
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