

Mikron

MILL X 400

MILL X 400 U



Swiss design and quality

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GF Machining Solutions introduces new reference machines in three-axis and five-axis-models for ultra-high-speed Milling

Based on the concept of the current MILL S series, GF Machining Solutions' engineers have developed two new machine models that represent an optimal answer to all aspects of three-axis and five-axis ultra-high-speed milling. The MILL X series is designed for highest productivity thanks to unique dynamics and reliability.

For the required construction measures, the focus is on the machine bed, the cooling, the axis drives, the motion control and workpiece measurement.

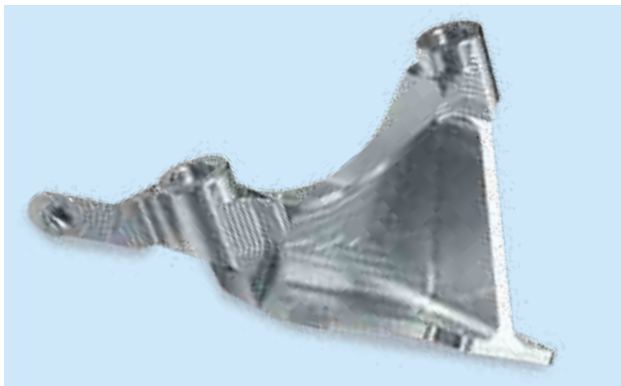
These vertical high-speed machining centers, developed for small and medium series production of high-quality parts, combine the entire technical know-how as well as comprehensive development experience of the Swiss machine manufacturer, GF Machining Solutions.

Applications



Medical component

- Stainless alloy
- + Reliable process
- + Precision
- + Surface quality



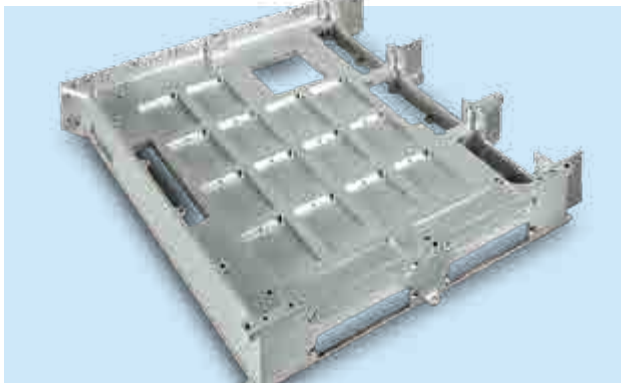
Aerospace structural part

- Aluminium
- + Reliable in tolerances
- + Smooth transitions
- + Short cycle time



Closed impeller

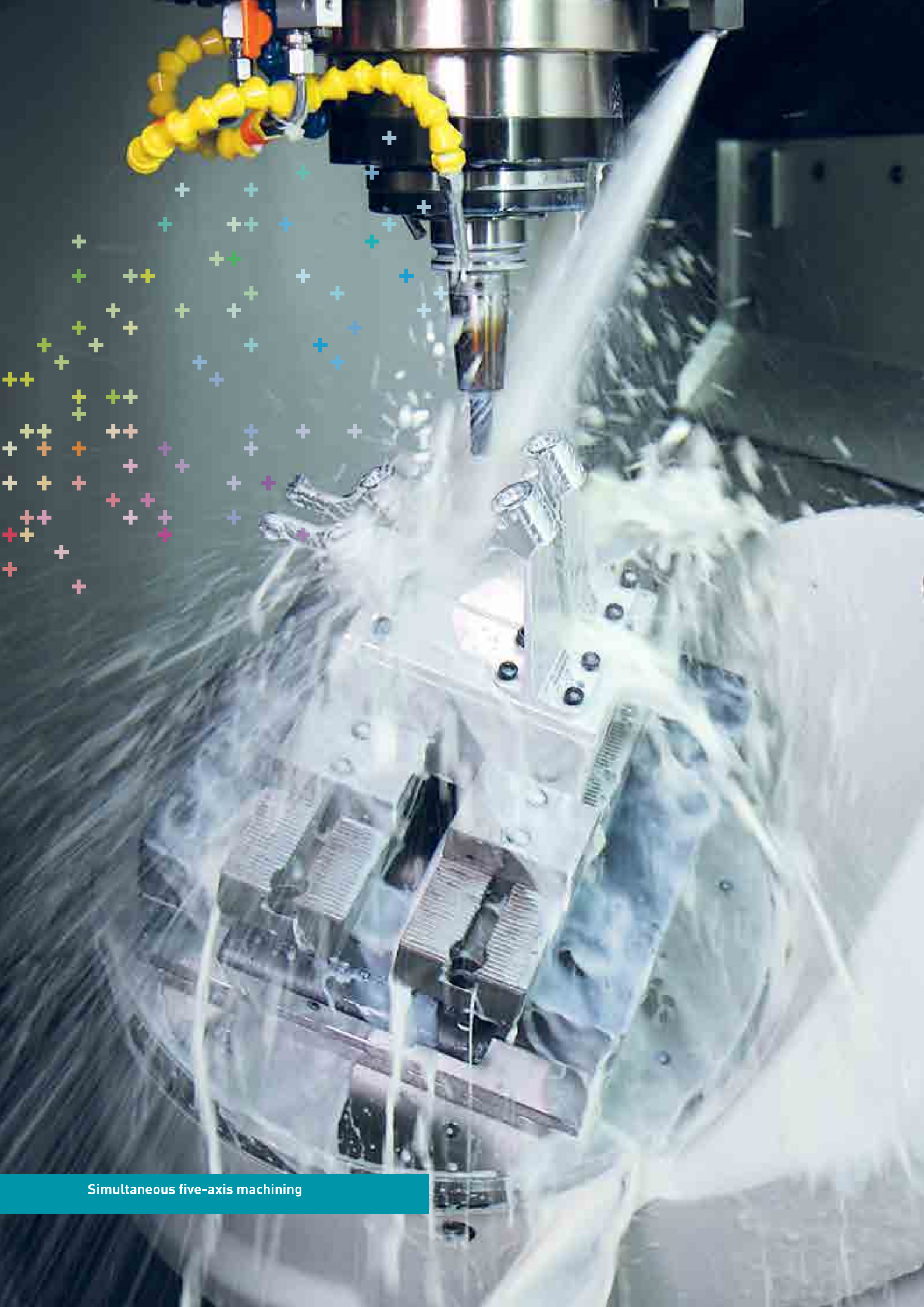
- Aluminium
- + Short cycle time
- + Dimensional accuracy
- + Requires precise, dynamic interaction of all axes
- + Very large swivel angle possible



ICT enclosure part

- Aluminium
- + Short cycle time
- + Warp-free machining
- + Burr free





Simultaneous five-axis machining

Highlights

Dynamics and quality for the productive machining of high quality parts in small- and medium-sized series production

Mikron MILL X 400 U



Stability and dampening

The most important conditions for the highest dynamics, the best workpiece surface quality and precision include the dampening and stability of the machine foundation.



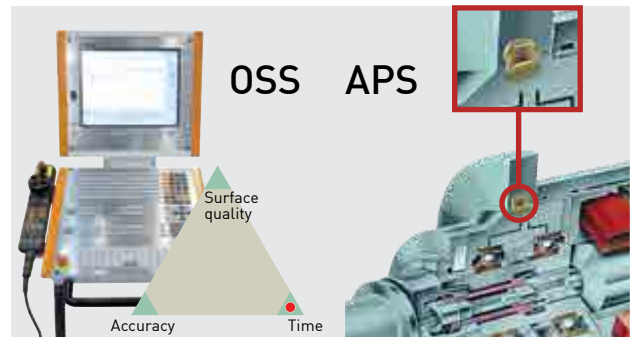
Automation

Optimal variations for your production needs

- + Small installation footprint
- + Integrated automation
- + Flexible tool magazines

HSM inside

The axes are powered with linear drives for the highest speed and acceleration. The pyramid-shaped structure made of polymer concrete and the weight-optimized construction and rigidity are essential for the high-speed cutting (HSM) process.



A firm grasp on our processes

The smart machine modules made by GF Machining Solutions further increase the productivity of the MILL X series.

Operator Support System (OSS) extreme

OSS increases its productivity with up to 23 percent faster processing time as well as improved surface quality and precision.

- + Time saved during three-axis milling due to higher jerk values
- + Better surface quality due to constant chip load

Advanced Process System (APS) extended

APS is a unique vibration monitoring system

- + Extended Spindle life (reduction of operating cost)
- + Optimisation of machining process
- + Increased tool life (reduction of tooling costs)

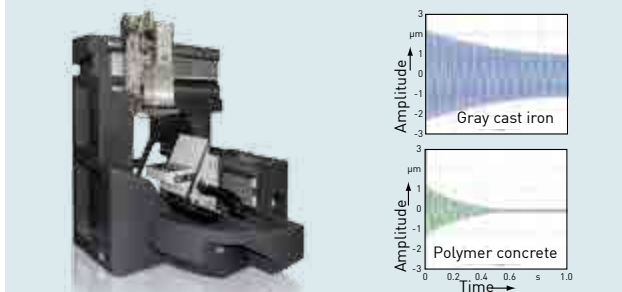
Optimal cooling

All power components are cooled.

Through the optional cooling of the machine bed, the thermal stability related to temperature fluctuations in the production environment of the machine is significantly improved.



A dynamic and reliable process for your production



Polymer concrete with high thermal inertia as well as excellent dampening properties.

The pyramid-shaped construction guarantees both an optimally static and dynamic distribution of mass as well as perfect support of the machining forces.

The closed O-shaped structure is excellently suited for Automation solutions by GF Machining Solutions and other manufacturers.

Chip management: A great deal of attention has been paid to the flow of chips. The steep incline of the chrome steel sheets in the workroom facilitate the flow of the chips.

Movable carriages along all axes are optimized with regard to weight and rigidity to meet the high dynamic requirements.

All guides have central oil lubrication.



Central oil lubrication

Direct drive: dynamic and reliable

On an HSC machine, the high dynamic force must be guided with great precision during the cutting.

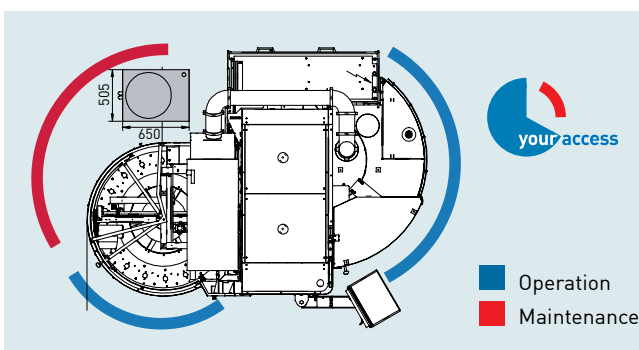
This is where the linear direct drive offers great advantages. Mechanical drive systems have fundamental weaknesses, because a highly dynamic arrangement naturally comes with a loss of precision.

Advantages of the linear drive

- + Short settling time
- + No over steering due to clearance and elasticity
- + High dynamic rigidity
- + Independent of slide position
- + Excellent precision and accuracy on the workpiece due to extremely rigid drive and guide concept
- + Excellent long-term precision due to reduced friction loss with direct drive and central oil lubrication
- + Reduction of main times due to maximum dynamic parametrization (OSS)
- + Reduction of downtimes due to high rapid traverse speeds
- + Reduction of maintenance and repair, since the ballscrew drive or transmission as a wear part is omitted



Linear direct drive



Ergonomics and process reliability

... are especially important in this machine type series:

- + Unchanged accessibility at every expansion stage, thanks to workpiece Automation through the portal
- + Excellent view of the workspace
- + Access to the workpiece from three sides
- + Side windows for optimal monitoring of the machining process

Accuracy

HSM-core competencies: Thermal accuracy

Static accuracy, Swiss precision

Before delivery, every Mikron MILL X machine is subjected to an extensive quality control process according to GF Machining Solutions approval guidelines in our air-conditioned production site.

Quality awareness means added value.

Dynamic accuracy: position sensor systems

All Mikron MILL X machines are intentionally equipped with direct position systems in the linear and rotary axes.

- + Proven Heidenhain accuracy
- + Resolution in nanometer range
- + Protected with air purge system

Thermal accuracy cooling concept

The Mikron MILL X series leads precision machining into a new era. Since high axis feed rates over long periods always generate heat in the drive groups, the Mikron MILL X series has a sophisticated cooling management system.

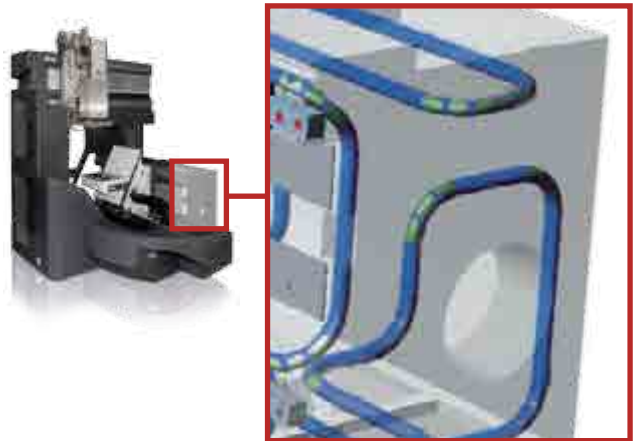
Each of the linear axes, the rotary units and the motor Spindle feature a separate cooling circuit. The heat is consistently transferred out of the machine and not distributed further inside the machine.

This also results in geometric stability which, in turn, ensures an extremely high repeatable accuracy of the motion control.

In Mikron MILL X machines, all electric heat sources are water cooled.

- + X, Y, Z, B, C drives
- + Spindle with Opticool or CoolCore technology
- + Electric cabinet

Five separate cooling circuits

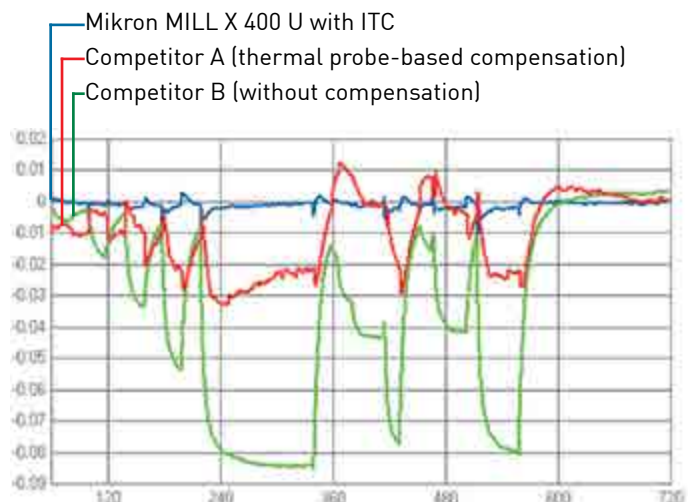


Cooled machine bed

Through the use of a cooled machine bed, the thermal stability related to temperature fluctuations in the production environment of the machine is significantly improved.

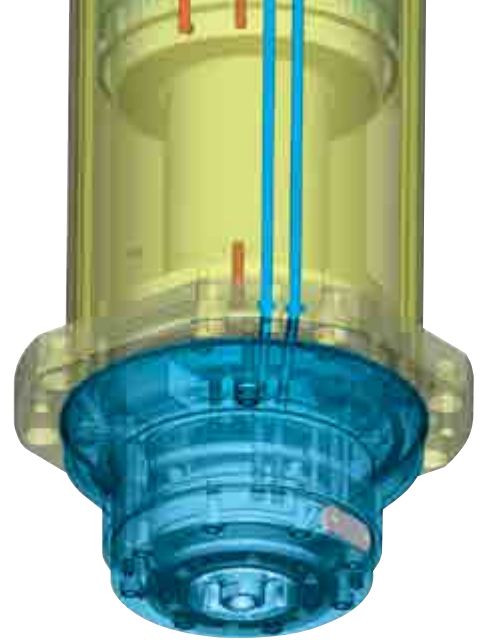
Measuring probes

- + Even higher accuracy with new Thermo-Lock measuring probe technology
- + Easy to install
- + Slows down the transfer of heat between measuring probe and Spindle
- + Increases accuracy when working with measuring probe on the machine
- + A strong duo: Thermo-Lock and Opticool



High-tech motor Spindle

The motor Spindle, an HSM core com- ponent



Spindles for demanding processing tasks

Whichever machine configuration you choose, with a Mikron MILL X machine you will also receive state-of-the-art Spindle technology from Step-Tec AG.

The facts

- + Vector control for full torque in the lowest range
- + Highly stable ceramic hybrid Spindle bearing
- + Spindle shell cooling using controlled cooling agent circuit for constant temperatures during the entire processing time
- + Oil-air lubrication system with extraction of consumed oil
- + Integrated "smart machine" sensors
- + Cooling between tool interface and front Spindle bearing with the Opticool Spindles

Your benefits

- + Precise high performance
- + Shorter acceleration phases
- + High torque
- + Thread cutting without compensation chuck up to M14 (CK45 to M8)
- + Drilling up to Ø 12 mm



Included in delivery is the smart machine module APS for the reliable recording and display of the vibrations during the milling process.

	30'000 min ⁻¹ HSK-E40 Opticool	42'000 min ⁻¹ HSK-E40 Opticool	42'000 min ⁻¹ HSK-E40 Cool Core	60'000 min ⁻¹ HSK-E32 Opticool
Mikron MILL X 400	+	+	+	+
Mikron MILL X 400 U	+	+	+	+

- + Higher accuracy with Step-Tec Opticool technology
- + Cooling of the front roller bearings
- + Low transfer of heat in the workpiece interface
- + Increases accuracy when working with measuring probe
- + Additional cooling of the rotor with separate cooling unit



Step-Tec AG

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

Tool magazine

Optimal variations, adjusted for your production needs

Tool Automation in every expansion stage

- + Single- or double-row disk magazine
- + Reliable "pick-up" changing system
- + Feed monitoring using light beam
- + Capacity of up to 68 tools with magazines integrated in the basic machine
- + Alignment of the measuring probe

Optionally available with a variety of capacities

Mikron MILL X 400

Mikron MILL X 400 U

HSK-E40: 18; 36; 68 tools

HSK-E32: 20; 40 tools

User-friendly workpiece loading

Productivity and process reliability are guaranteed thanks to the workpiece loading on the side.

- + Simultaneous processing and loading
- + Easy feed monitoring due to large glass window
- + Ergonomic access



HSK-E40-magazine with two rows, integrated in the basic machine, with a capacity of 68 workpieces.



Expanded tool magazine

168x HSK-E40

308x HSK-E40

120x HSK-E50





**Productivity
with pinpoint
accuracy**



Workpiece clamping

Integrated pallet clamping systems

Avoid unproductive times

Completely integrated reference clamping systems by System 3R in standard models, versions with media feed-through as well as Tooling on request.

Mikron MILL X 400 U

25 kg

Five-axis models



Rotary swiveling table with reference clamping system

- + System 3R Macro Magnum
- + Erowa ITS

- + **Extremely dynamic and fast:**
turning and swiveling with direct drives in B and C axes up to 250 min⁻¹
- + **Extremely accurate and precise:**
liquid-cooled motors and absolute measuring systems
- + **Extremely stable and mobile:**
Hydraulic clamping in the rotatory and swivel axis plus integrated reference clamping system with a B-axis swivel range of 220°

Mikron MILL X 400

120 kg

Three-axis models



Mikron MILL X 400 with reference clamping system

- + System 3R Dynafix
- + System 3R GPS
- + Erowa UPC

- + **Extremely generous**
Matching the traverse distances, pallet dimensions up to 350 mm x 350 mm
- + **Extremely fitting**
Reference clamping system in standard masses of the most important manufacturers

Media feed-through to clamping surface (on customer's request)



- + **Extremely efficient**
Media feed-through for automatic workpiece clamping systems make rapid clamping of workpieces in the workroom possible as well.
- + **Extremely flexible**
Media feed-through for automatic two-pallet system. Two pallet sizes can be operated automatically.



Customer-specific solutions: more parts in less time at lower costs



From the pallet magazine to the robot system

GF Machining Solutions has developed a fully integrated pallet magazine as a standard product.

With a standardized robot interface, the Mikron MILL X type series can be operated with the robot systems of well known suppliers.

No matter what type of handling system is used, the accessibility of the machine remains outstanding.

Together with the modular tool magazines, the compact Milling center becomes a highly productive and flexible production cell...

... including in conjunction with other machines.





Options

Standardized options or at the customer's request

Chip management in many variations and options

A great deal of attention has been paid to the flow of chips. The steep incline of the chrome steel sheets in the working area facilitate the flow of the chips. In addition, a large selection of chip conveyor and filtration systems are available.



Optimal chip fall, including with T-slot table



Coolant tank



Chip conveyor to remove large volumes of chips



Chip flushing



Steep covers directly into the spiral conveyor



Cooling lubricant filtration



Mist extraction

Specific equipment at customer's request

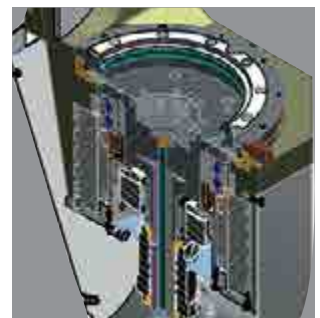
At the customer's request, many production-specific solutions are possible.

Already implemented requests

- + Automatic workpiece clamping on pallet
- + Automation with two pallet sizes and adapter pallets
- + Air/cooling lubricant through Spindle
- + Additional chip flushing on the Spindle
- + and many more



Pick-and-place systems with automatic parts clamping



Up to four additional media on the pallet



Automation interface



Cooling lubricant/air through Spindle

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.



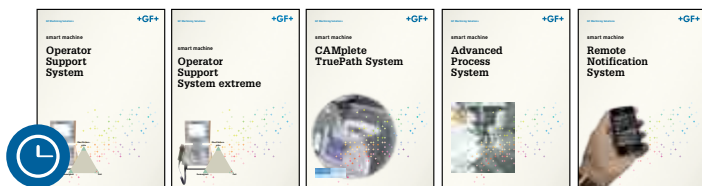
Saving energy



Protection



Precision



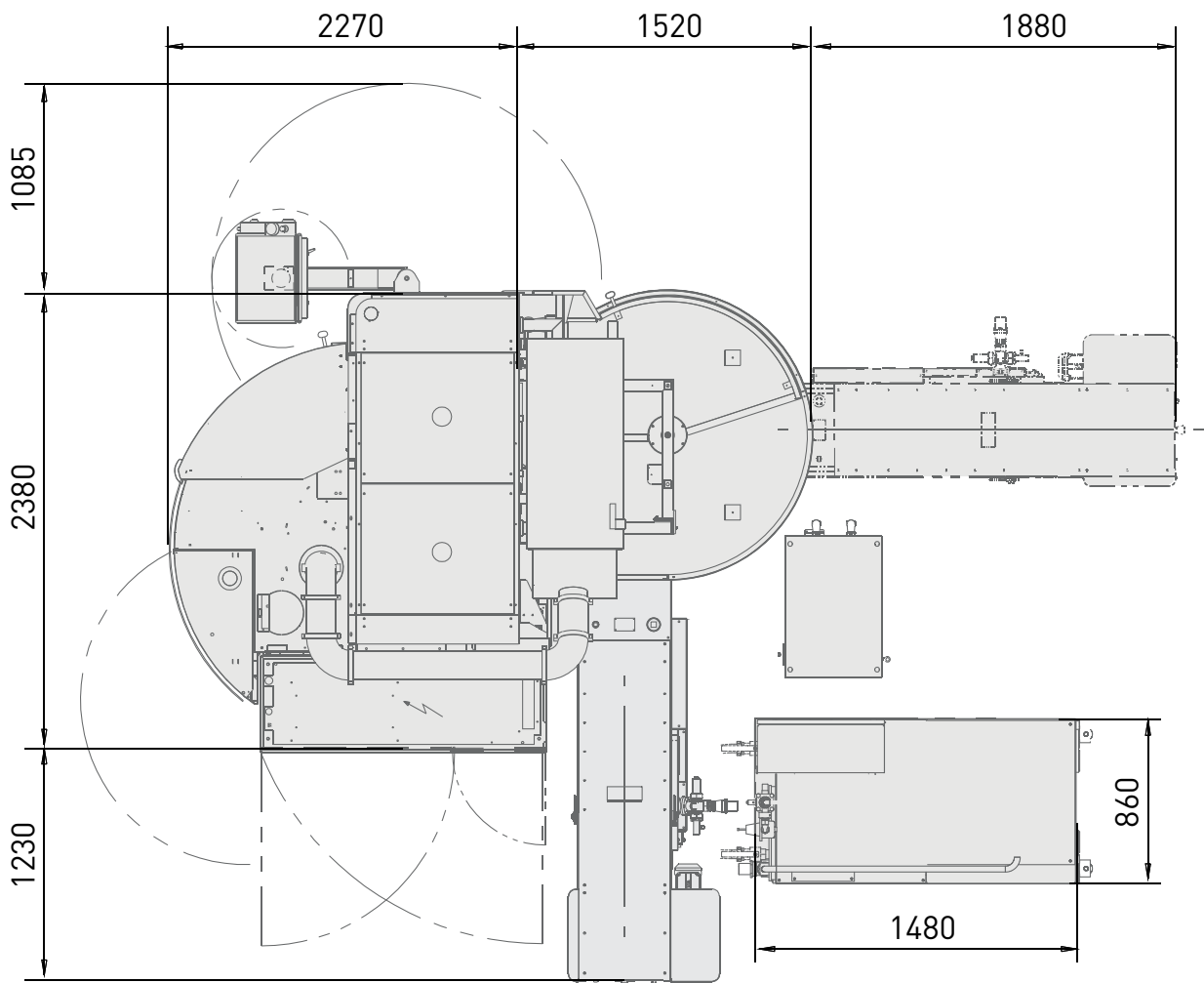
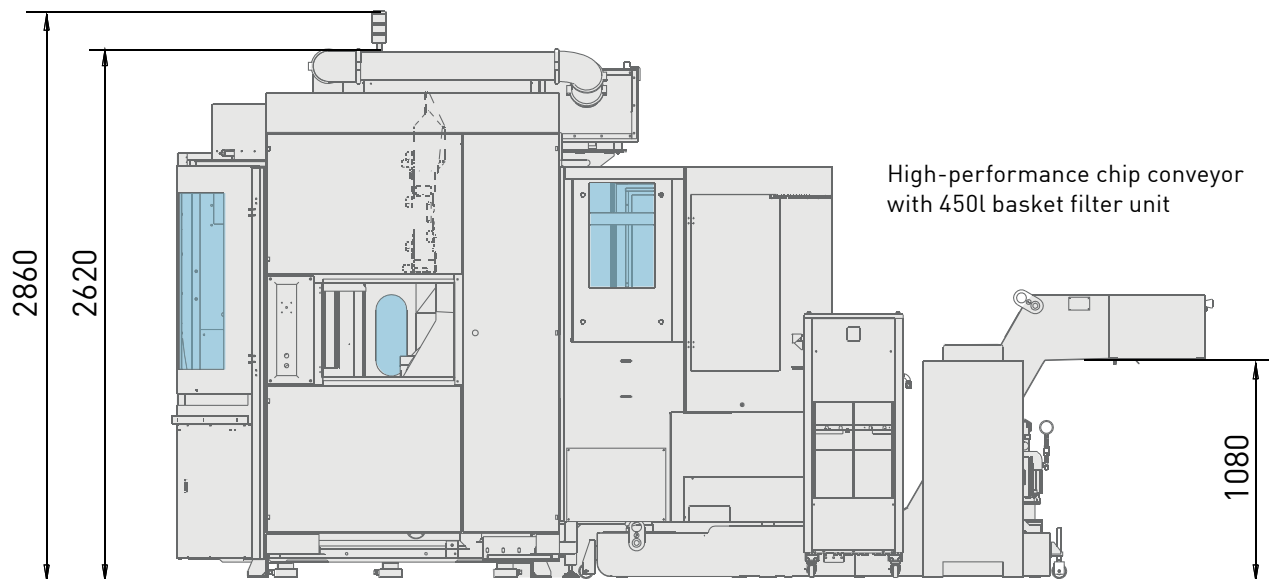
Productivity

The smart machine is constantly being further developed.
The currently available modules can be found at
www.gfms.com

Technical data



Machine			Mikron MILL X 400	Mikron MILL X 400 U
Axis travel				
Lengthwise	X	mm	400 +100	500
Crosswise	Y	mm	450	240
Vertical	Z	mm	360	360
Swiveling axis		°	-	+110/-110
Rotating axis		°	-	n x 360
Travel speed				
Rapid traverse	X, Y	m / min	100	100
Rapid traverse	Z	m / min	100	100
Rapid traverse (swivel)		min ⁻¹	-	165
Rapid traverse (turn)		min ⁻¹	-	250
Spindle (40% ED, S6)				
60'000 min ⁻¹ , HSK-E32		kW / Nm	8.5 / 3.5	8.5 / 3.5
42'000 min ⁻¹ , HSK-E40 (Cool Core)		kW / Nm	13.5 / 8.8	13.5 / 8.8
30'000 min ⁻¹ , HSK-E40		kW / Nm	13.5 / 8.8	13.5 / 8.8
Work table				
Pallet/clamping surface		mm	Dynafix 350 x 350	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
Tool magazine				
HSK-E32	tool holder		20 / 40	20 / 40
HSK-E40	tool holder		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		80	25
Weight				
Machine	kg		6'800	7'000
Pallet changer	kg		1'200	1'200
Control				
Heidenhain			iTNC 530 HSCI	iTNC 530 HSCI



GF Machining Solutions



Milling

High-Speed and High-Performance Milling Centers. In terms of cutting speed, HSM centers are 10 times faster than conventional milling machines. Greater accuracy and a better surface finish are also achieved. This means that even tempered materials can be machined to a condition where they are largely ready to use. One essential advantage of HSM is that with systematic integration, the process chain can be significantly shortened. HSM has developed alongside EDM into one of the key technologies in mold and tool making.



EDM

Electric Discharge Machines. EDM can be used to machine conductive materials of any hardness (for example steel or titanium) to an accuracy of up to one-thousandth of a millimeter with no mechanical action. By virtue of these properties, EDM is one of the key technologies in mold and tool making. There are two distinct processes — wire-cutting EDM and die-sinking EDM.



Laser

Laser texturing. Laser texturing supplements and extends the technologies offered by GF Machining Solutions. With our laser technology we enable you to produce texturizing, engraving, microstructuring, marking and labeling of 2D geometries right through to complex 3D geometries. Laser texturing, compared to conventional surface treatment using manual etching processes, offers economic, ecological and design advantages.



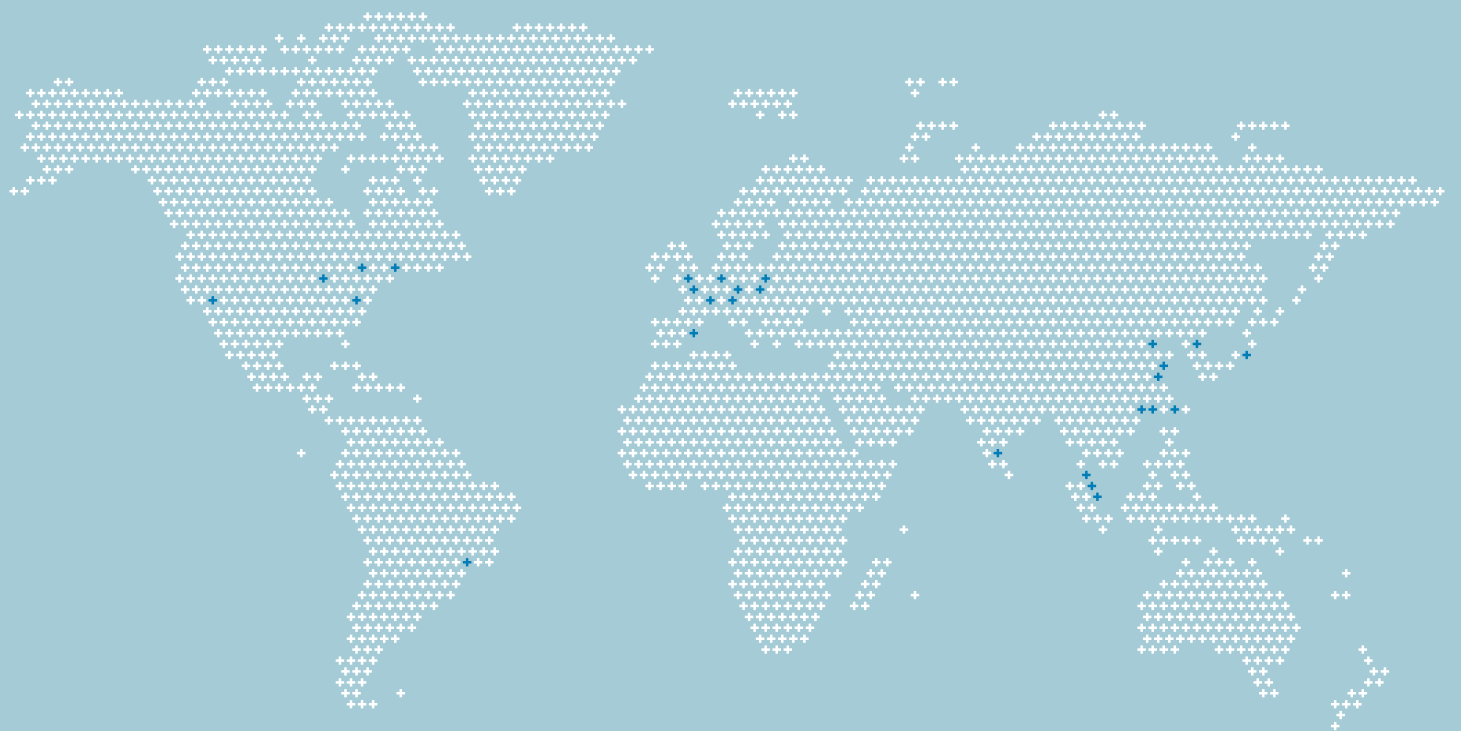
Automation

Tooling, Automation, Software. Tooling for fixing workpieces and tools; automation systems and system software for configuring machine tools and recording and exchanging data with the various system components and design advantages.



Customer Services

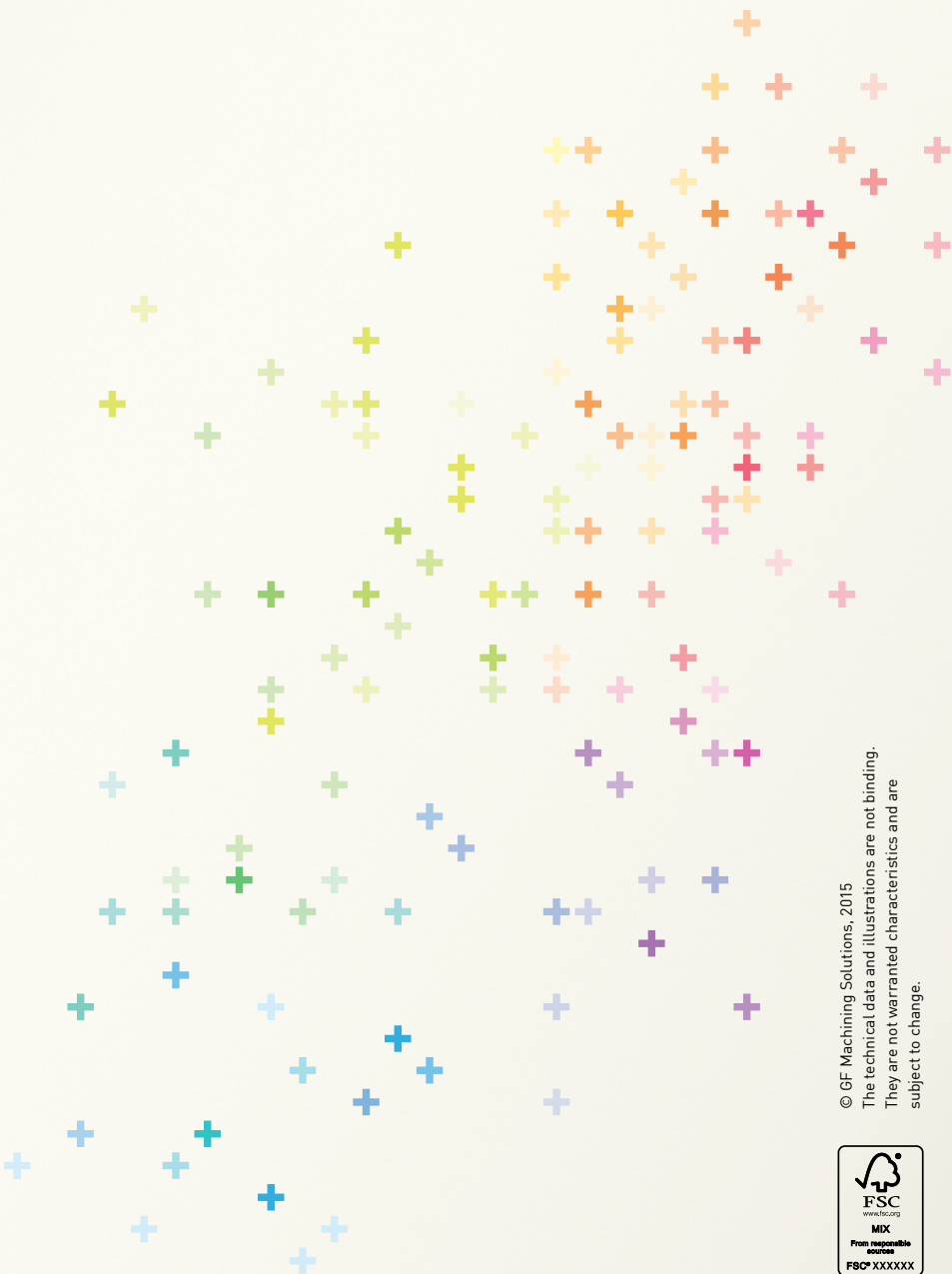
Operations, Machine and Business Support. Customer Services provides with three levels of support all kind of services for GF Machining Solutions machines. Operations Support offers the complete range of original wear parts and certified consumables including wires, filters, electrodes, resin and many other materials. Machine Support contains all services connected with spare parts, technical support and preventive services. Business Support offers business solutions tailored to the customer's specific needs.



At a glance

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

www.gfms.com



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