

### Mikron



### 500 U 700 U



# Becoming better every day – since 1802

#### **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 service 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.



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The Mikron MILL E 500/700 U high-efficiency series comprises five-axis machines in a stiff, stable, cast iron C-frame construction. With large-sized guideways and double supported rotary table, this range delivers parts quality and optimum chip removal rate—ideal for job shops and parts producers in automotive, energy and power generation, and general machinery.

#### Market segments and applications

## **Typical applications**

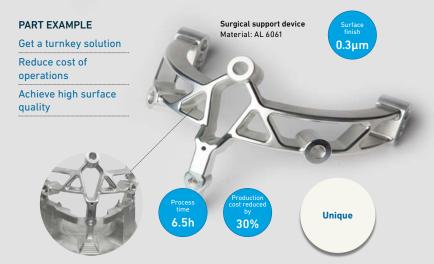


**Aerospace** 





Medical





Medical





**Automotive** 





Mold and die





Machinery and general mechanics



#### **Technology**

## **High-efficiency Milling**

The Mikron MILL E U series is a dynamic, high-efficiency machine center for entry-level five-axis machining.

It provides highly efficient and productive processing for all kinds of materials, including aluminum alloys and stainless steel. This solution's economical design saves spaces and its ergonomics make it easy for your operator to use.

- 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.



#### **Solutions**

## The right solution—for you



Stiff machine construction



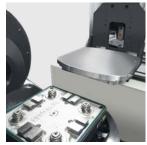
Double-supported rotary torque table



Step-Tec Spindle: 120 Nm, 20,000 rpm



Choice of HEIDENHAIN or FANUC control



Integrated Automation or third-party automation

## **Customer** benefits

- \* Benefit from the dynamic behavior essential to perfect part production.
- \* Machine under maximum load generates minimal noise and achieves top quality on your parts.
- \* Get the performance and Spindle power to execute all kinds of applications.
- \* Enjoy unmanned production—nights or weekends—with your favorite Automation system.



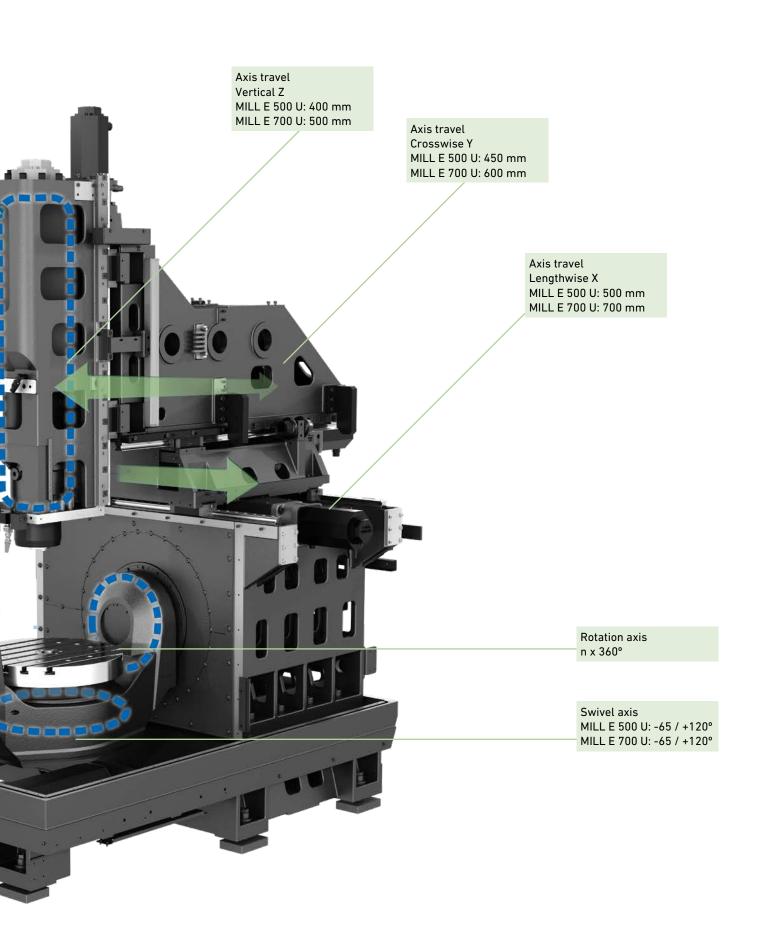
Integrated palletization

#### Robust and precise

# MILL E 500 U/700 U core components

- <sup>+</sup>Up to 60 tools integrated. 215 tools on a tool tower
  - Easy loading during operation
- \*Torque or gear drives for rotary table
  High positioning accuracy and repeatability thanks to direct drive technology
- Large swivel range from -65° to +120°
  Allows perfect access with the optima I tool length to the part
- \*20,000 rpm motor spindle with 120 Nm
  Best surface finish for both roughing and finishing
- \*Compact footprint and ergonomic access
  Highest efficiency and ergonomics on smallest space





#### Benefit from an automated process

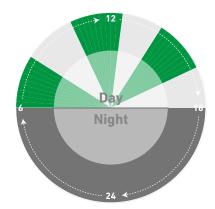
## Ramp up your productivity and flexibility

Execute small, express jobs with the same efficiency and profitability as mid-size series or repeat orders.

Your progress to higher productivity:

Step 1

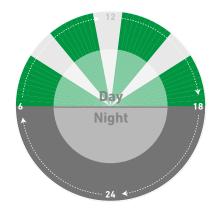
Move from three-axis, multiclamping Milling to five-axis, one-clamping Milling.



+46% productivity

Step 2

Upgrade the machine: clamping with System 3R



+20% productivity

Step 3

Extend your system: pallet magazine and clamping with System 3R

Mikron MILL E 500 U / 700 U



+16h additional capacity daily

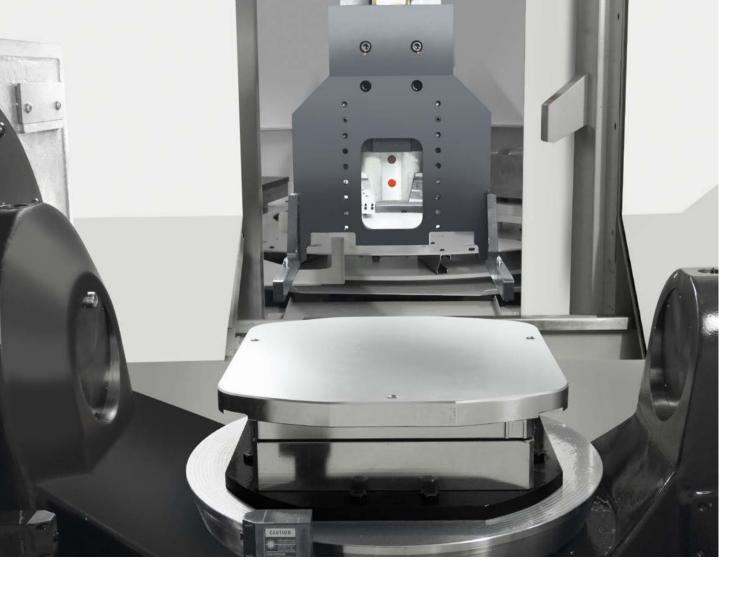
You'll run additional shifts 24/7 at lowest cost.



Generate a fast return on invest with a Mikron MILL E 500 U with 20,000 rpm Spindle, simultaneous torque table and our own pallet Mikron Mill pallet Automation with up to seven pallets.







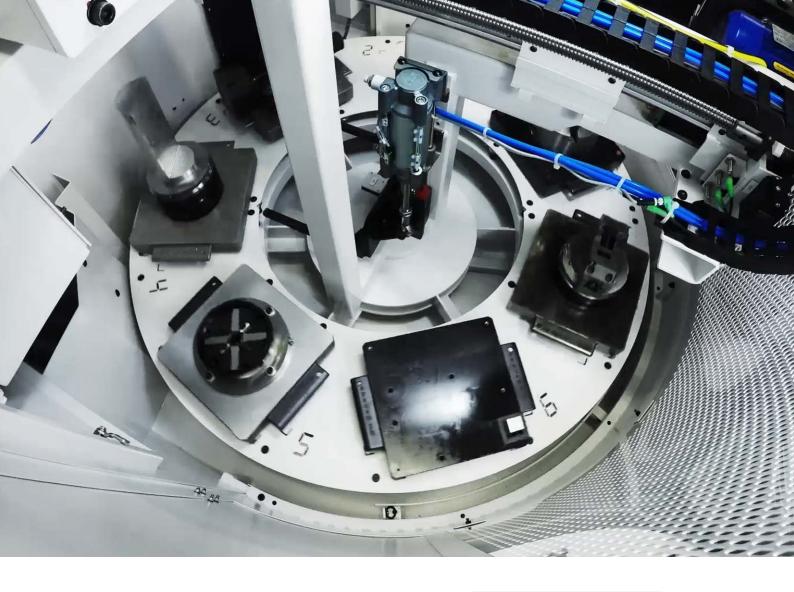
### Automation with pallet magazine

## Integrated palletization

Take your productivity to new levels while reducing your costs with our superior Automation solution. The pallet magazine's generously dimensioned door allows optimum pallet access for loading light parts by hand and heavy parts by crane. Larger windows allow a good view into the pallet area, and pallets are managed by using the machine control.



Ergonomic door design for easy loading of parts up to 200 kg



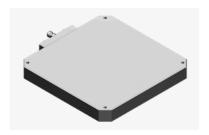
#### Five-sided processing in one clamping

5-Axis processing offers significant advantages for large and small components. Using 5-Axis technology, it is possible to process different shapes and surfaces with one clamping device.

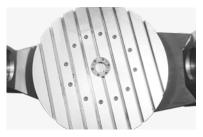
- Rotary swiveling table available as a pallet version: System 3R (Dynafix/Delphin)
- Rotary swiveling table available as a generously dimensioned tabletop version (Ø 500 / 630 mm with parallel T-grooves)
- Cartesian (right-angled) arrangement of the axes results in easily understood tool/workpiece movements during the Milling process
- Direct measurement on the B and C axes
- Machine available as 5-Ax or 5-Axis simultaneous versions



Dynafix pallet Automation



Delphin pallet Automation

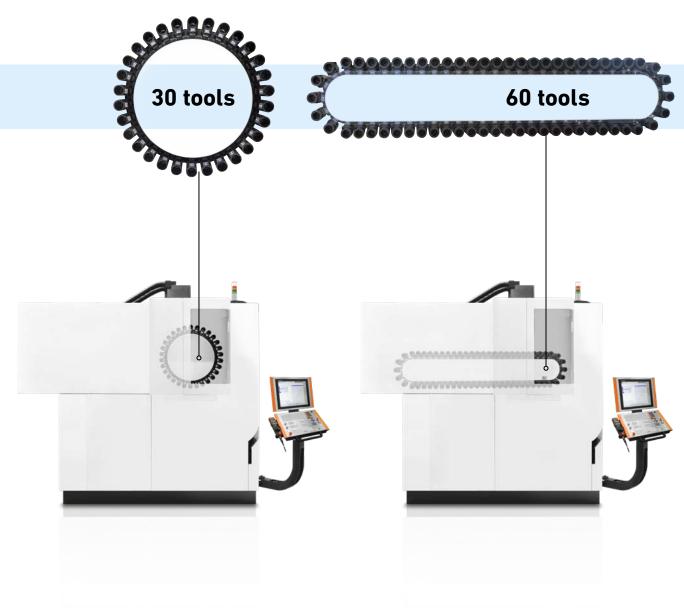


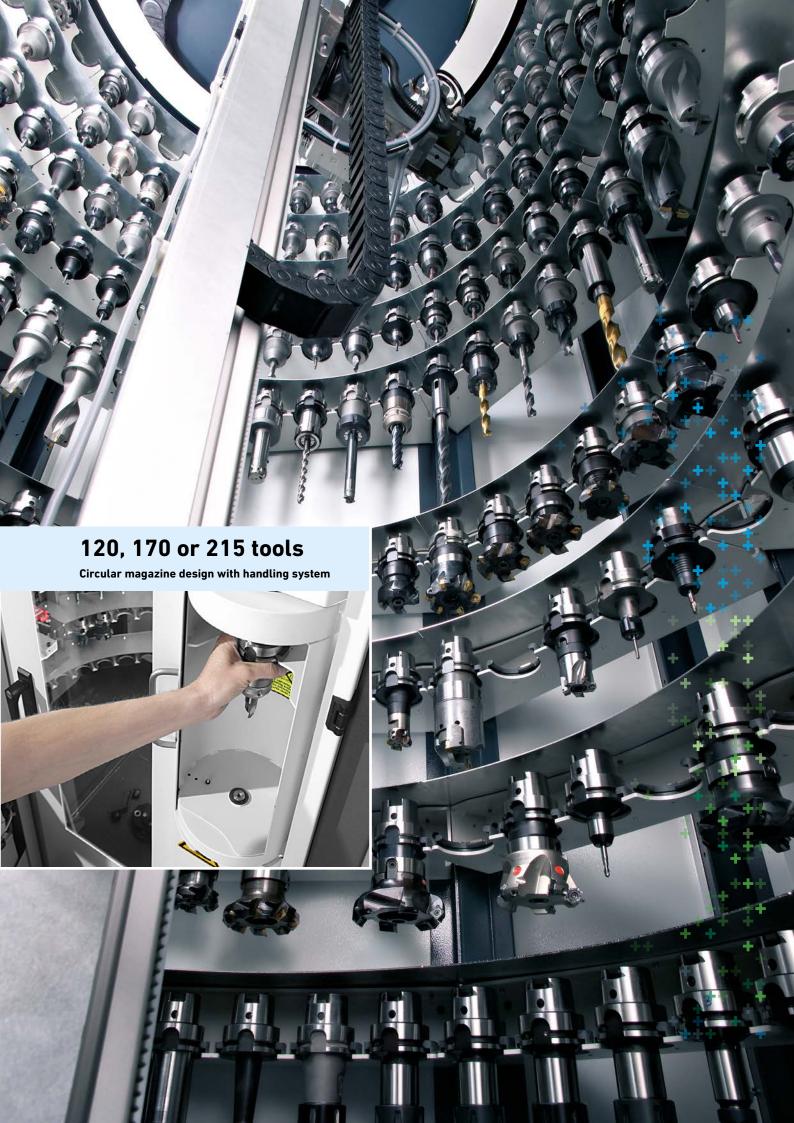
Rotary swiveling table with parallel grooves

#### Tool magazines

# We have the solution for your needs

- Ergonomic and user friendly
- Ensures productivity and process reliability
- Parallel machining and tool loading
- Easy tool loading possibilities thanks to an ergonomic tool loading door





#### **High-performance Spindles**

## High-efficiency Milling and effective processing

The high-performance Spindles on the Mikron MILL E 500 U / 700 U series are designed to do heavy roughing and Milling to best surface finish all at once. With a bearing design with three preloaded hybrid ball bearings in the front and a thermally robust hybrid cylindrical roller bearing on the back, you are guaranteed a super-rigid rotating system that enables Milling with extra-long tools reaching into deep cavities. Ramp up your chip removal, thanks the feed rates made possible by this solution's absorption of high Milling forces at the tool tip.

The 20,000 min<sup>-1</sup> Spindle features the well-proven OptiCool principle that keeps the front bearing area cool while the extra heat barrier cooling loop keeps the motor heat away from the Spindle nose. That results in a thermally balanced Spindle thus assuring a high level of precision, repeatability and surface finish.

min <sup>-1</sup>
min <sup>-1</sup>

- Direct Lubricating System (DLS) oil-air bearing lubrication through outer race
- Fully digital Spindle equipped with every conceivable sensor to support smart machine integration
- Through-Spindle cooling featuring rotary unions fed by all known liquid and gaseous media



The 12,000 min<sup>-1</sup> Spindle delivers sufficient performance and power for all kinds of applications. The ball bearings, which are lubricated for life, are effectively protected against incoming dirt with an air purge system. The tool is held by a spring and is released through hydraulic cylinder.

Power (S6)	20 kW
Torque (S6)	88 Nm
Speed max.	12,000 min <sup>-1</sup>
Acceleration	2.5 s
Lubrication	Oil-air
Tool interface	ISO 40 / BT 40 / CAT 40

- Good thermal stability through OCS
- Excellent weight/performance ratio
- Integrated intelliSTEP functionality
- Spindle cone ISO 40/BT 40/CAT 40
- Infinitely variable rotation speed range—no loss of performance
- Prepared with internal cooling agent feed for production use (optional)



#### Spindle challenge

## **Slotting operation**

#### **Description**

- Slotting with a depth of 1.5xD is a challenging task for the machine.
- The feed rate was set to a spindle load of 85%.
- Tests with more speed brought the machine to soar up.



#### Tool

• Type: Ø 16 mm end mill

 Manufacturer: FRANKEN (2615AZ.016)

#### **Processing parameters**

Spindle speed: 2,586 min<sup>-1</sup>
 Feed rate: 1,034 mm/min
 Cutting depth: 24 mm

Step over: 16 mm

Material removal rate: 397 cm³/min

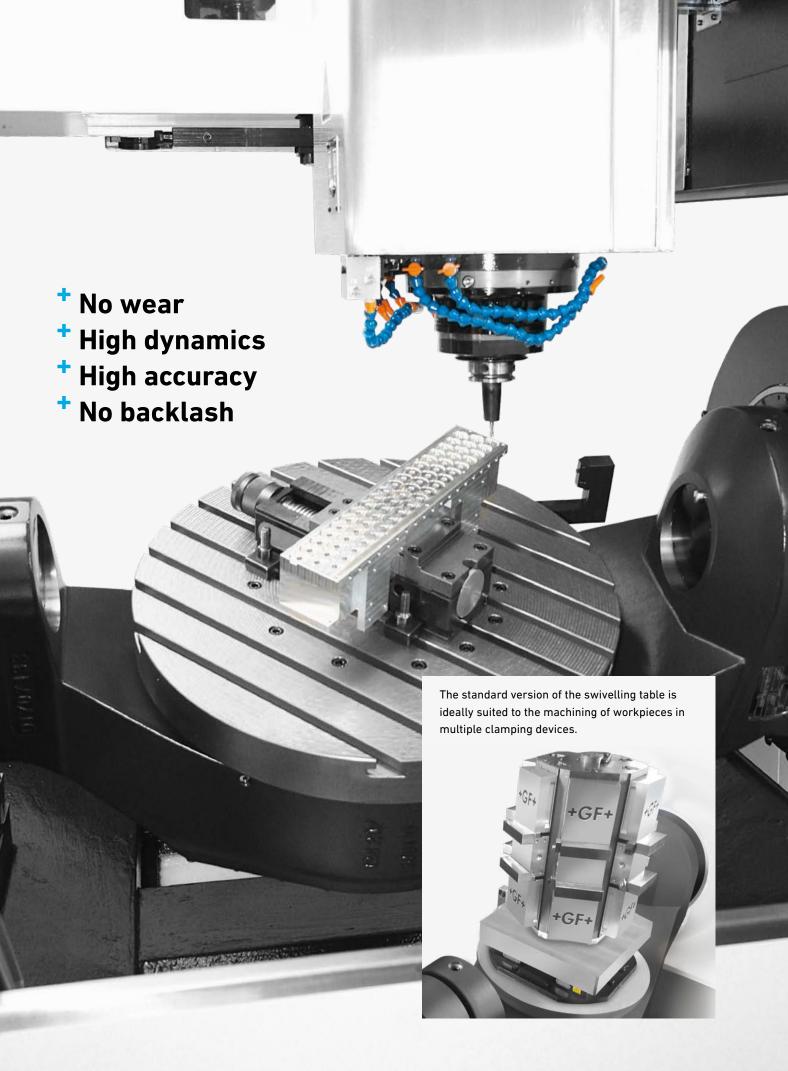
MILL E 500 U
Spindle load 85% - 76%

Standard Spindle Spindle load **150**%



Machinery and general mechanics

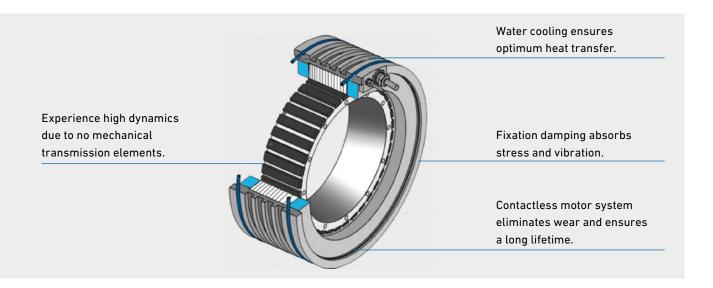


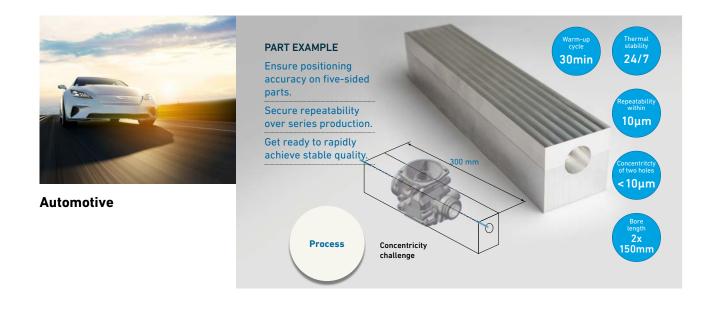


#### Direct torque drive

# Direct drive rotary tilting table

Direct torque drive technology allows excellent precision and surface finish on the workpiece. The fact that there are no mechanical transmission elements involved in the force transmissinon means that friction and wear as well as reduction in dynamic and rigidity are things of the past. All rotary tables are designed and manufactured in-house by GF Machining Solutions.





#### Chip management

Clean machining, wet or dry

#### Adapted chip management

- Solution for high-volume small and light chips with lift-up scraper chip conveyor and coolant unit with fine filtration
- Solution for high-volume steel Milling chips with lift-up scraper chip conveyor and coolant filtration unit

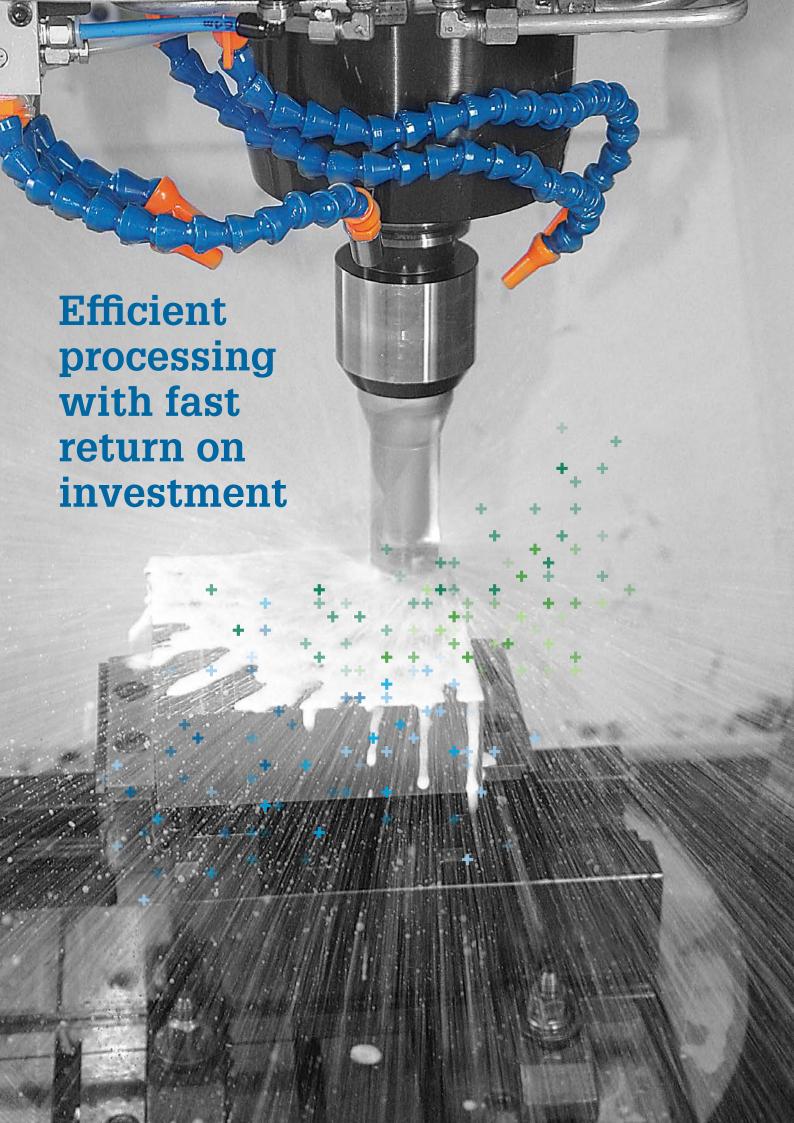


**Options** 

- Through-Spindle coolant
- Wash-down system
- Coolant thermal control
- Oil skimmer

- + Optimum chip flow to steep and smooth cabin walls
- Wash-down nozzles for all corners to prevent chip accumulation
- Professional lift-up scraper to transport 43 l/h chips out of the working area





## We take you to new heights

## Guiding your ascent

Whether it is Milling, EDM, Laser Texturing or Additive Manufacturing, our Service + Success experts guide you throughout the entire lifecycle of our Machining and Automation tools in order to help you reach your peak performance. Our trusted experts backed by our latest cutting-edge, intelligent Digital Solutions, provide a full range of services.



Operational steering
Hands-on and operational
service interventions with
supply of consumables
and wear parts



Advanced diagnosis

Machine check-up, preventive maintenance and advanced services including original spare parts availability in all our hubs around the world



Cortification

State-of-the-art reference by industry sector and on machining equipment



Ingrados

Designed to add value to the original machine investment in order to achieve higher sustainable productivity



Training

Performance oriented academy with a human-centric approach of knowledge transfer in order to realize the full potential of our solutions



**Transformation** 

Strategic partnership from made-to-measure advice on business model evolution to industrial implementation



#### **Financial solutions**

For the optimization of operating costs featuring minimal initial expenditure programs and leasing options



As a long-time partner, since 1802 we have been serving various industrial segments and have been dedicated to providing you with a first-in-class combination of services.

We have conceived our new Success Packs range for maximizing **your return on investment**, empowering you in your quest for success whatever your industrial profile.



Silver + Secure your future



Silver
Set the foundation for growth



Bronze +
Achieve flawless
production



#### Heidenhain TNC 640 and smart machine

# Optimal machining to enhance your process beyond program and machine setup

This includes a range of modules collectively referred to under the generic term "smart machine" and that fulfill various functions. In order to make the Milling process "intelligent," various requirements have to be implemented.

- 1 is establishing comprehensive communication between man and machine, which makes available precise information that the operator requires to assess the Milling process.
- 2 is supporting the operator in the optimization of the process, which considerably improves the performance.
- 3 is the machine optimizing the Milling process, which improves process safety and workpiece quality especially important 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.



The Heidenhain TNC 640 control provides flexibility and efficiency from job preparation until part is milled. Mounted on a pivot arm to give more operator's accessibility, the touchable screen allows the operator to quickly navigate through the control. Thanks to an user-friendly and practical interface in combination with several functionalities, the TNC 640 support operators in their daily job giving to them more availability for other tasks.

#### **Precision** smart machine modules like ITC and Kinematic opt support the precise base of your Saving energy machining center to achieve an smart machine modules even more precise final part. like Econowatt, saving up to 50% energy, are ecological necessities with attractive economic advantages. **Protection** smart machine modules like PFP protect and extend the lifetime of your machine and tools.

#### **Customer Services**

## New digital service possibilities

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



**rConnect** provides a digital services platform for all GF Machining Solutions technologies. This modular system includes a range of services – all backed by TÜViT-certified cybersecurity – to increase your manufacturing productivity.

**rConnect Messenger** lets you track production status with machine data updates on your mobile device. Monitor your entire shop and maximize your productivity from anywhere in the world, right on your smartphone.

rConnect Live Remote Assistance (LRA) enables our expert engineers to help you maximize machine uptime with quick responses to your service requests through audio, video chat and more.



#### **Options**

## Multiple options to drive your success







Laser tool measuring system



Infrared measuring probe



Mist extraction



Air through Spindle/coolant through Spindle



Wash down system



TSC belt filter system (20 bar)



Rotating inspection window



Operation mode 3



Signal light

- · Extended warranty
- · Linear glass scales
- · Mimimal quantity lubrication
- · Scratched proofed window
- · Oil skimmer
- · Robot interface

Additional options

APS

APS extended

ITC

ITC 5X

RNS

PFP

DNC

KinematicsOpt

smart machine



#### Fanuc control system

Reliable and cost-performance CNC with high-end features like NANO interpolation and AI contour control

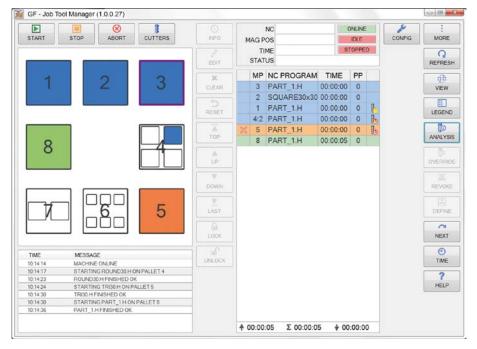
#### Performance and reliability

The Fanuc 0i-MD features an ultra-compact design using limited cabling to ensure highest reliability and provide easy maintenance.

Coupled with the latest Fanuc drive technology, the Fanuc 0i-MD ensures smooth machined surfaces by using a much finer resolution for position commands.

#### System 3R - Pallet and tool management software

## JobToolManager (JTM)



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.

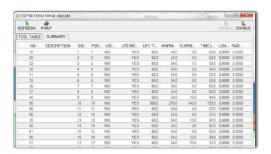


#### Assign NC file, check tool capacity, schedule

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, will the job be blocked.

### **Technical data**

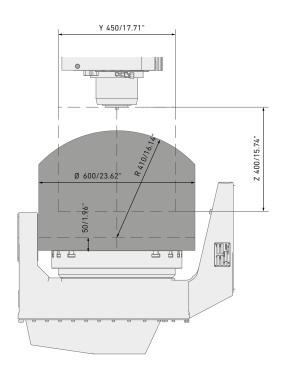


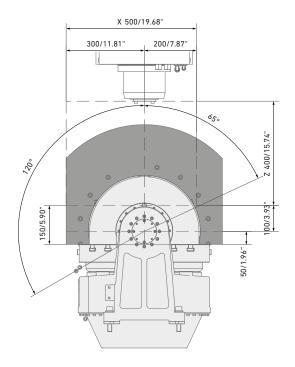


**MILL E 500 U** 

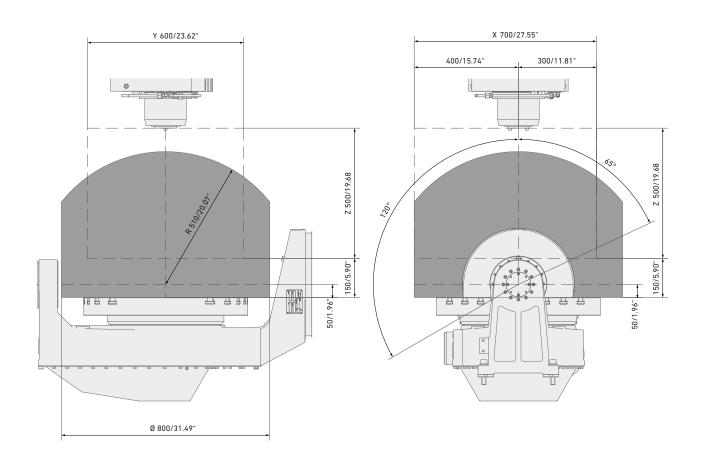
**MILL E 700 U** 

				MILL E 500 U RTT 5-Axis MILL E 500 U RTT 5-Axis simultaneous		MILL E 700 U RTT 5-Axis		MILL E 700 U RTT 5-Axis simultaneous		
Axis travel										
Lengthwise	X	mm	500		500		700		700	
Crosswise	Υ	mm	450		450		600		600	
Vertical	Z	mm	400		400		500		500	
Swivel axis		0	-65 / +120		-65 / +120		-65 / +120		-65 / +120	
Rotation axis		0	n x 360		n x 360		n x 360		n x 360	
Axes			3+2		5-Axis simultaneous		3+2		5-Axis simultaneous	
Spindle										
Spindle type			In-line	Motor	In-line	Motor	In-line	Motor	In-line	Motor
Max. rotations		min <sup>-1</sup>	12,000	20,000	12,000	20,000	12,000	20,000	12,000	20,000
Max. torque		kW/Nm	20/88	36/120	20/88	36/120	20/88	36/120	20/88	36/120
Tool interface			ISO 40 BT 40 CAT 40	HSK-A63	ISO 40 BT 40 CAT 40	HSK-A63	ISO 40 BT 40 CAT 40	HSK-A63	ISO 40 BT 40 CAT 40	HSK-A63
Travel speed										
Rapid traverse	X, Y, Z	m/min	30 / 30 / 30		30 / 30 / 30		30 / 30 / 30		30 / 30 / 30	
Rapid traverse	В, С	min <sup>-1</sup>	17 / 28		32 / 112		17 / 28		32 / 112	
Automation										
Integrated tool magazine unit		unit	DT 30 / CT 60		DT 30 / CT 60		DT 30 / CT 60		DT 30 / CT 60	
Tool tower ι		unit	120 / 170 / 215		120 / 170 / 215		120 / 170 / 215		120 / 170 / 215	
Pallet magazine		unit	5 Delphin 400/400 or 5 MTS 400/400 or 7 Dynafix 350/350 or 7 UPC 320/320		5 Delphin 400/400 or 5 MTS 400/400 or 7 Dynafix 350/350 or 7 UPC 320/320		5 Delphin 400/400 or 5 MTS 400/400 or 7 Dynafix 350/350 or 7 UPC 320/320		5 Delphin 400/400 o 5 MTS 400/400 or 7 Dynafix 350/350 or 7 UPC 320/320	
Pallet changing time sec.		30		30		30		30		
Robot interface		Available		Available		Available		Available		
Rotary swivel to	able									
T-groove table	groove table mm 500			500		630		630		
Workpiece weig	kpiece weight (3/5) kg		300		300 / 200		450		450 / 450	
Weight									-	
Machine weight kg		6,030		6,030		8,060		8,060		
Control										
Heidenhain		TNC 640		TNC 640		TNC 640		TNC 640		
Fanuc (12,000 min <sup>-1</sup> )		0i-MD		-		0i-MD	Oi-MD		-	

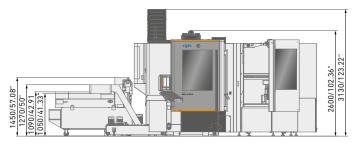


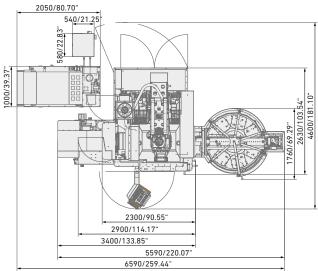


#### MILL E 700 U

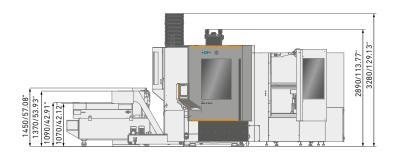


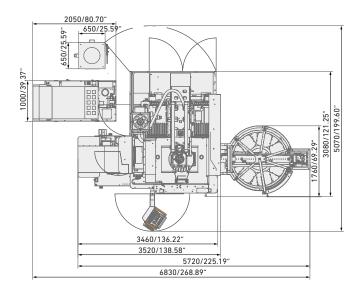
#### MILL E 500 U with pallet magazine



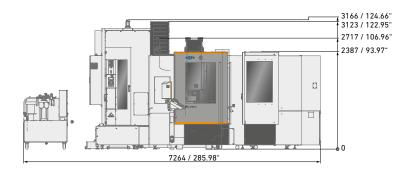


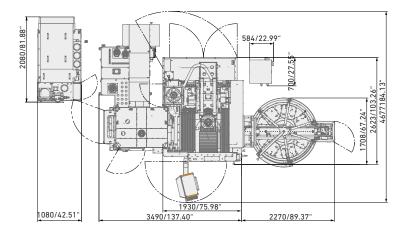
#### MILL E 700 U with pallet magazine



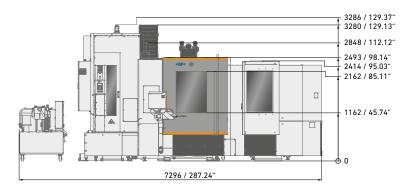


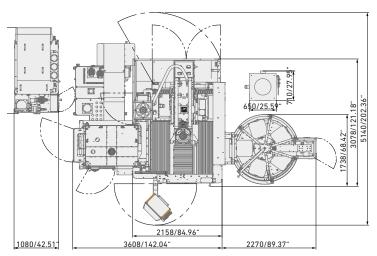
#### MILL E 500 U with pallet magazine and tool magazine 120, 170 or 215 tools





#### MILL E 700 U with pallet magazine and tool magazine 120, 170 or 215 tools





### **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.

**EDM** (Electrical Discharge Machining)







#### Millina



#### Advanced manufacturing







#### 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 diesinking 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  $\mu$ m (4  $\mu$ in).

#### Hole-drilling EDM

GF Machining Solutions' robust hole-drilling EDM solutions enable you to drill holes in electrically conductive materials at a very high speedand, with a five-axis configuration, at any angle on a workpiece with an inclined surface.

Precision tool and mold manufacturers enjoy a competitive edge with our Mikron MILL S solutions' fast and precise machining. The Mikron MILL P machines achieve above-average productivity thanks to their high performance and Automation. Customers seeking fastest return on investment benefit from the affordable efficiency of our MILL E solutions

#### High Performance Airfoil Machining

Our Liechti turnkey solutions enable the highly dynamic manufacturing of precision airfoils. Thanks to the unique performance and our expertise in airfoil machining, you increase productivity by producing at the lowest cost per part.

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.

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.

GF Machining Solutions offers the industry's most complete line of Laser micromachining platforms optimized for small, high-precision features to meet the increasing need for smaller, smarter parts to support today's leading-edge products.

#### Laser Additive Manufacturing (AM)

GF Machining Solutions and 3D Systems, a leading global provider of additive manufacturing solutions and the pioneer of 3D printing, have partnered to introduce new metal 3D printing solutions that enable manufacturers to produce complex metal parts more efficiently.

#### Tooling and Automation





#### Software



#### Service + Success



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, multiprocess cells, tailored to your needs.

#### 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.

#### We take you to new heights

Our Success Packs are designed to maximise you return on investment and empower you in your quest for success across all industrial segments. Our subscription packs feature a comprehensive range of services that guarantee the access and support you need to get the most out of your assets today, while preparing for the challenges of tomorrow. Our trusted experts backed by our latest cutting-edge, intelligent Digital Solutions, provide a full range of services.

### Worldwide for you



#### **Switzerland**

Biel/Bienne Losone Geneva Flawil Langnau

www.gfms.com/ch

#### **Europe**

Germany, Schorndorf www.gfms.com/de

United Kingdom, Coventry www.gfms.com/uk

Italy, Agrate Brianza - MI www.gfms.com/it

Spain, Sant Boi de Llobregat Barcelona www.gfms.com/es

France, Palaiseau www.gfms.com/fr

Poland, Raszyn / Warsaw www.gfms.com/pl

Czech Republic, Brno www.gfms.com/cz

Sweden, Vällingby www.gfms.com/system3r

Turkey, Istanbul www.gfms.com/tr

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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 services completes our proposition.

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