MIKRON HSM 400, 400U 600, 600U, 800
GF AgieCharmilles makes no compromises
HSM machines combine accuracy, extreme dynamics and high machining speeds with other important aspects, such as excellent chip removal, high flexibility, extraordinarily good ergonomics and possibility for automation. This makes HSM machines an ideal manufacturing facility for prototype and mold making and also for workshop.
For years GF AgieCharmilles has successfully set benchmarks in high speed machining with the HSM family. This means workpiece accuracy, dynamics, ergonomics, automation and process safety as well as exemplary accessibility of these portal machines and their suitability for wet and dry machining.

The integrated pallet magazine for the unmanned operation is an important highlight. This generation of machines embodies the entire knowledge and years of experience of GF AgieCharmilles in high speed machining.
Applications
3-axis

MIKRON HSM 400, 600, 800

Graphite electrode
MIKRON HSM 400
Graphite
Mold making
• High contour accuracy
• Efficient graphite machining

Watch components
MIKRON HSM 400
Different materials
Watch making industry/ micromechanics
• High contour and position accuracy
• High surface quality
• Thin-walled and small geometries
• Part-specific handling systems

Roll
MIKRON HSM 600
Aluminium
Medical technology
• Machining out of entire pieces
• Machining with 4th axis
• High contour accuracy

Die
MIKRON HSM 800
Alloyed tool steel
Tool and mold making
• High surface quality
• High contour accuracy
• Machining out of entire pieces

HSC milling of a prototype mold insert.
Applications
5-axis

**Watch casing**
MIKRON HSM 400U
**Different materials**
**Watch making industry**
- Machining out of entire pieces
- 5-axis simultaneous machining and 5-axis alternate machining
- High surface quality

**Motorcycle part**
MIKRON HSM 600U
**Aluminium production part**
**Motor sport**
- Production part
- High contour accuracy
- 5-axis machining

**Casting mold**
MIKRON HSM 600U
**Alloyed tool steel**
**Tool and mold making**
- Machining out of entire pieces
- High surface quality
- 5-axis simultaneous machining

**Dental bridges**
MIKRON HSM 400U
**Titanium**
**Medical technology**
- Machining of titanium alloys
- 5-axis simultaneous machining
- Complete machining in one clamp

**Impeller**
MIKRON HSM 400U
**Aluminium**
**Automobile industry**
- 5-axis simultaneous machining
- High speed
- Thin-walled geometries

Efficient machining of an impeller in 5-axis simultaneous operation.
GF AgieCharmilles machining centers are distinguished by extraordinary ergonomics. Compelling features of MIKRON HSM include an unparalleled accessibility regardless of the respective machine configuration.
Ergonomics and process safety
No compromises are made with regard to safety and accessibility.
- Unaltered accessibility in every configuration level thanks to the automation through the portal
- Excellent view of the working area
- Access from 3 sides by opening a single smooth running door - also for crane loading
- Side window for optimum monitoring of machining process
- Uninterrupted production thanks to the pallet magazine

Machine control system
Powerful latest generation contour control system. Heidenhain iTNC 530 is a versatile and flexible workshop-oriented control system that meets all requirements.
- Efficient workshop programming or external machine-independent program creation
- Parallel programming, free contour programming, user-definable subprograms
- Quick processing thanks to a short set processing time
- Swivelling of machining level
- 3D tool correction
- The best control system for 5-axis simultaneous machining

Clean cabins thanks to perfect chip management
Maximum attention was paid to the chip flow. Steeply inclined chrome steel plates in the working area facilitate chip fall extremely well.
- No chip accumulation
- Easy cleaning
- For dry, wet and minimum-quantity cooling lubrication applications

Process optimisation
Various smart machine modules support an optimum process. More accuracy, enhanced surface quality and contour accuracy along with improved safety, which is particularly valued in unmanned operation.

Stability and damping
Primary prerequisites for maximum precision and best workpiece surface quality include damping and stability of the components:
- Highly stable portal construction
- Monolithic design
- Machine base of mineral cast with high damping characteristics (8-10x better than grey cast iron)
- Improved workpiece surfaces and tool service life increased up to 30%
For maximum possible efficiency, GF AgieCharmilles has developed its own pallet magazines.

The linear type magazine can be loaded during operation and operated very easily via CNC control system. This ensures automated production.

Universal automation for heavy workpieces. Pallets weighing up to 1000 kg can be loaded in the magazine.

**Advantages of automation**

- Highest productivity and efficiency are achieved in combination with automation technology. The combination considerably enhances the economic utilisation of the machine.
- Auxiliary processing times can be reduced to a minimum. While one workpiece is being machined the others can be mounted.
- Shorter production times increase productivity and lower production costs.
- Simultaneous machining operations are carried out without interruptions in multiple shift operations.

Universal automation for heavy workpieces.

- Linear 4x storage
- Up to 1000 kg load capacity

**MIKRON HSM 600**

GF AgieCharmilles
Size 600 x 600 mm

4x

(max. load capacity 800 kg)

**MIKRON HSM 800**

GF AgieCharmilles
Size 800 x 600 mm

4x

(max. load capacity 1,000 kg)

The linear type magazine - the universal automation for heavy workpieces.
For maximum possible efficiency GF AgieCharmilles has developed its own pallet magazines.

The disc type magazine can be loaded during operation and operated very easily via CNC control system. This ensures automated production.

A fully integrated automation solution for the prevalent industry standards. Pallets weighing up to 90 kg can be loaded in the magazine.

**A pallet magazine to be proud of**

Automated production is ensured in MIKRON HSM machines by cost-effective integration of pallet magazine. Together with the modular tool magazine it serves as a compact milling center for a high production and flexible manufacturing cell.

- System 3R (Macro Magnum, GPS, Dynafix) or Erowa (ITS 148, UPC) version.
- Repeated machining operations are executed without interruptions in multiple shift operations
- Increases the economic viability of the machine with a correspondingly higher profit

We recommend: SIGMA FMC (Flexible Manufacturing Cell) and RNS (Remote Notification System). These and other smart machine modules guarantee still more flexibility and process safety in high-quality component production.

**MIKRON HSM 400U**

- **System 3R**
  - GPS 240 x 240 mm
  - Dynafix 280 x 280 mm
  - UCP 320 x 320 mm
  - Dynafix 350 x 350 mm

- **Erowa**
  - ITS 148
  - Macro

**MIKRON HSM 400U**

- **System 3R**
  - Macro Magnum
  - ITS 148
  - Macro

**Ergonomic loading and unloading of disc type magazine.**
Robot Interface for automation systems

Producing more parts in shorter time at lower cost.

Workpiece-side automation of MIKRON HSM through a robot solution.

Thanks to the standardised robot interface MIKRON HSM can be used in robot systems of well-known providers.

Whether it is an integrated robot or a WorkMaster by System 3R, the ergonomics of the machine is always guaranteed.

These machines can be easily also integrated in a total system. Again, the accessibility is not affected.

MIKRON HSM 400U Robot Integrated with the fully integrated FANUC robot. Loading and unloading from rear side through the portal.
Achieve more...
Table variants
3-axis

Process-oriented workpiece clamping - the integrated automation interface.

Origin clamping system
In place of T-slot tables, origin clamping systems are used for clamping of standard or normal pallets. As standard it includes clamping of workpieces while machining.

Clamping systems of the companies “System 3R” and “Erowa” are used on MIKRON HSM-400 machines.

On MIKRON HSM 600/800 near-standard pallets are in 600 x 600 mm or respective 800 x 600 mm size.

MIKRON HSM 400
Up to 200 kg load capacity

MIKRON HSM 600/800
Up to 800/1000 kg load capacity
Pallet table
MIKRON HSM 600
The excellent dynamics of round tilting tables with MIKRON HSM 400U and MIKRON HSM 600U direct drive allows HSC simultaneous machining in all 5 axes - a product of GF Agie-Charmilles:

- Extremely fast: turning and swiveling movements up to 250/min
- Extremely precise and flexible: integrated origin clamping system
- Highly dynamic during turning and swivelling thanks to the direct drives
- Extremely stable: hydraulic clamping in turning and swivelling axis
- Ergonomic and clean: without troublesome edges for best access and optimum chip fall
- All feed motors are liquid-cooled
- Direct measuring system

**MIKRON HSM 400U**
Up to 25 kg load capacity

Round tilting table with pallet chuck
System 3R Macro Magnum Ø 156 mm

**MIKRON HSM 600U**
Up to 120 kg load capacity

Round tilting table with pallet chuck
System 3R GPS, 240 x 240 mm

Round tilting table with pallet chuck
Erowa ITS Ø 148

Round tilting table with pallet chuck
System 3R Dynafix 280 x 280 mm

During pallet change

Round tilting table with pallet chuck
System 3R Dynafix 280 x 280 mm
Basic machine

Sophisticated polymer concrete basic design for maximum rigidity.

Polymer cast machine base
The single unit portal construction impresses with its high rigidity and compact look. No loss of stability since there are no joining points due to the monoblock principle.

Cross slide
The cross slide is most weight-optimised and well ribbed to meet highly dynamic requirements.

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.

Pyramid-shaped design
The pyramid-shaped arrangement additionally ensures more stability and rigidity.

Closed structure
The O-shaped portal is extremely suitable for integrated automation solutions.
Accuracy

Maximum accuracy through direct positioning measuring systems, cooled drives and other features.

Position measuring systems
As standard all MIKRON HSM machines are equipped with direct position measuring systems.
- Long time accuracy
- No negative effects of drive train

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

Water-cooled
All water sources in MIKRON HSM machines are as standard water-cooled.
- Drives
- Tool spindle
- Switch cabinet

Laser measuring system
An accurate and reliable tool measurement is absolutely necessary for a good process and accurate workpieces. Due to this laser measuring system is included in MIKRON HSM machines as standard equipment.
- Tool measuring at nominal speed
- Wear/crack monitoring
- Measuring molding tools

Quality control
Before delivery every MIKRON HSM machine is tested in our air-conditioned assembly shop among other things with laser measuring system for accuracy and quality.
High-tech spindle

Constant machining in HSC area:
Core components of high-tech motor spindles.

Tool spindles for demanding machining jobs

Whichever machine configuration you select, with a MIKRON HSM machine you get one of the most modern tools available with the latest spindle technology.

The facts
• Vector control for full torque in deepest area
• Highly stable ceramic hybrid spindle bearing
• Spindle jacket cooling by means of a controlled cooling circuit for constant temperatures during entire working hours
• Oil-air lubrication system with used oil suction
• Integrated “smart machine” sensors

Advantages
• Precise high performance - conventional, universal as well as HSC machining
• Shorter acceleration phases
• High torque at lower speeds
• Thread cutting without compensating chuck

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<th>30,000 min⁻¹</th>
<th>36,000 min⁻¹</th>
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Since 1995 Step-Tec has developed, produced, sold and repaired motor spindles for leading manufacturers of machining centers for milling and drilling applications.

Step-Tec is able to manufacture fast running and precise heavy-duty spindles with an integrated motor. Thanks to these spindles machining hours are reduced drastically with optimum quality.

The scope of delivery includes smart machine module APS (Advanced Processing System) for reliable recording and display of vibrations during milling process.
Tool magazine

No restriction to the work area.

Tool automation in every configuration level
- Single or double row tool magazine
- Reliable “Pick-and-Place” system
- Loading control through light beam
- Capacity up to 68 tools
- Tool lengths up to 210 mm
- Tool diameter up to Ø 75 mm
- Tool weight up to 3 kg

Available sizes:
- HSK-E32: 20; 40 tools
- HSK-E40: 16; 36; 68 tools
- HSK-E50: 15; 30; 60 tools
- HSK-E63: 30; 50 tools

Operator friendly tool loading
Productivity and process safety are ensured thanks to side tool loading
- Simultaneous machining and loading
- Easy loading control through large glass pane
- Ergonomic access

Double row HSK-E40 magazine with a capacity of 68 tools.
Chips and liquids

Well conceived working area for optimum chip fall.

Chip removal
Chip removal lies at the core of every machining center. This process should be as automated as possible and should take place without much intervention from the operator. A good concept is the key to success.

Clean working area
MIKRON HSM machines have the steepest possible inner casing. This chrome steel casing facilitates optimum chip fall and cleaning.

Handling of chips and liquids
Chip form and quantity as well as liquids determine the chip management. The options range from cooling lubricant tank with chip tray...

to the variants with standard chip conveyor...

and further up to the solution with a chip conveyor for increased demands or without filter unit.

Cooling lubricant through the spindle (IKZ)
In this option the percentage purity of the cooling lubricant is of considerable importance. A filter is therefore absolutely essential.

With a well conceived combination of an efficient chip conveyor and filtering unit, nothing stands in the way of machining with through-spindle cooling.
MEDICAL TECHNOLOGY

Innovative Spinal Technologies (IST)

Milled and electrical discharge machined implants make backs mobile again

Spine implants and associated surgical instruments tested in its own operating theater makes the Innovative Spinal Technologies (IST) the world leader in minimum invasive spinal surgery products. The company with its head-office in Massachusetts develops, designs and produces prototypes for all products on its own. Key technologies used here are electrical discharge machining and 5-axis milling.

"MIKRON HSM 400U exactly matches the requirement profile of our production unit. For electrical discharge machining also we have invested in GF AgieCharmilles machines. We thus get excellent one-stop service and advice".

Jeff Kazmierski
Production manager - IST
Innovative Spinal Technologies

AUTOMOBILE INDUSTRY

Great Lakes Mold

Unique with unmanned milling jobs

Great Lakes Mold in the US state of Michigan makes complete injection molding tools for automobile, electronics and medical industry components. The company also supplies tool elements such as mold inserts, slides, ejectors and repair parts. For this, Great Lakes Mold uses HSC and EDM machining processes as key technologies in tool production.

"I know of no other milling machine, which could carry out our certain machining jobs in unmanned operation better than MIKRON HSM 800".

Ron Kriss
Vice-President, Great Lake Molds and Engineering

MOULD PRODUCTION

Krones

Pulse generator for innovations in milling

With the production of stretch-blow molding tools Krones AG offers its customers the service for producing PET bottles. For accurately detailed reproduction of customer design, the Bavarian company employs the latest GF AgieCharmilles HSM machines.

"Since1999 we have purchased 20 high-speed machining centres from GF AgieCharmilles. Several times during this period Krones gave an impetus for new developments, which are successfully implemented today in MIKRON models".

Georg Hofmeister
Production team manager FE 1
Blow moulding by Krones AG
Options

Customised equipment

Other options:
- T-slot table
- Minimum-quantity lubrication
- Minimum-quantity lubrication easy to dose via NC program
- Rotating window
- Internal coolant supply
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 hourly rate 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.

The smart machine is constantly being developed further.

The currently available modules can be found at www.gfac.com
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.

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.

Spindle  HSM Spindle Technology

Development, production and sale of the motor spindles that form the core components of modern HSM centers. The spindles rotate at speeds between 10,000 and 60,000 rpm.

Service  Services and Consumables

Service, maintenance, spare parts and consumables for EDM, milling and HSM systems as well as for other machine tools; consumables include filters, wire, graphite, copper electrodes and special resin.