

MFP 51

Maximum productivity
for complex components



Key Data

- Portal tool magazine
- Simultaneous tool & dresser roll changer
- Process-optimized coolant supply
- Tool identification

Mägerle AG Maschinenfabrik

Precision, quality and flexibility are key attributes of the products manufactured by Mägerle AG Maschinenfabrik. A technology leader for high-performance surface and profile grinding systems, the company founded in 1929 primarily specializes in customized solutions.

At the heart of the international success of our high-quality Swiss machinery is the unique design principle of the MÄGERLE modular system. Thanks to state-of-the-art technology, MÄGERLE can offer customers from many branches of industry reliable grinding centers. The high machining precision of the custom special-purpose machines ensures that our customers remain competitive.

Alongside decades of accumulated expertise, our highly motivated and dedicated employees play a key role in the success of the company.

As part of the UNITED GRINDING Group, MÄGERLE is a strong member of the group of globally leading machinery engineering companies for grinding machines. All over the world, this gives MÄGERLE customers access to an extensive network of experienced service and engineering technicians.

MFP 51

Large magazine for tools · Automatic tool and dressing roll changer · Process-optimized coolant supply with automatic nozzle changer · Tool identification system · Hydrostatic guideways · Maintenance-friendly design

Characteristics

Dimensions

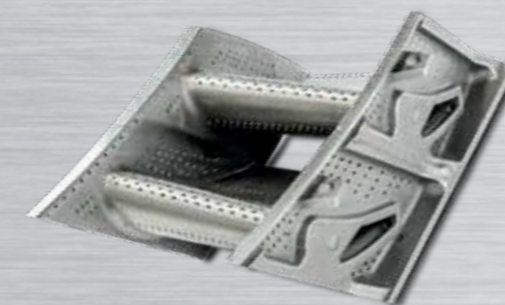
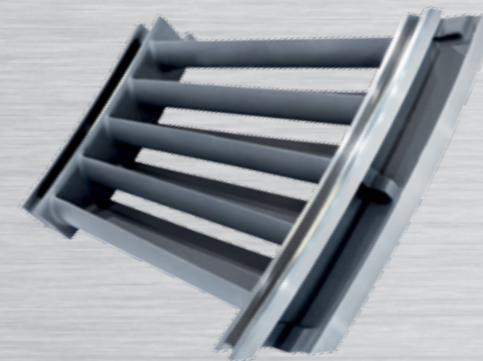
- X-axis - longitudinal stroke: 500 mm
- Y-axis - vertical stroke: 650 mm
- Z-axis - transverse stroke: 650 mm

Hardware

- Tool changer with 66 positions
- Simultaneous tool and dressing roll changer
- Automatic nozzle changer
- Tool identification system
- Continuous power grinding wheel drive: 25/50 kW
- Spindle speeds up to 12,000 rpm
- 5 or 6-axis system
- Grinding, milling and drilling in a single clamping

Software

- Pre-programmed grinding and dressing cycles
- User-specific programmable interface
- Intuitive operation
- Focus on work and production safety



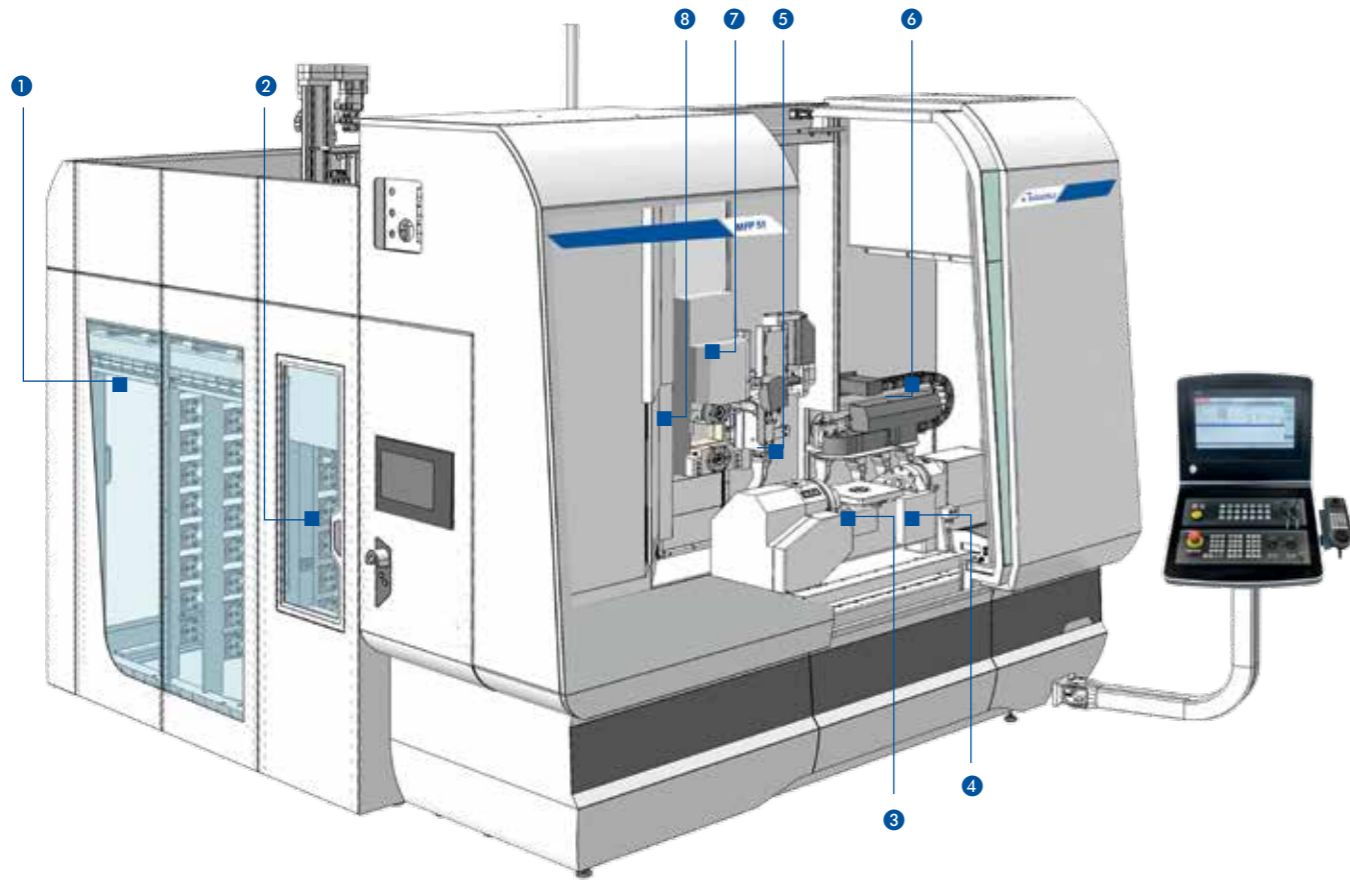
The sturdy grinding center comes with an integrated tool changer in a gantry design with 66 positions. The magazine can be flexibly loaded with various grinding wheels, diamond rolls, measuring probes and tools for drilling and milling operations. The large capacity of the tool changer enables efficient machining of several different workpieces without altering the tooling.

Very short process times are achieved with the high-speed spindle, which allows speeds of up to 12,000 rpm, and the overhead dresser integrated into the grinding support. The grinding wheels and diamond dressing rolls are exchanged simultaneously or individually with a double gripper for the individual machining steps. The compact tool holding fixtures allow an efficient grinding process and the continuously dressed grinding wheel enables high removal rates with high profile accuracy over long cuts. The overhead dresser eliminates the dressing process after the grinding cycle and the movement times to the table dresser.

The NC table can be loaded from above and from the front, by crane or by robot. The simple rear and side access points for servicing and maintenance work supports the exceptional ergonomics of the MÄGERLE grinding center.

Machine Configuration

MFP 51 machine concept



- 1 Tool magazine
- 2 Loading station with optional tool identification
- 3 NC indexing head
- 4 Dressing device
- 5 2-axis NC coolant nozzle
- 6 Optional coolant nozzle changer
- 7 Overhead dresser
- 8 Tool and dressing roll changer

Large Magazine for Tools

Efficient machining of a variety of workpieces



Example 1:
21 grinding wheels
21 dressing rolls
7 tools

Example 2:
28 grinding wheels
including sister tools
14 dressing rolls

Example 3:
37 CBN grinding wheels
with maximum diameter

The tool magazine for grinding wheels, diamond rolls and tools comes in a gantry design with 66 positions. All tools are transferred to the magazine safely and ergonomically by means

of a loading station. Change over is carried out in just a few steps and can easily be performed during production. The large tool capacity makes it possible to machine recurring lot sizes without

long downtimes. The 66 positions can be flexibly equipped with different variants.

Flexible loading options



Application Examples and Machining Capabilities

Turbine vanes



Turbine vanes are ground on the MFP 51 with minimal downtimes and a high degree of autonomy. The combination of automatic tool changer and CD overhead dresser enables several profiles to be ground in a single workpiece clamping, as well as ensuring dimensional stability.

Turbine blades



The high capacity of the tool changer allows the machine to be prepared for several types of turbine blades. As a result changeover times can be significantly reduced. The compact tool holding fixtures enable wide machining contours to be achieved, together with high removal rates.

Compressor blades



before

after

Compressor blades for aircraft engines are manufactured from forgings, which comprise high-strength and in some cases also heat-resistant material alloys. The complete blade root profile is produced in a single clamping. The machine configuration with a 3-axis indexing head also enables the machining of radial root profiles.

Shrouds



Shrouds can be completely machined in just a few clampings on the MFP 51, including milling and drilling operations. Each individual machining process can be optimized with different coolant nozzles.

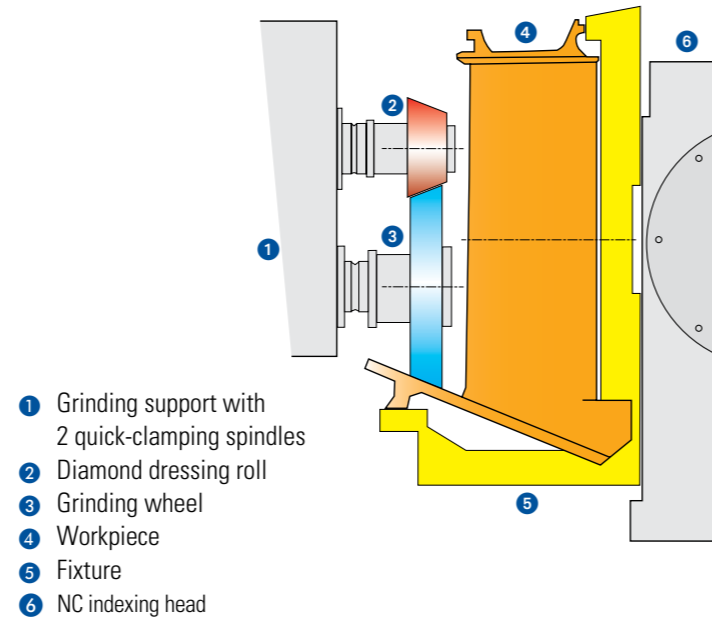
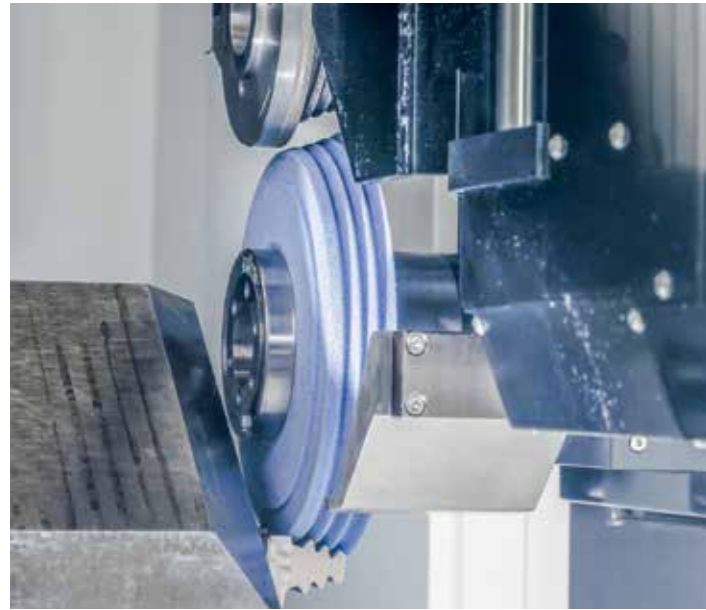
Gear grinding



Gear grinding on challenging workpieces is enabled by a tailored system configuration. To ensure dimensional stability, external and internal diameter can be ground in the same clamping. The process-optimized coolant supply enables high removal rates with consistent production quality.

The Right Dressing Method

Dressing system



The dressing of grinding wheels is a crucial factor for the cost effectiveness of a grinding process. With overhead and table dressing devices MÄGERLE offers professional solutions for the various requirements that can be placed on the process step. The overhead principle realizes its potential particularly in continuous dressing (CD). MÄGERLE uses servo motors for

the drive; these can be freely programmed across the entire rpm range. The compact tool holding fixtures significantly reduce susceptibility to vibrations and the continuously dressed grinding wheel enables high removal rates with high profile accuracy over long cuts.

Simultaneous tool & dresser roll changer



The grinding wheels and diamond dressing rolls are exchanged simultaneously or individually with a double gripper for the individual machining steps. This results in a significant reduction in auxiliary times.

Hydrostatic System and Powerful Drives

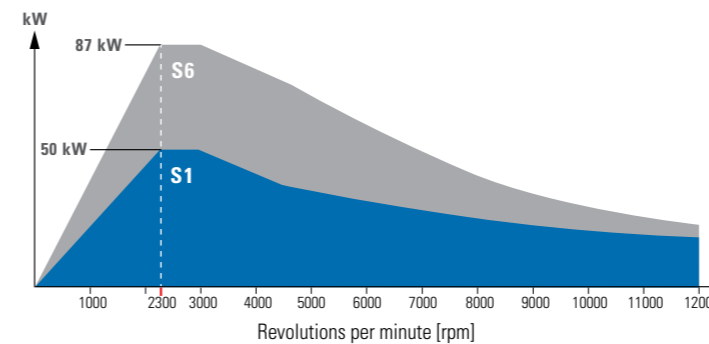
Wear-free guide concept



The unique design principle of MÄGERLE machining centers forms the basis for the overall machine quality. The vertical axis is supported by hydrostatic wrap-around guideways on a thin oil film and is completely separated from the column upper section. This principle enables the machines to withstand very high stresses free of wear, even in long-term use. The oil film also has a vibration-damping effect and guarantees high-precision machining of simple or complex workpieces.

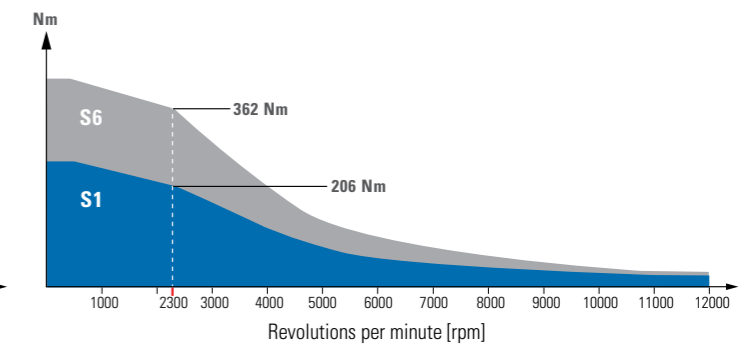
High performance and high torque

Spindle capacity



S6 = 40% duty cycle

Torque



The water-cooled direct drive motor for the grinding spindle enables high performance and torque in continuous operation across the entire speed range. This leads to outstanding results in terms of removal rates. The HSK flange mountings guarantee high rigidity, attributed to the generous

support on the tool holding fixture via the collar. They are also the key to enabling quick tooling changes with absolute repeatability precision. An optional balancing system dynamically balances unequal forces in the rotating grinding wheel.

Cooling Intelligence

Optimal grinding and machining results



The NC controls of the MÄGERLE grinding centers enable precise positioning of the coolant supply, taking into account the respective grinding wheel geometry. Nozzles are available on the grinding support for drilling and milling tools, and a coolant supply can be optionally provided through the spindle. Additional separate nozzles for the dressing process and cleaning of the grinding wheels ensure that optimal grinding results are achieved. Labyrinth seals with a sealing air arrangement protect all bearings in the machining area from impurities and contribute to the long working life of the overall system.

Process-optimized coolant supply



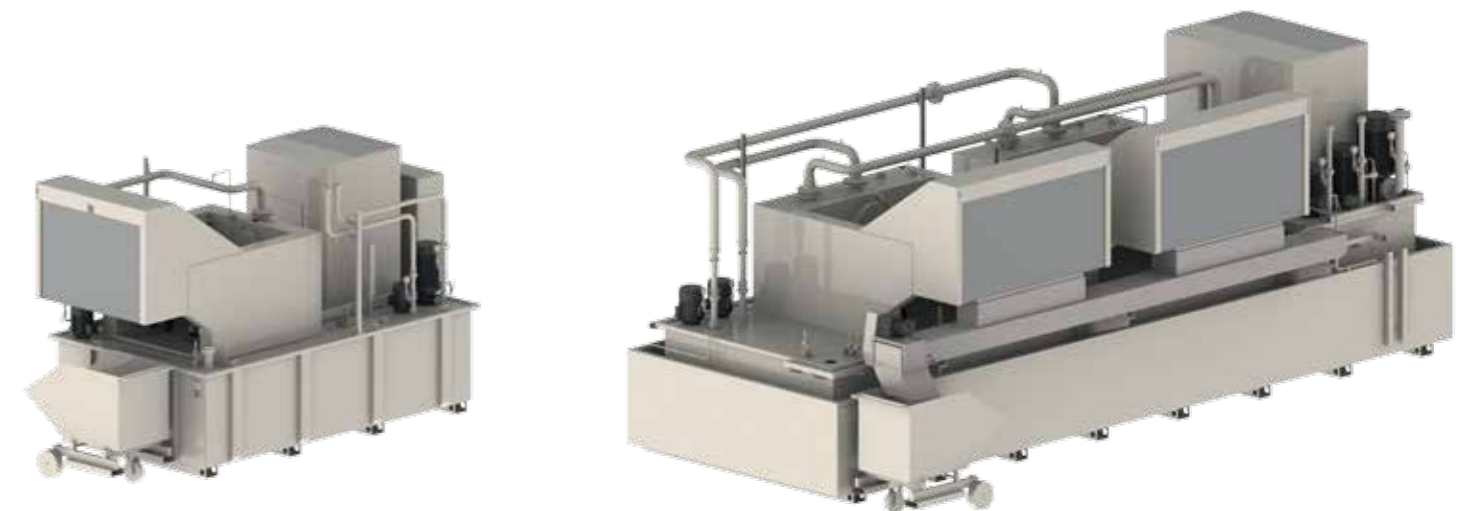
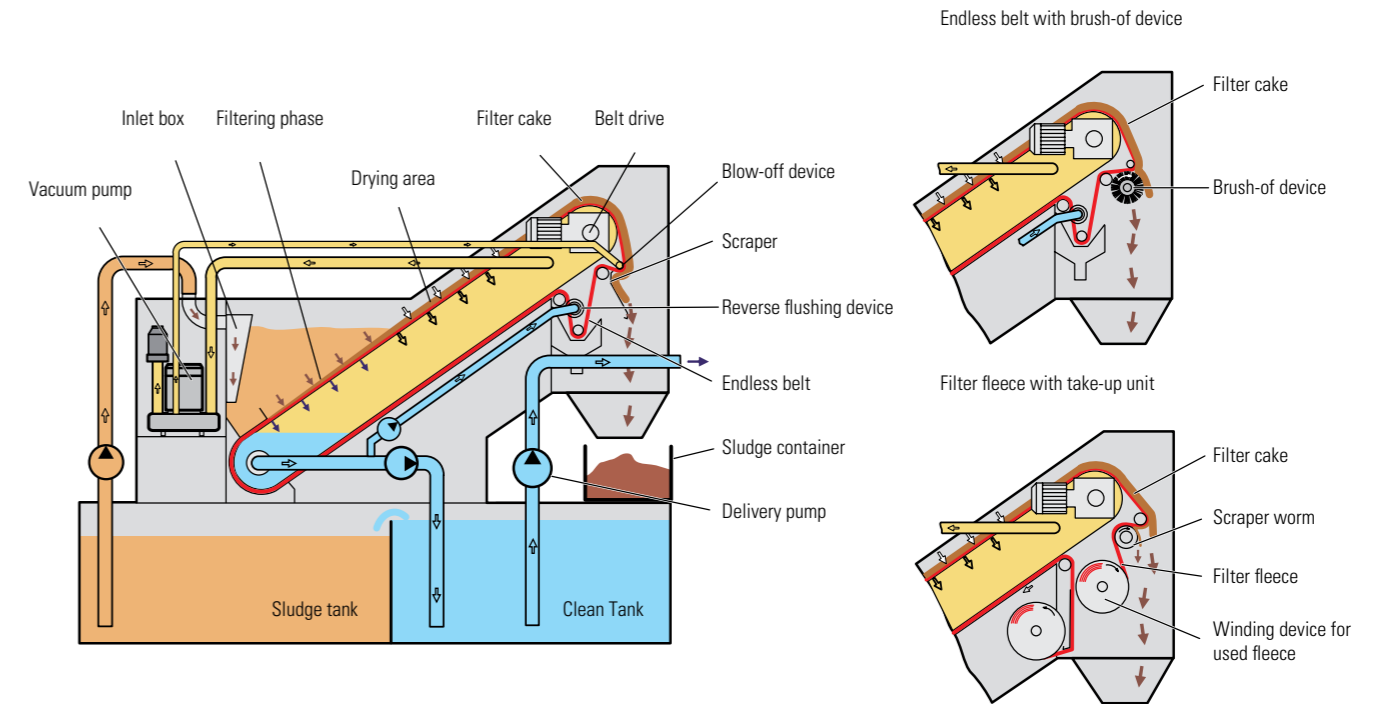
The MFP 51 can be optionally equipped with an automatic nozzle changer with up to 6 process-optimized coolant nozzles. This substantially optimizes the grinding conditions for different profiles.

Coolant Cleaning Units

The optimal solution for every application

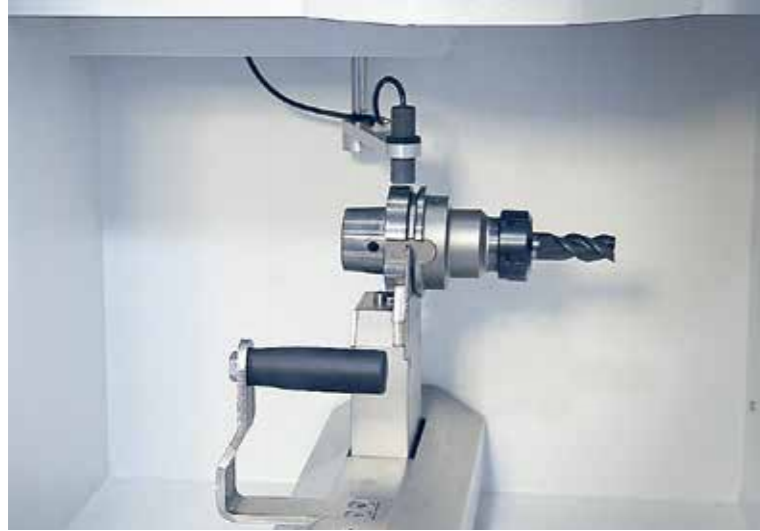
MÄGERLE considers the grinding process as a system of different components and thus creates the necessary conditions for a high cost effectiveness. The system concept for coolant supply and cleaning is of central importance. Correct dimensioning is essential for utilization of the full

coolant potential with low disposal costs. Taking account of these economic and ecological aspects, MÄGERLE in conjunction with the coolant system supplier matches integrated solutions to the customer-specific requirements.



Safe and Autonomous Operation

Tool identification

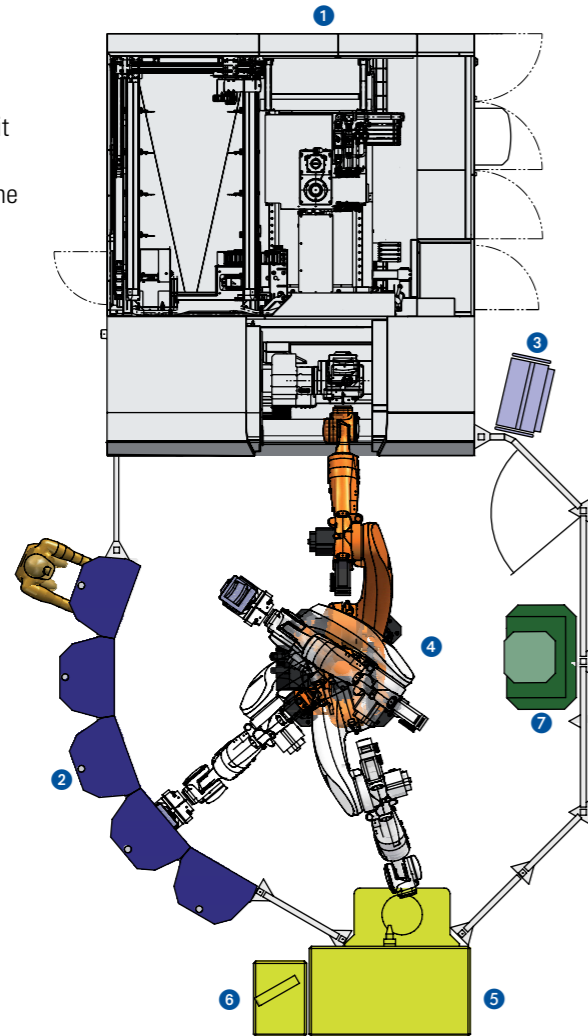


The MFP 51 can optionally be equipped with an identification system for grinding wheels and tools. The tool is inserted in the loading station of the tool changer. The data stored on an RFID chip is securely imported prior to the loading process. When the grinding wheel is removed from the tool magazine, the system updates the chip with the current tool data.

This eliminates the probability of errors when entering the tool data on the machine and consequently also the risk of downtime.

Automation and machining cells

- 1 MFP 51 grinding machine
- 2 Loading/unloading stations
- 3 Sinumerik 840D sl control unit
- 4 Robot
- 5 Coordinate measuring machine
- 6 Control panel
- 7 Cleaning station

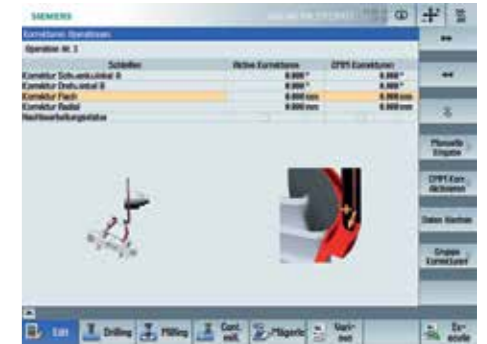
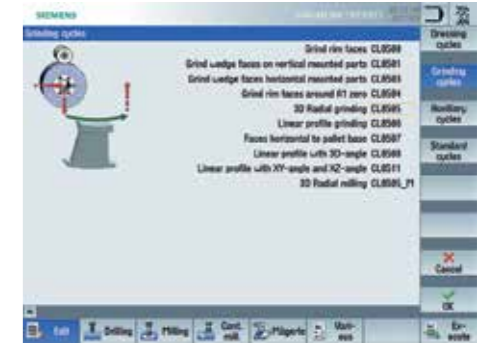


The MFP 51 is ideally suited for automatic loading and unloading. Flexible and efficient automation solutions are possible with a robot and linear system. The workpiece handling with robot technology is a quick and reliable step for increasing the capacity utilization and productivity of the MFP 51.

The integration of additional grinding machines and auxiliary processing such as cleaning and measuring are possible. MÄGERLE's expertise and experience with implemented automation solutions guarantee the highest productivity and quality and ensure your long-term competitiveness.

Control Systems

Operational safety and user-friendliness in the center

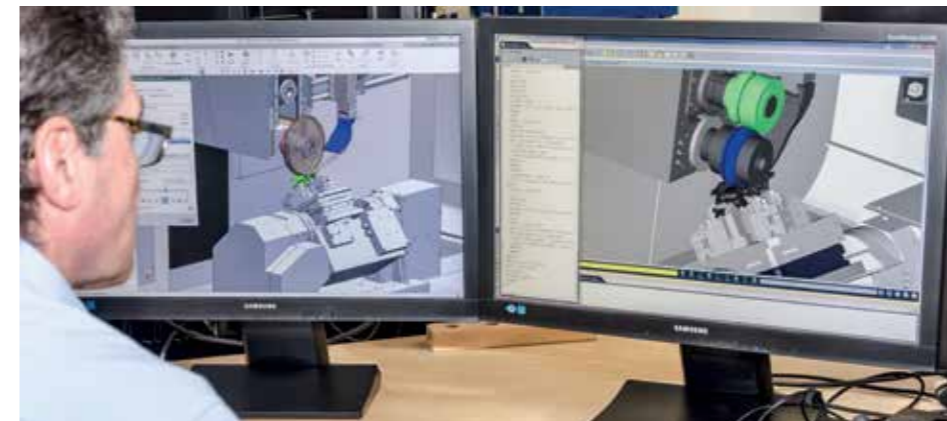


The grinding center is operated by means of the SIEMENS Sinumerik 840D Solution Line control unit. This system fulfills all industrial requirements in terms of safety and performance. Individually visualized and pre-programmed grinding

and dressing cycles are available for efficient workpiece programming. 3D grinding and auxiliary cycles can be programmed for milling and drilling operations in 5-axis machining. Additional tasks such as complete tool manage-

ment, optionally available balancing or different measuring programs for workpiece and tool are displayed on the touch screen in a clear and user-friendly way.

CAD/CAM connection



A SIEMENS NX postprocessor is available for CAM process development. The generated NC programs take account of the Mägerle grinding cycles. As a result the programs can be easily edited on the machine control unit via operator guidance. Mägerle provides a Vericut package for simulating and checking the programs.

Ease of Operation and Maintenance

Operation



The machine is operated via the swiveling control panel with a view of the working area in the front of the machine. When the splash guard is opened, heavy workpieces including clamping fixtures can also be loaded from the top with a gantry or jib crane. The tools are provided to the tool changer via a separate loading station.

- 1 Working area
- 2 Splash guard opened at the top
- 3 Loading station

Maintenance



Access for maintenance of the respective units and components of the entire machine is centrally positioned and designed to make maintenance easy. Periodic maintenance activities can thus be efficiently performed.

- 1 Service access for tool magazine
- 2 Central lubrication
- 3 Electric cabinet
- 4 Fluidics and pneumatics



Customer Care

MÄGERLE surface and profile grinding machines should fulfill the customer's requirements for as long as possible, work cost-effectively, function reliably and be available at all times. From "start up" through to "retrofit" – our Customer Care is there for you throughout the working life of your machine. 3 professional helplines and trained service technicians are available in your area, wherever you are in the world.

- We will provide you with fast, uncomplicated support.
- We will help to increase your productivity.
- We work professionally, reliably and transparently.
- We will provide a professional solution to your problems.



Start up
Commissioning
Warranty extension



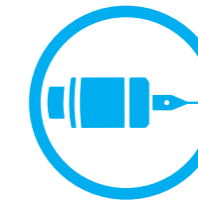
Qualification
Training
Production support



Qualification
Training
Production support



Service
Customer service
Customer consultation
HelpLine
Remote service



Material
Spare parts
Replacement parts
Accessories



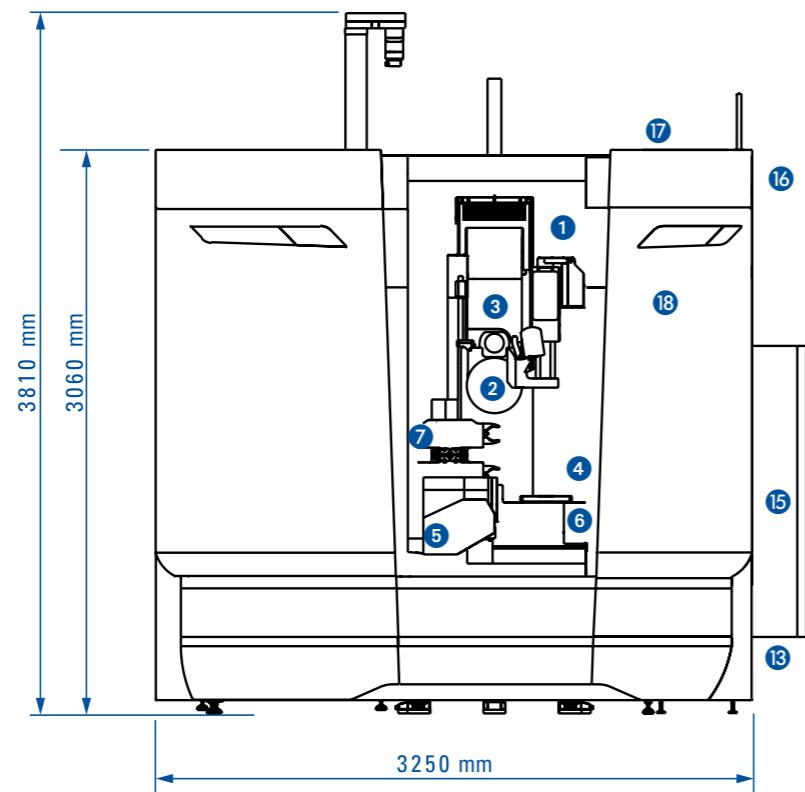
Rebuilt
Machine overhaul
Assembly overhaul



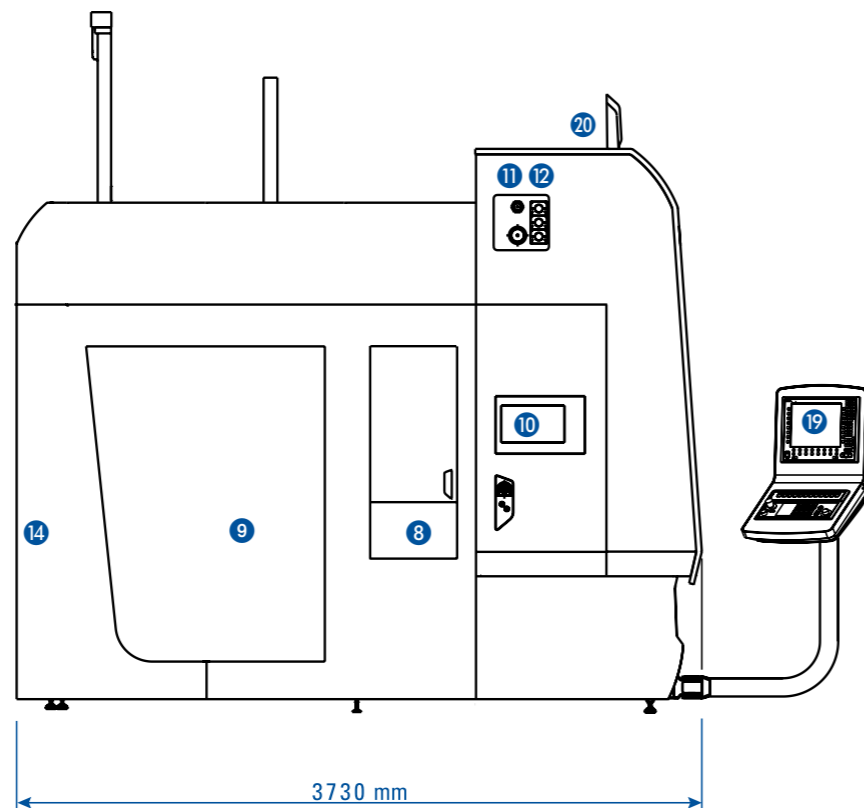
Retrofit
Modifications
Retrofits

Layout

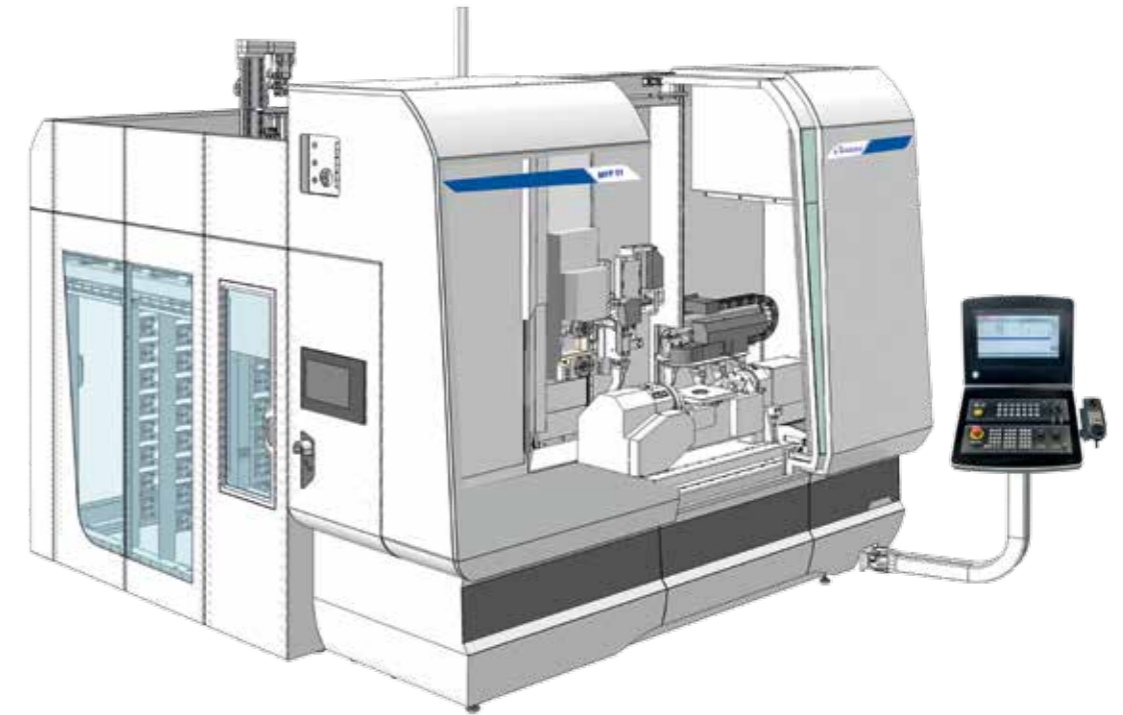
MFP 51 Machine configuration



- 1 Working area
- 2 Quick-change spindle for machining tools
- 3 Quick-change spindle for diamond dressing rolls
- 4 Automatic coolant nozzles
- 5 NC indexing head 2/3 axes
- 6 Dressing device
- 7 Dual gripper
- 8 Tool loading station with tool identification
- 9 Tool change magazine
- 10 Input station for tool management
- 11 Interface to coolant processing system
- 12 Interface to cooling system for spindle drives
- 13 Hydrostatic/Hydraulic unit
- 14 Centralized lubricating system
- 15 Electrical cabinet
- 16 Mist extractor (interface)
- 17 Automatic door drive
- 18 Safety splash guard cabin
- 19 Sinumerik 840D controller
- 20 Machine status lamp



Technical Data



Technical data for MFP 51

X-axis	longitudinal stroke	mm	500
	travel speed	mm/min	0...50.000
Y-axis	vertical stroke	mm	650
	travel speed	mm/min	0...30.000
Z-axis	transverse stroke	mm	650
	travel speed	mm/min	0...30.000
Maximum continuous power grinding wheel drive		kW	25/50
Rpm range max.		rpm	0...12.000
V-axis profile dressing device, roll width, max.		mm	60
Tool changer positions		n/pos	66
Nozzle changer positions (optional)		n/pos	6
Quick-clamping spindles		n	2 x HSK-B80
Tool length max.		mm	250
Grinding wheel dimensions (D x T x H)		mm	300 x 60 x 76,2
NC-combination – rotary/swivel axes		n/axes	2/3
Integrated additional swiveling dressing device (optional)			
Measuring system with measuring probe (optional)			

We reserve the right to make technical changes



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