THE DMG MORI MAGAZINE FOR CUSTOMERS AND INTERESTED PARTIES 01 – 2023.

DMG MORI

TECHNOLOGY EXCELLENCE

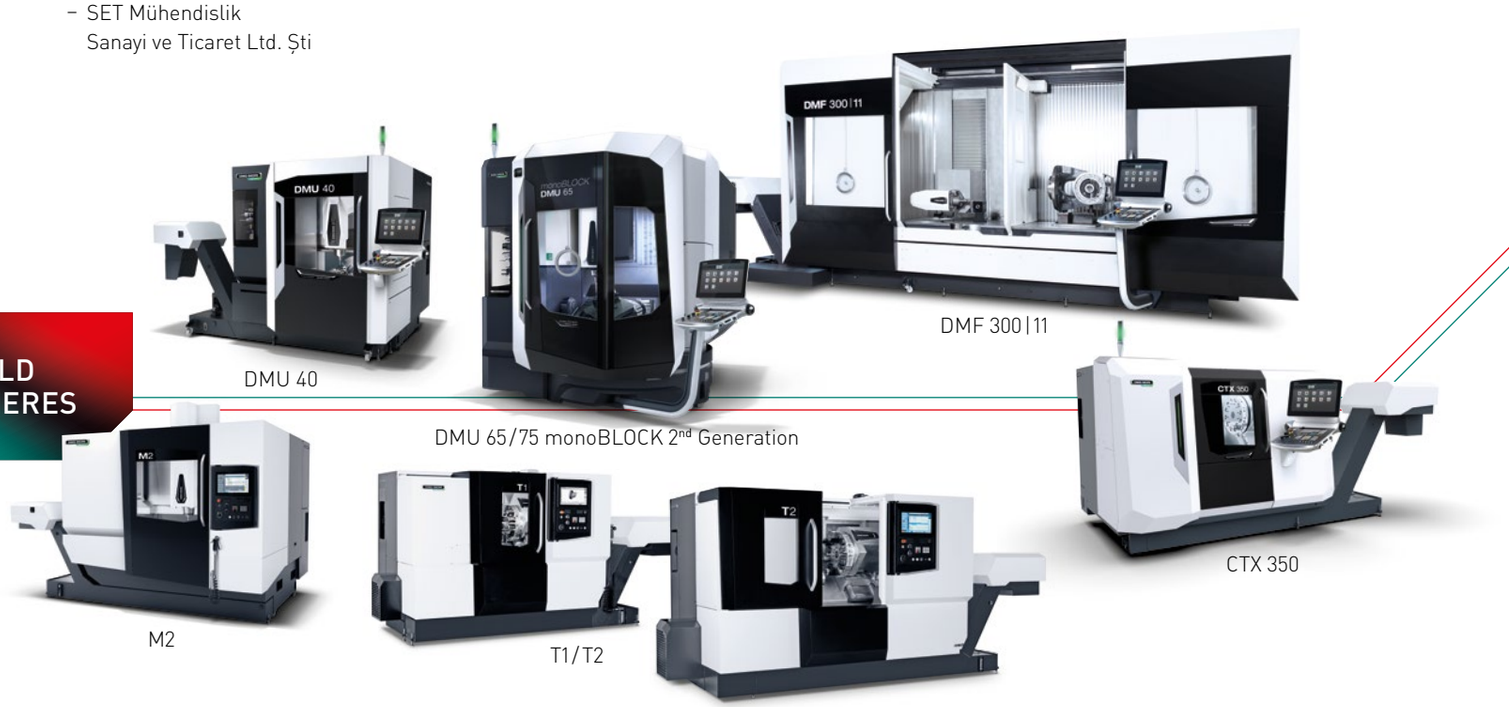
PROCESS INTEGRATION

7 WORLD PREMIERES
13 CUSTOMER STORIES

Reduction in cycle times, thanks to integration of 8 technologies on a single machine: turning, milling, grinding, gear cutting, measuring, Ultrasonic, Lasertec and Additive Manufacturing.

Xiamen: the production of housings for air compressors takes place on two production lines, each consisting of four NHC 4000s and a mobile robot.

7 WORLD PREMIERES



INNOVATIONS FOR PEOPLE AND THE ENVIRONMENT

Holistic process integration describes the connection of machines, technologies, users, automation and digitization.

Dr. Eng. Masahiko Mori
President
DMG MORI COMPANY LIMITED

Our high level of process integration enables resource-saving and efficient production and makes a significant contribution to people and the environment.

Christian Thönes
Chairman of the Executive Board
DMG MORI AKTIENGESELLSCHAFT

Process integration holistically redefined: Up to 8 technologies in one machine with turning, milling, grinding, gear cutting, measuring, Ultrasonic, Lasertec and Additive Manufacturing. Plus automation and digitization for the shop floor of the future and with people in the center.

Industrial manufacturing must change fundamentally because global customer markets and the behavior of customers are changing fundamentally. In this context, DMG MORI is now projecting its strategic triad of automation, digitization and sustainability holistically onto the optimization of the entire shop floor. The aim is to comprehensively improving effectiveness and efficiency in manufacturing, while at the same time improving agility and flexibility on the shop floor and also raising the quality of procedures and processes to a new level. We talked to Dr. Eng. Masahiko Mori, President of DMG MORI COMPANY LIMITED, and Christian Thönes, Chairman of the Executive Board of DMG MORI AKTIENGESELLSCHAFT, about how exactly this works and the added value customers can expect.

Dr. Mori, what are the ambitions of process integration?

Dr. Eng. Masahiko Mori: DMG MORI is in a position like no other company in machine tool manufacturing to support its customers individually as a total solution provider, from a single source in all areas, for the optimization of the shop floor.

In this context, holistic process integration is a comprehensive framework for our customers and us on the way to the manufacturing of the future. The combination of machines, technologies, users, automation and digitization enables a high degree of process integration for resource-saving and efficient production.

What does that mean in specific terms from the customer's point of view?

Christian Thönes: Our strategic fit and focus on our customers' shop floor are a perfect match. In essence, the customer's shop floor is now becoming an integrative network for greater efficiency, resilience, and sustainability, whose decisive added values are derived from the enormous interactivity. In specific terms, complexity is transparently reduced, decisions can be made more robustly, planning periods are shortened, flexibility incrises, the utilization and effectiveness of machines and systems incrises, and the quality of products and processes is also improved.

What impact does this have on sustainability?

Dr. Eng. Masahiko Mori: Our innovative solutions make a significant contribution to the benefit of people and the environment. The integrative implementation of our innovations helps to expanded the environmental sustainability of manufacturing. In this way, energy efficiency is significantly expanded, while at the same time any waste becomes visible and can be minimized. Global challenges make resilience and sustainability mandatory in all areas!

I would particularly like to recommend the article on DMG MORI **GREEN**MODE on page 92. It describes how design innovations and new components can save up to 40 % of the total energy costs in the operation of a machine tool.

Does the holistic perspective reduce the importance of machines?

Christian Thönes: On the contrary, in the past the product was at the center, today our high-tech machines form the homogeneous platform for holistic process integration on the way to the shop floor of the future. This is demonstrated in particular by the 8-in-1 combination of turning, milling, grinding, gear cutting and measuring as well as Ultrasonic, Lasertec and Additive Manufacturing (*DED hybrid* + *SLM*). Even workpieces made of hard-brittle materials can be produced on these machines with unrestricted geometrical freedom. No other manufacturer in the world can offer this in terms of form and capacity range.

In a general sense, this also applies to automation, right?

Dr. Eng. Masahiko Mori: Correct! Fully tapping the economical and ecological sustainability potential on the shop floor is only possible with automation and 24/7 continuous operation of the machines. Automation increases productivity in the process, ensures the quality of the parts produced in 24/7 operations, and leads to longer machine runtimes and greater sustainability. This ultimately reduces labor and unit costs. That is why we have strategically evolved from an all-rounder in machine tool manufacturing to an all-rounder in automation as well!

Today, DMG MORI offers its customers 57 automation solutions in 13 product lines for machine-specific, universal and scalable solutions. There are solutions for all quantities and workpiece sizes as well as for component geometries from simple to complex.

The offer is complemented by our cell control technology for integrating manufacturing cells and systems on the shop floor and for controlling the automatic supply of materials. Our portfolio also includes digital utilities for tool provision and driverless transport vehicles as well as flexible manufacturing systems as turnkey solutions.

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DMG MORI GREENMODE FOR MAXIMUM ENERGY EFFICIENCY

+ Braking energy recovery
+ LED lighting
+ Frequency controlled coolant / hydraulic pumps
+ Energy efficient cooling units
+ ZERO SLUDGE coolant tank
+ Adaptive high-pressure coolant flow control
+ *zero*FOG oil mist collector
+ On / off control and standby mode
+ Minimization of air purge requirements
+ AI-based chip removal
+ Adaptive feed control
+ Energy monitoring

DMG MORI **GREEN**MODE is our solution for maximum energy efficiency on all machines, enabling up to 40 % lower energy consumption.

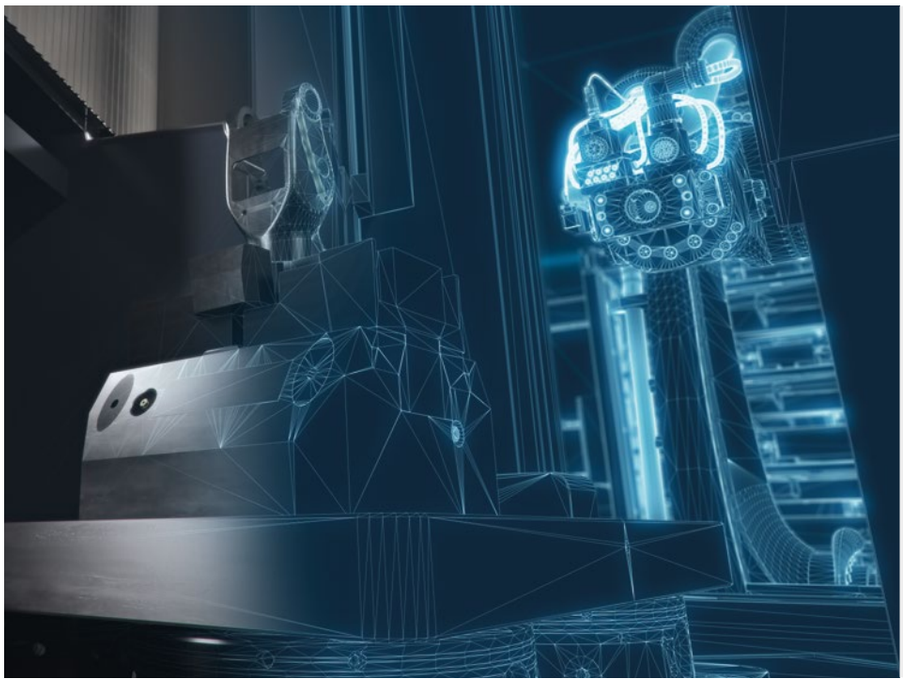
What is the significance of digitization?
Christian Thönes: Like no other company, DMG MORI combines digital products and services with a unique mechatronic excellence, comprehensive automation solutions and intelligent control and planning systems. Only this makes a smart network of user, machines, technologies, procedures, processes and data-based information possible.

But how does DMG MORI support its customers specifically on this path to the digital shop floor?
Christian Thönes: Our end-to-end promise applies here as well. Everything starts with DMG MORI CONNECTIVITY. Connectivity sets new standards for cross-manufacturer interoperability and for harmonizing our customers' heterogeneous equipment. In this way, we create the communicative basis for maximum functionality and openness. As a result, the entire shop floor can evolve continuously through the collection, aggregation, analysis and utilization of data and information.

For our customers, end-to-end also means that we, as a solution partner, take all aspects of the process chain into account: On one hand, this applies to the digital path to the machine, i.e., DMG MORI POWERTOOLS with their offerings from CAD to CAM and tool management; and to the evaluation of solutions, the simulation of processes with DMG MORI Digital Twin, up to machine- and control-specific NC program optimization using the CELOS DYNAMIC*post*.

On the other hand, end-to-end also applies to all factory-wide areas such as costing, planning, quality assurance, maintenance and repair, and service. This issue of Technology Excellence Magazine also offers a wide range of information on these topics – for example, the Digital Twin Interview can be found on pages 86 to 89.

DMG MORI's portfolio consists of 57 automation solutions in 13 product lines for machine-specific, universal and scalable solutions including the complete hardware and software: from machines with tool and pallet changer and flexible manufacturing cells to automatic tool supply (CTS), automated guided vehicles (AGV & AMR) and the various turnkey expansion stages of flexible manufacturing systems, such as LPP or MATRIS, completed by the DMG MORI CELL CONTROLLER LPS 4.



DMG MORI DIGITAL TWIN

+ 40 % faster production ramp-up – carry out unproductive activities digitally
+ Up to 30 % reduction in costs – due to less testing on the machine
+ 100 % collision-free start-up – with complete digital testing and optimization

The DMG MORI Digital Twin empowers our customers to use their machines and automation solutions for their designated purpose: 24/7 manufacturing of high-quality components in a self-learning ecosystem. In this context, the DMG MORI Digital Twin enables the open interaction of machines and processes for perfect planning, control, simulation and analysis.

From a holistic perspective, how do you assess the level of readiness of your customers' digital shop floors?
Dr. Eng. Masahiko Mori: Particularly with regard to machine operation, the control of flexible manufacturing systems and the immediate machine environment, digitization is already widely practiced by our customers and by us. DMG MORI technology cycles with simple workshop programming take the strain off operators. The added value of the No-Code platform from TULIP is also well received by our customers. Operators can use it to independently transform recurring tasks into virtual actions that support operators in their everyday work, even without programming knowledge. A new highlight is in-process measurement for adaptive optimization of the machining process.

With PAYZR, DMG MORI offers for its customers Software-as-a-Service (Saas), for example TULIP, and Equipment-as-a-Service (Eaas). We would be interested to know how these solutions are being accepted by your customers.
Christian Thönes: At this point, I would like to refer to the PAYZR interview on page 31. Briefly, our expectation of expanding our customer base with PAYZR has been fulfilled. Almost 60 % of the EaaS by PAYZR users have also subscribed to a machine from DMG MORI for the first time.

The M1 milling machine in particular, together with the PAYZR business model, has motivated many young companies to enter manufacturing and impressively confirmed its intended role as a door opener in the entry-level sector. The new machine configurator has also made a positive impression, with more than 100 specific orders already generated digitally throughout the past year.

In short, we are right on target and will expand the range from the current five offerings to a total of seven high-tech machines for turning, milling, mill-turning and turn-milling by this summer.

Final question: Are you worried about overwhelming customers with the sheer variety of machines, technologies, automation solutions, digitization as well as innovative service offerings and new business models?
Dr. Eng. Masahiko Mori: Not at all, because the path to the solution does not depend on the variety of offerings, but always develops from the individual task. The goal therefore determines the path. In addition, each individual solution is coherent and independently creates added value, but is also integrative and scalable in its value-enhancing interaction with the process chain. All machines and modules of the integrated DMG MORI portfolio can therefore be successively configured into an individual overall solution according to the customer's priorities or on the basis of the specific application. This closes the loop of the strategic triad of automation, digitalization and sustainability. This is process integration at its best.

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WORLD PREMIERE 2023

DMU 40
ENTRY-LEVEL 5-AXIS SIMULTANEOUS MACHINING

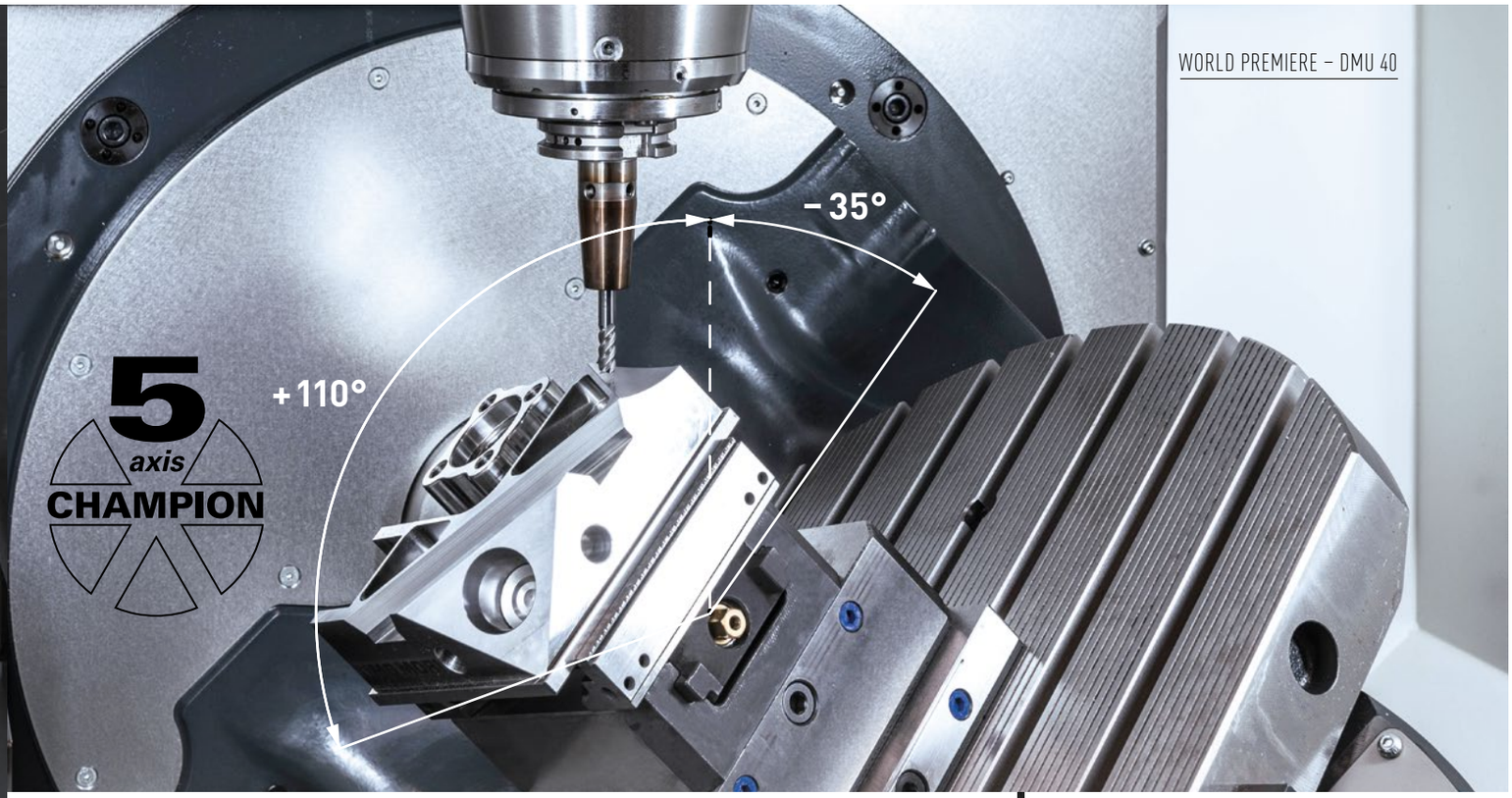
< 5.1 m² FOOT-PRINT

HIGHLIGHTS

+ Travel X/Y/Z: **550 / 450 / 420 mm**
+ Excellent stiffness due to one-piece cast iron machine bed
+ High dynamics with rapid traverse up to 30 m/min
+ Integrated 5-axis simultaneous table with large swivel angle (-35° / +110°) and maximum table load of 300 kg
+ High accuracy due to direct drives in the X- and Y-axis
+ < 5.1 m² footprint (without chip conveyor): One of the most compact 5-axis universal milling machines on the market

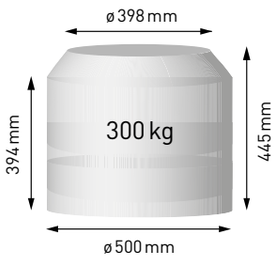
Universal, compact and powerful: The perfect entry to 5-axis simultaneous machining.

Fabian Suckert
Managing Director
DECKEL MAHO Seebach

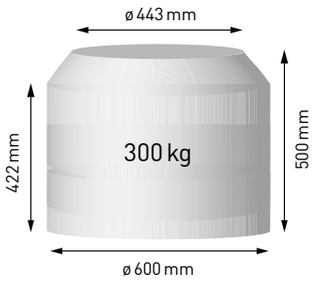


WORLD PREMIERE DMU 40 – THE LITTLE BROTHER OF THE DMU 50 3rd GEN. IN 3 BASIC MACHINES

Workpiece dimensions:



< 5.1 m² footprint



< 6.5 m² footprint

DMU 40

+ 12,000 rpm inline spindle
+ Tool magazine with 24 pockets (without set-up support)
+ Chip tray with coolant tank 125 l
+ Footprint < 5.1 m² (without chip conveyor)
+ CELOS with SIEMENS

DMU 40 PLUS

Additional to the basic machine // DMU 40 Plus

+ 15,000 rpm inlineMASTER Spindle with 36 months warranty
+ Tool magazine with 30 pockets SK40 (with set-up support)
+ Absolute measuring systems from MAGNESCALE
+ Passive cooling of all main components

DMU 40 PRO

Additional to the DMU 40 Plus

+ 20,000 rpm speedMASTER Spindle with 36 months warranty
+ Active cooling of all main components

DMU 50 3rd Generation

+ speedMASTER spindles up to 20,000 rpm or 200 Nm, with 36 months warranty
+ Tool magazine with up to 120 pockets
+ Absolute measuring systems and active cooling of all main components
+ Footprint of 6.5 m² (without chip conveyor)

OPTIONAL

CELOS with HEIDENHAIN, spindle with BT 40 | CAT 40, Chip disposal package incl. chip conveyor

CELOS with HEIDENHAIN, spindle with HSK-A63 | BT 40 | CAT 40, tool magazine with 60 pockets, chip disposal packages incl. internal coolant supply up to 80 bar

CELOS with HEIDENHAIN, spindle with HSK-A63 | BT 40 | CAT 40, tool magazine with 60 pockets, chip disposal packages incl. internal coolant supply up to 80 bar

Customized special options up to full technology integration (turnkey solutions)

Higher performance and dynamics through 25 % increase in traverse rates (42 m/min)

AUTOMATION

Automation interface for PH 150 or Robo2Go Milling

Automation interface for PH 150 or Robo2Go Milling

From standard automation, e. g. Robo2Go Milling or PH Cell, to fully automated production cells with workpiece and pallet handling

The DMU 40 is a true space saving wonder. With a footprint of less than 5.1 m² and a width of less than 2 m, it offers space for workpieces up to ø500 × 445 mm and 300 kg. The DMU 40 PRO is fitted with an automatic side door at Voigt Systemtechnik to prepare it for autonomous operation at a later date.

5-AXIS MACHINING TO MICRON PRECISION

Voigt Systemtechnik GmbH from Großbreitenbach in Thuringia was founded by brothers Jens and Eckhard Voigt in 1990 shortly after reunification. It was the continuation of a family tradition, which was started by their great-grandfather at the end of the 19th century. Following the new foundation, the range of services was quickly expanded to include industrial parts manufacture and assembly. There are now around 140 specialists working at the location. They manufacture complex and precise workpieces as well as entire assemblies for a range of sectors including medical, analytics, the optical industry, and electrotechnology. The plant list comprises approximately 40 machines, 15 of which are from DMG MORI and some of which are also automated. The latest addition is a DMU 40, which has been tried and tested by Voigt Systemtechnik as a beta test customer.

Flexible parts manufacturing for the most diverse industrial applications

Managing Director Jens Voigt knows that his experienced engineers and the versatility of the company's machine tools are the basis of Voigt Systemtechnik's sustained success: "Parts manufacturing in particular requires us to react flexibly to the different workpieces and batch sizes." Series of up to 3,000 parts are just as likely to be on the daily schedule as medium-sized production runs. "We have also used our expertise to develop our own products, including an adaptive jet cleaner that cleans tanks on the inside highly efficiently, and a gripper for sensitive products, controlled by compressed air," Jens Voigt says, pleased with the innovative developments.

5-axis machining with DMG MORI

Complex components are typical of customer orders. Modern manufacturing solutions are needed to machine them, ideally 5-axis machines, which Voigt Systemtechnik has been purchasing from DMG MORI for many years. 5-axis machining centers in a wide range of sizes have long had a place in production, including a DMU 50 eVo *linear*, two DMU 50s, a DMU 70, a DMU 100 and a range of DMC machines. In addition there are other production centers – an NLX 2000, for example.

DMU 40
IN BETA TEST:
WORKPIECES UP TO
ø 500 × 445 mm
IN A FOOTPRINT OF
< 5.1 m²

The importance placed on 5-axis technology and the longstanding good and cooperative relationship with DMG MORI has now led

to the installation of a beta test machine tool from DMG MORI. The new DMU 40 was installed in 2022. The machine tool manufacturer designed the compact universal machine to introduce customers to 5-axis simultaneous machining based on the DMU 50 3rd Generation. Even more compact than the DMU 50 and with a machine width of just two meters, the DMU 40 offers travels of 550 × 450 × 420 mm. It enables 5-axis simultaneous machining of workpieces up to ø 500 × 445 mm and up to 300 kg. High-quality components such as the one-piece machine bed made of cast iron, the geometry-optimized Y- and Z-axis slideways, as well as the speedMASTER spindle from DMG MORI ensure complex parts can be machined precisely.

5-axis precision machining to within 5 µm tolerance

"The installed machine was designed specifically to machine aluminum and stainless steel, which makes it perfect for our manufacturing," explains Michael Weyrauch, Process Manager at Voigt Systemtechnik responsible for the project involving the DMU 40. The speedMASTER spindle rated at 20,000 rpm was selected for this purpose. "It had already proven itself to be very reliable in other machining centers. We use it to machine complex workpieces productively as well as precisely and can even achieve accuracies of up to 5 µm under optimal conditions. We are currently running the machine in two-shift operation. However, with the appropriate automation, its high reliability and dimensional stability would also make it suitable for unmanned production during night shifts. Of course, the range of parts needs to be appropriate," adds Michael Weyrauch.

Automated series production for small parts

According to Jens Voigt, Voigt Systemtechnik already achieves increased productivity with automated machining centers including during unmanned night shifts: "We have been using three MILLTAP 700s and a DMP 70 for manufacturing medium and large series since 2016 – all with the WH 3 Cell workpiece handling system." Voigt Systemtechnik considers automated manufacturing to be important for raising production output going forward: "If the range of parts is suitable for the machine, we will continue the automation process. We have already ordered a DMP 70 with WH 3 Cell."

DMU 40 and Robo2Go Milling

When it comes to smaller batch sizes, Voigt Systemtechnik is also moving towards automation. As the next step, DMG MORI will install another DMU 40, this time with Robo2Go Milling. "This easy-to-operate robotic automation system has a workpiece magazine with a flexible grid that allows us to customize it to suit our parts." The Robo2Go Milling has a load handling capacity of 25 or 35 kg, depending on the version.

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VOIGT SYSTEMTECHNIK FACTS

+ Founded in Großbreitenbach in 1990
+ 140 skilled staff
+ Manufacture of complex, high precision components and assemblies for medical, analytics, and the optical industries, among others

VOIGT
technical parts and components

Voigt Systemtechnik GmbH
Ilmenauer Straße 4
98701 Großbreitenbach
Germany
www.voigt-systemtechnik.de

The DMU 40 has decisively proven itself in our multi-shift operation. Its stability and precision mean we can achieve accuracies of 5 µm.

Jens Voigt
Managing Director
Voigt Systemtechnik GmbH

Voigt Systemtechnik manufactures high-precision workpieces and assemblies on the DMU 40, primarily from aluminum and stainless steel. Among others, they are used in medical, analytics and optical industries.

WORLD PREMIERE 2023

DMU 65/75 monoBLOCK 2nd GENERATION

THE BEST IN CLASS

OUR ALL-ROUNDER!

THE monoBLOCK-SERIES ALWAYS PROVES SUITABLE

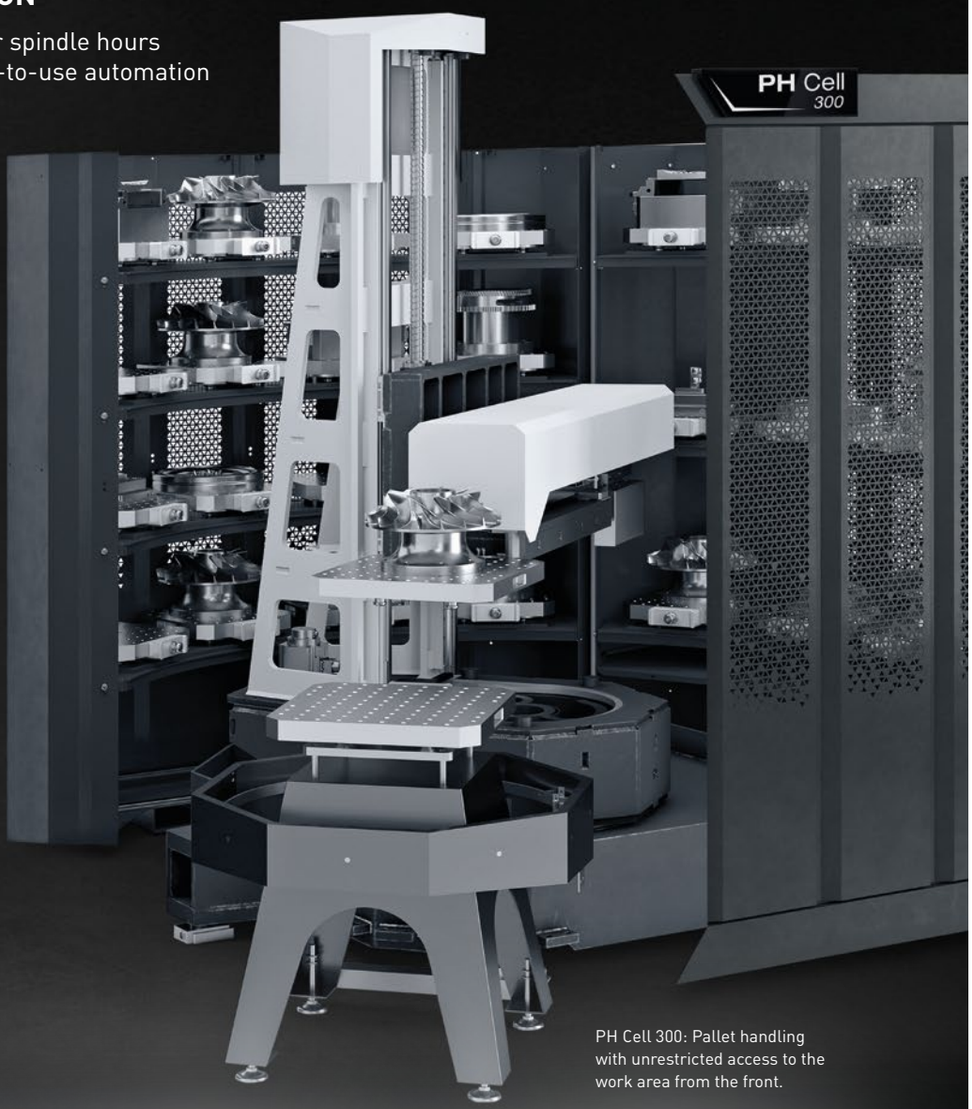
4 µm
POSITIONING ACCURACY

+ 4 µm positioning accuracy and **30 % higher volumetric accuracy** thanks to directly driven ballscrews
+ **Easy accessibility to the working area –** both stand-alone and automated!
+ **High rigidity** thanks to the monoBLOCK made of gray cast iron and a holistic cooling concept
+ **5-in-1 Technology Integration:** Milling, turning, grinding, gear cutting and measuring
+ **Preparation for automation as standard,** ideal for retrofitting
+ **CELOS** with SIEMENS or HEIDENHAIN

Compact!
Workpieces up to ø 840 × 500 mm and 1,000 kg in a footprint of only 8 m²

AUTOMATION

Increase your spindle hours through easy-to-use automation solutions.



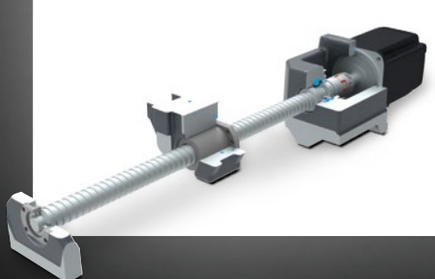
PH Cell 300: Pallet handling with unrestricted access to the work area from the front.

With over 6,000 machines delivered, the monoBLOCK series is one of the most successful in the machine tool industry.

Cornelius Nöß
Managing Director
DECKEL MAHO Pfronten GmbH

HIGH ACCURACY

+ 4 µm positioning accuracy and 30 % higher volumetric accuracy
+ Direct drive ballscrews in the X/Y axes
+ Optimized drive in the rotary axes (A-/C-axis) for high accuracy and quiet operation



THERMOSTABILITY

+ Optimized thermosymmetrical cooling of the machine ram increases temperature stability by 20 %
+ Powerful 5 kW cooling unit as standard, directly integrated into the machine

PRODUCTIVITY

+ Technology integration with milling, turning, grinding, gear cutting and measuring in one machine
+ Space-saving magazine for up to 240 tools
+ Set-up during machining

HIGH-TECH MACHINES FOR THE PERFECT ALLOY WHEEL

Due to their high strength, forged wheels can be manufactured very easily.

In 2016, ROC Fertigung24 GmbH from Freudenstadt launched its production of high-quality forged wheels in a unique design. Automobile manufacturers, customisers and tuners enhance their vehicles with the products made by the 28-member team. Attention to detail and professional competence flow into the manufacture of the wheels – from production through to finishing. In order to meet the high demand, ROC has continuously expanded both its factory area – it all started in a garage – and its manufacturing capacity. Just shortly after the foundation of the company, a decision was taken in favor of 5-axis simultaneous machining centers from the DMU monoBLOCK series as far as milling is concerned. Today there are 14 on the shop floor, which are used to full capacity around the clock in 3-shift operation. As a beta test customer, ROC put five DMU 75 monoBLOCK 2nd Generation machines through their paces in 2022.

Weight-optimized high-end alloy wheels – from sports cars to electric vehicles

Sports cars, luxury sedans and SUVs are eye-catchers – especially when striking alloy wheels are part of the vehicle. ROC is dedicated to the development and production of unique wheels. Quality takes top priority. Tobias Haug, founder and owner of ROC Fertigung24, says in this respect: "We only use forged aluminum, which is lightweight and, in comparison to cast wheels, much stronger." Weight is growing in importance. "Electric vehicles are heavy while at the same time having to be very efficient. So every kilogram counts, including where the wheels are concerned."

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Its enormous flexibility, top performance and accuracy make the monoBLOCK the ideal machine for us. It is a true all-rounder. It is always suitable for our purposes!

Lukas Betz, *Technical Manager*
Tobias Haug, *Founder & owner and*
Mario Schurr, *Commercial Manager*
ROC Fertigung24 GmbH

The influence on aerodynamics and thus the drag coefficient is also relevant. "Many vehicles are equipped with prototypes from our production while still in the development phase and tested in a wind tunnel," says Tobias Haug about ROC's function as a development partner.

14 monoBLOCK MACHINES IN 3-SHIFT OPERATION

ROC serves a niche market with its products, which range from prototypes for development and show bikes for trade fairs, a wide range of products for well-known vehicle tuners and on through to the aftermarket. "We sell our own range of forged wheels under the ProLine Wheels brand", adds Mario Schurr, commercial manager for ROC Fertigung24 and ProLine Wheels. Production does not go beyond small batches. "The high demand requires highly flexible and at the same time efficient production," explains Lukas Betz, technical manager at the company.

Flexible and productive manufacturing with DMU monoBLOCK machining centers

The 5-axis simultaneous machining centers of the DMU monoBLOCK series have always combined flexibility and performance. DMG MORI has already installed more than 6,000 of these at customers, including ROC. "We need machines that on the one hand offer high machining throughput and on the other can mill filigree structures and engrave", is how Lukas Betz describes the demands placed on CNC technology. In addition, complex geometries are the order of the day. "After the positive experience with the first DMU 75 monoBLOCK, we were convinced that the machine was a perfect fit for our machining requirements."

DMU 75 monoBLOCK 2nd Generation: More machining quality and perfect for continuous operation

ROC gradually expanded its machine capacity to include nine DMU monoBLOCK models, which it utilizes to the full. Due to the reliable continuous operation of the machining centers, the company proved an ideal user for beta testing the new generation of machines. No fewer than five DMU 75 monoBLOCK 2nd Generation centers were installed by DMG MORI at ROC in 2022, which were to be tested extensively before the official market launch. The main improvements in the new development include directly driven ballscrews, a helical gear train in the NC swiveling rotary table and 20 % higher thermal stability – measures that improve surface quality and ensure high long-term accuracy.

speedMASTER spindles with up to 20,000 rpm and 130 Nm

The DMU 75 monoBLOCK 2nd Generation is equipped in its standard version with a 20,000 rpm, 130 Nm speedMASTER spindle. "This is the perfect balance between speed and torque", says Lukas Betz with regard to the cost-efficient machining of the forged wheels. The tool magazine has space for 60 tools, more than enough for the machining requirements at ROC. An innovation is the ergonomic access. A sliding door ensures that machines of the new generation require less space and can therefore be placed closer together. The biggest visual innovation of the DMU 75 monoBLOCK 2nd Generation is the stealth design. The cabin is made of durable sheet metal, while flat – and thus service-friendly – panels offer a good view of the work area.

On 14 monoBLOCK machines, including 5 monoBLOCK 2nd Generation centers, ROC produces weight-optimized, high-end alloy wheels for sports cars through to electric vehicles.

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1. + 2. As a beta test customer, ROC put five DMU 75 monoBLOCK 2nd Generation centers through their paces. There is now a total 14 monoBLOCK machines in operation. **3.** Thanks to the speedMASTER spindle rated at 20,000 rpm and 130 Nm, ROC benefits from both high machining throughput and an ability to mill filigree structures on the DMU 75 monoBLOCK. **4.** With its construction of new forged wheels, ROC is also a development partner for car manufacturers.

All-round support from DMG MORI Finance and DMG MORI Service

In machining centers from DMG MORI, ROC has found an optimal solution and a reliable partner in all areas relating to manufacturing technology. "Above all, the uncomplicated leasing offer from DMG MORI Finance has made repeated investments easier", recalls Tobias Haug. This has enabled ROC to grow steadily in line with rising demand. As the machining centers are in operation around the clock, the company relies on fast service. Lukas Betz is satisfied: "If malfunctions cannot be resolved via the hotline or *my* DMG MORI and the DMG MORI NET*service*, we benefit from our proximity to the service in Leonberg."

Growth with DMG MORI

Thanks to the good cooperation with DMG MORI, ROC is already planning further investments. However, the existing factory area will first have to be expanded to 2,100 m². Tobias Haug is clear: "We will need this additional space to drive our growth with additional machining centers from DMG MORI."

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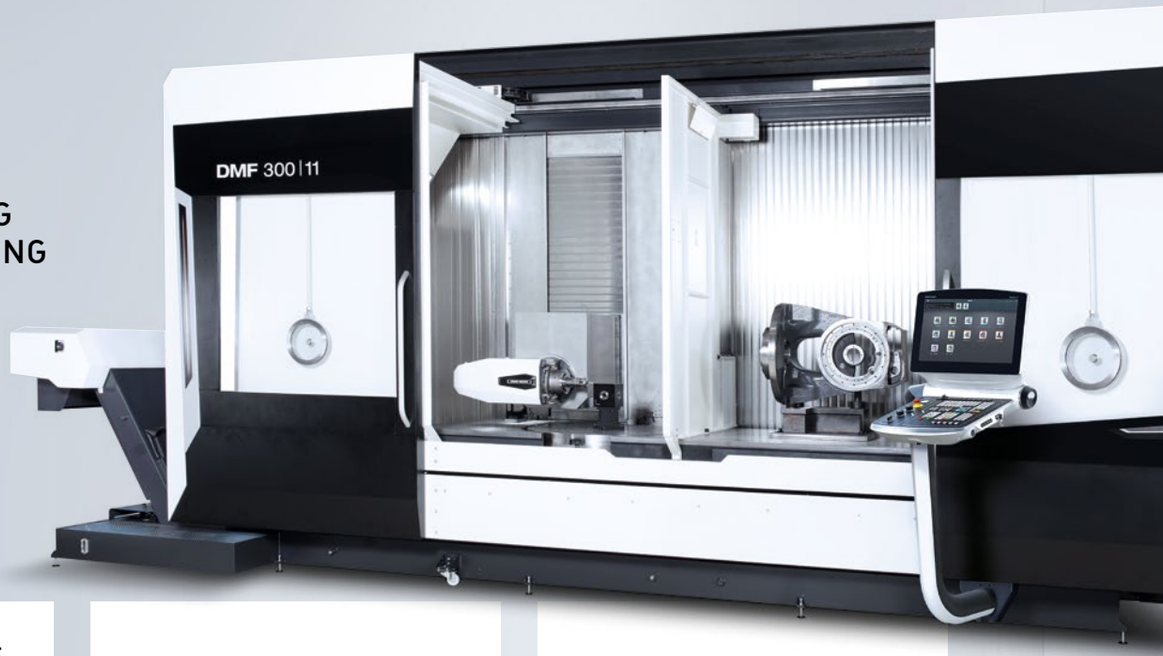
ROC FERTIGUNG24 FACTS

+ 2016 founded in Freudenstadt
+ 28-strong team
+ Design and manufacture of high-quality forged wheels for automobile manufacturers, customisers and tuners

ROC Fertigung24 GmbH
Im Sulzhau 4
72250 Freudenstadt, Germany
www.fertigung24.com

WORLD PREMIERE 2023

FLEXIBILITY AS NEVER BEFORE
THE NEW DMF 300|11



2-IN-1: PENDULUM MACHINING ENABLES SET-UP DURING PRODUCTION

+ **Easy to install partition** for creating two working areas
+ **Optimal for robot automation**

LARGE WORKING VOLUME

with travels X/Y/Z:
3,000 mm/1,100 mm/1,050 mm
+ 2-in-1: machining in
2 independent work areas

MAXIMUM STABILITY

due to one-piece cast iron machine bed and 3 linear guideways in the X-axis

HIGH LONG-TERM THERMAL ACCURACY

due to extensive cooling of the machine structure

INNOVATIVE TOOL CHANGER

with double gripper outside the work area

MODULAR CONSTRUCTION

with speedMASTER and powerMASTER spindles and a flexible table concept as a solution for all requirements in this machine class

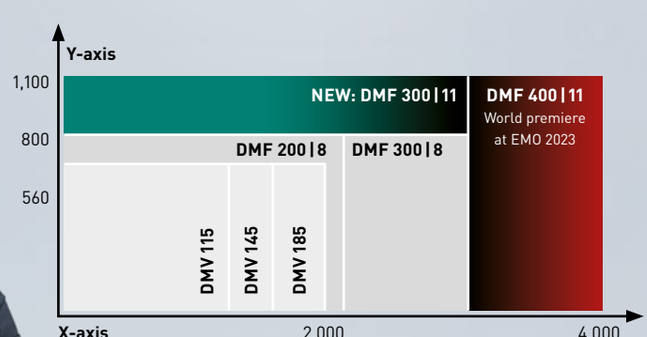
HIGH MILLING PERFORMANCE

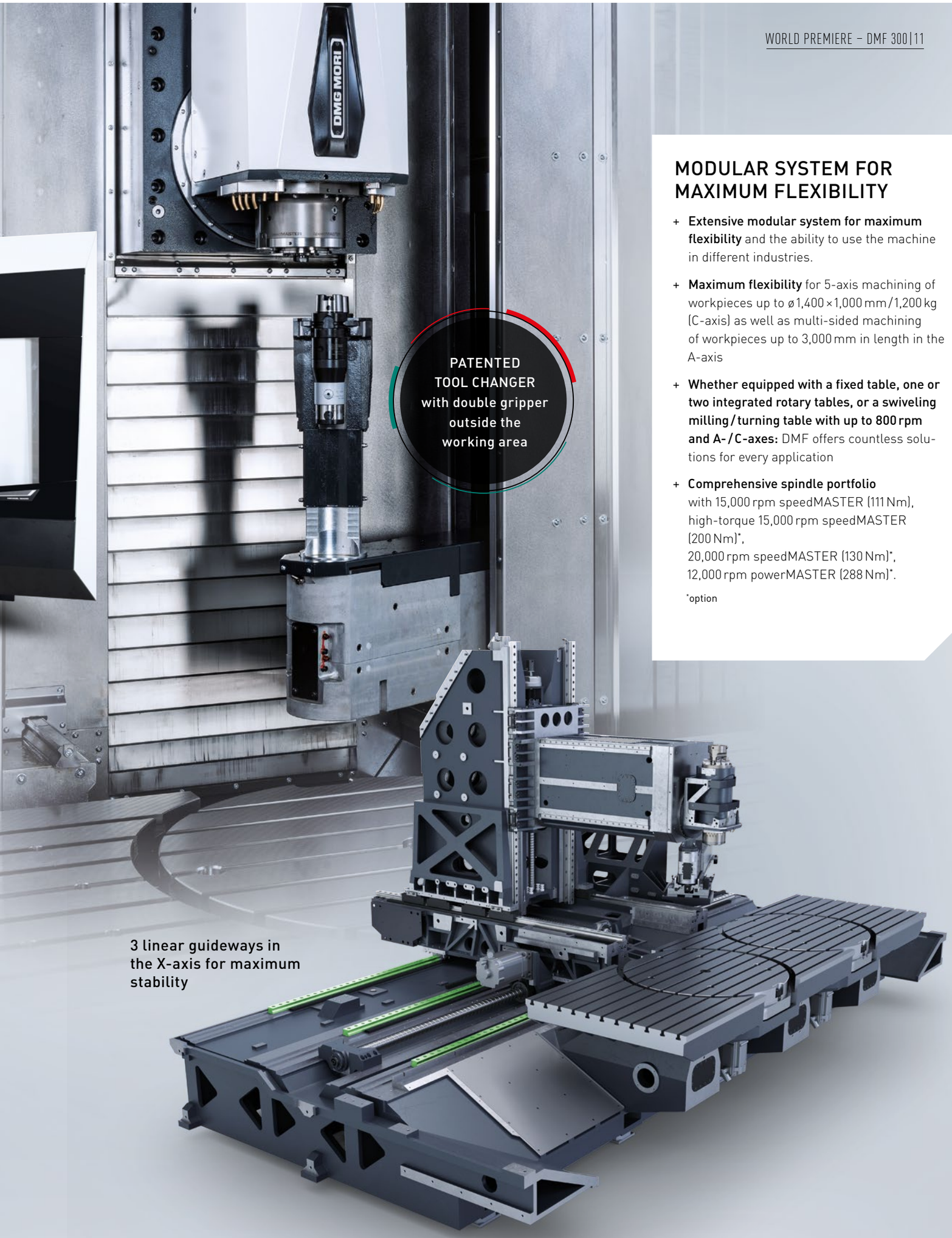
due to powerful spindles and HSK-A100 interface

Even more flexible, even more powerful: New moving column design and maximum spindle power with HSK-A100 interface for a previously unattainable performance.

Fabian Suckert
Managing Director
DECKEL MAHO Seebach

CONTINUED SUCCESS STORY





PATENTED
TOOL CHANGER
with double gripper
outside the
working area

MODULAR SYSTEM FOR MAXIMUM FLEXIBILITY

+ **Extensive modular system for maximum flexibility** and the ability to use the machine in different industries.
+ **Maximum flexibility** for 5-axis machining of workpieces up to ø1,400 × 1,000 mm / 1,200 kg (C-axis) as well as multi-sided machining of workpieces up to 3,000 mm in length in the A-axis
+ **Whether equipped with a fixed table, one or two integrated rotary tables, or a swiveling milling / turning table with up to 800 rpm and A- / C-axes:** DMF offers countless solutions for every application
+ **Comprehensive spindle portfolio** with 15,000 rpm speedMASTER (111 Nm), high-torque 15,000 rpm speedMASTER (200 Nm)*, 20,000 rpm speedMASTER (130 Nm)*, 12,000 rpm powerMASTER (288 Nm)*.

*option

3 linear guideways in the X-axis for maximum stability

SPECIAL-PURPOSE MACHINES
FOR THE MANUFACTURE OF PHOTOVOLTAIC CELLS AND E-MOBILITY

PRODUCTION EXCELLENCE FOR GREEN TECHNOLOGIES

+ **Automated handling solutions** for crystalline silicon wafers used in the production **of solar panels**
+ **Production equipment for energy storage systems in e-mobility,** e.g. for battery cell production or the assembly of battery modules

DMG MORI GREEN TECH

Jonas & Redmann Automationstechnik GmbH in Berlin was founded in 1989 as a service provider in the field of special machine construction. The demanding projects all concern the automation of production in the solar panel industry, the medical sector, vehicle construction and battery manufacture. With 450 employees, Jonas & Redmann is a dedicated partner for its customers, from product conception through design and production to service. In order to be able to react quickly and flexibly, the company has built up its own machining department, which includes eight machine tools from DMG MORI. Jonas & Redmann has been working with products from this machine tool manufacturer since 1994. The latest model, a DMF 200 | 8, was procured for the high-precision machining of long profiles, sheets and support frames.

Customized automation solutions for e-mobility and the medical sector

Automated production is the surest way to remain productive and competitive in a global market. "Such solutions are extremely complex, especially in high-tech industries", explains Frank Polak, responsible for communications at Jonas & Redmann. "Depending on the requirements of the products our customers manufacture, we design individual solutions that range from simple fixtures to complex handling and assembly systems to fully automated production lines." Jonas & Redmann can implement even the most demanding projects within a year. In the founding years, the enormous upswing in photovoltaics shaped the day-to-day business.

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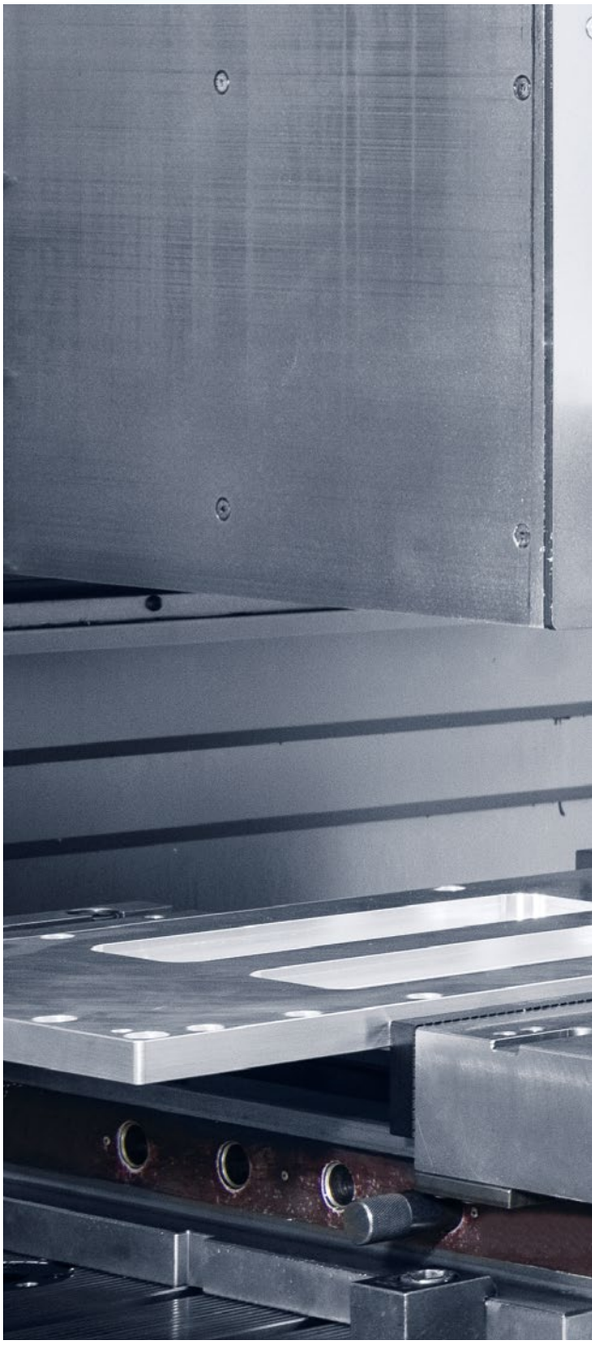


The DMF 200 | 8 is used to manufacture long, high-precision profile components.

The concept of the DMF has optimized our cutting over the long term. The design even allows us to machine over-long workpieces that extend beyond the working area.

***Frank Polak** (left), responsible for communication*
***Yilmaz Öztürk** (right), mechanical manufacturing manager*
Jonas & Redmann Automationstechnik GmbH

The new traveling column concept of the DMF makes it possible to machine long components that extend beyond the working area.

DMF 200|8

THE NEW MOVING COLUMN SERIES

HIGHLIGHTS

+ **Maximized rigidity** due to 3 linear guideways in the X-axis
+ **Constant milling performance** due to consistent overhangs
+ **Excellent surface quality and accuracy** due to direct drives in the Y-axis and Z-axis, as well as integrated cooling
+ **Maximum machining flexibility** thanks to B-axis milling head with ± 120° swivel range
+ **Large working area** with travels of X = 2,000 / Y = 800 / Z = 850 mm
+ **Patented and innovative tool changer,** fast, collision-free and positioned behind the machine table for safety

Video of the DMF 200|8:
youtu.be/If8jUP8TjWo&t

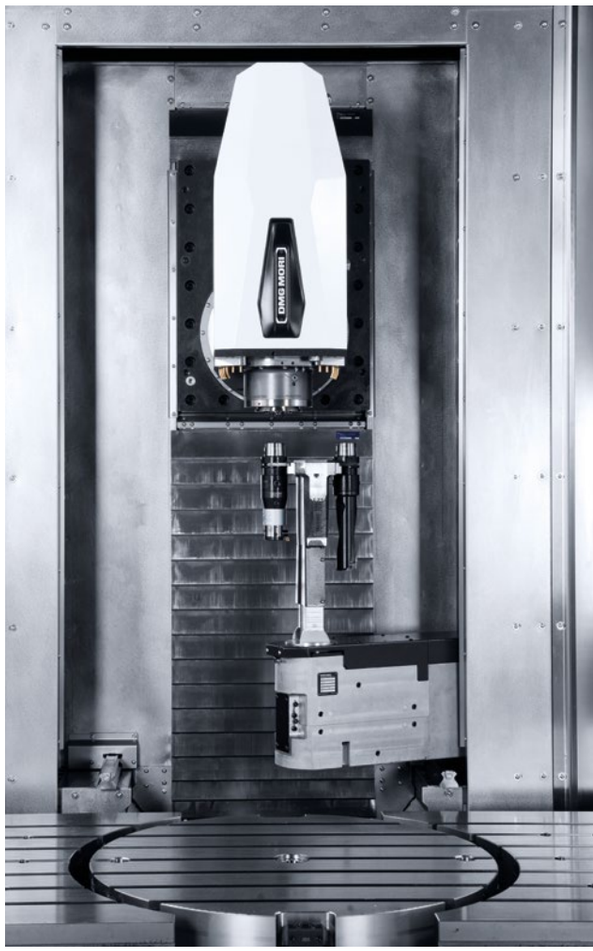
The manufacture of solar panels is one of the company's main business areas, says Frank Polak, alongside the medical sector, automotive engineering and the production of energy storage systems: "The strong growth in e-mobility has resulted in the latter two areas increasingly overlapping." As a direct supplier to major manufacturers, Jonas & Redmann is involved in new development projects at a very early stage.

Rapid response through in-house machining

Jonas & Redmann procures a large proportion of components for the automated systems from suppliers. They are assembled at the headquarters in Berlin. This is also where final acceptance takes place. In addition, the company has set up its own machining facility. "It allows us to compensate for capacity bottlenecks and process urgent orders," explains Yilmaz Öztürk, head of mechanical production. Machine tools from DMG MORI have been operating here reliably for many years, both for turning and milling, and include 5-axis DMU 50s and an NL 2000 for turning.

DMF 200|8: Maximum and constant rigidity thanks to 3 *linear* guideways in the X-axis

In 2021, extra capacity in the profile machining area was needed. A large working area was required for the workpieces, which were long in many cases. DMG MORI had the right model in the product range with the DMF 200|8, which was new at the time. "Thanks to the 3 guideways in the X-axis, the new DMF center makes powerful, high precision machining possible. This is consistent throughout the entire working volume", says Yilmaz Öztürk, assessing the machine concept. With the speedMASTER spindle, which achieves a rotational speed of 15,000 rpm, Jonas & Redman machines aluminum, steel and stainless steel as well as plastics. One reason for the outstanding rigidity of the DMF 200|8 is the one-piece gray cast iron machine bed, the 3 *linear* guideways in the X-axis and the previously mentioned consistent overhang in the Y-axis. A comprehensive range of cooling measures also ensures high, long-term thermal accuracy.



Patented and innovative tool changer, fast, collision-free and process-safe behind the worktable.

Safe machining of long workpieces

A highlight of the DMG MORI traveling column concept is the innovative and unique tool changer behind the worktable. Yilmaz Öztürk adds: "This allows us to use the entire clamping surface for entire frameworks without the risk of collision." The DMF 200|8 also provides process safety due to its guideways, which are outside the working area. "Wear is therefore reduced to a minimum."

In order to overcome production bottlenecks and respond efficiently to rush orders, Jonas & Redman relies on in-house mechanical manufacturing. Among other machines, an NL 2000, several DMU 50s and a new DMF 200|8 are in use.

The Machine Protection Control (MPC 2.0) technology cycle completes the attributes of the DMF 200|8 by offering a high degree of process safety. The aperture for loading lengthy components through the side panel is considered a bonus: "When we open it, we can clamp parts that are longer than the 2,300 mm table."

INNOVATIVE TOOL CHANGING OUTSIDE THE WORKING AREA

DMF – long-term chip removal optimization

Jonas & Redman moved into a large new building two years ago in which all processes from design to manufacturing and assembly can be carried out even more efficiently. In this connection, the DMF 200|8 was an investment based on long-term metalcutting optimization. We want to press ahead with this: Yilmaz Öztürk says looking ahead: "We will gradually modernize our mechanical manufacturing with innovative solutions similar to the DMF 200|8 to increase our capacity and particularly our productivity. We will definitely also be taking a look at the new DMF 300|11 with its 1,100 mm Y-axis."

«

JONAS & REDMANN AUTOMATIONSTECHNIK FACTS

+ Established in Berlin in 1989
+ 450 employees
+ Design and manufacture of automated production lines for the solar panel industry, medical engineering, car manufacturing and battery production

Jonas & Redmann
Automationstechnik GmbH
Segelfliegerdamm 65
12487 Berlin, Germany
www.jonas-redmann.com

WORLD PREMIERE 2023

M-SERIES: THE NEW M2 – OUR DOOR OPENER

DEVELOP YOUR PRODUCTION WITH LONG LASTING DMG MORI QUALITY

M1: 550 mm X-axis travel in a 5.9 m² footprint
(w/o chip conveyor)

M2: 1,100 mm X-axis travel in a 7.3 m² footprint
(w/o chip conveyor)

New SIEMENS SINUMERIK ONE as standard

LONG LASTING PRODUCTION

HIGH RIGIDITY

+ Monolithic machine bed with fixed table and massive castings (machine weight 6,950 kg)
+ Large working area: X = 1,100 / Y = 550 / Z = 510 mm, in a 5.9 m² footprint
+ Fixed & rigid table size of 1,400 × 600 mm and max. load of 1,700 kg assures high machining performance

MAXIMALE PERFORMANCE

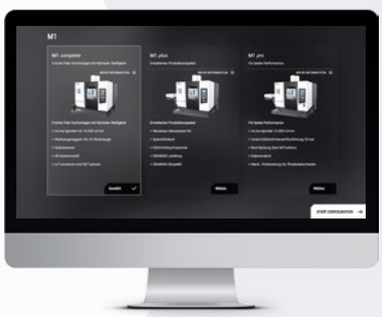
+ Proven quality inline spindle – 10,000 / 12,000 rpm* with hydraulic tool release
+ Outstanding cutting perfomance – Q: 232 cm³/min – in it's class: (C45, milling head: D63 mm, ap: 3.5 mm, ae: 70 %, Vc: 250 m/min, f: 1,500 mm/min)
+ Easy installation & maintenance friendly

LATEST TECHNOLOGY

+ New SIEMENS SINUMERIK ONE incl. ShopMill with 15" screen and USB 3.0
+ IoT*connector*, NET*service* and auto shut down as standard!

*option

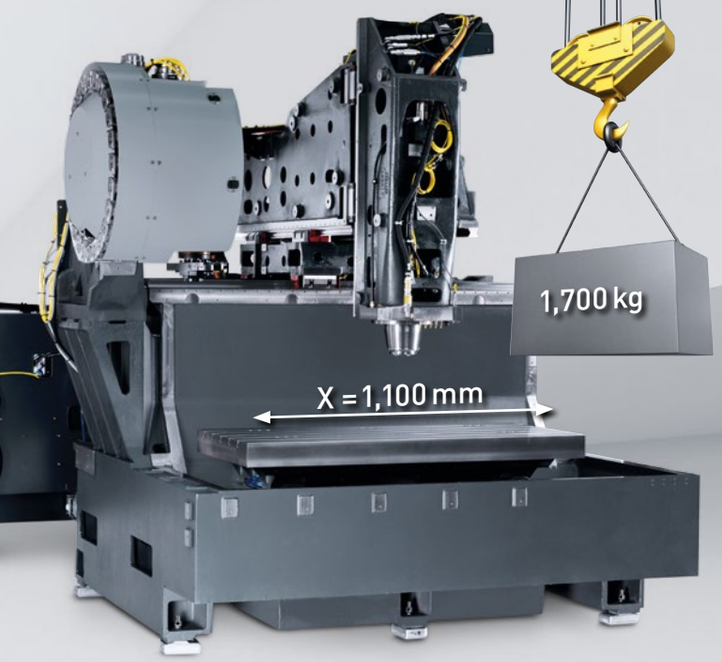
Use our online configurator to order your individual M1 / M2:
configure.dmgmori.com



M series comparison tabular		M1	M2
Travel X/Y/Z	mm	550/550/510	1,100/550/510
Table size	mm	850 × 650	1,400 × 600
Max. table load	kg	600	1,700
Maximum spindle speed	rpm	10,000/12,000*	
Spindle power (40 % DC)	kW	13	
Spindle torque (40 % DC)	Nm	64/83*	

With a 1,100 mm travel in the X-axis, the new M2 from DMG MORI sets standards in the entry-level class of compact vertical machining centers.

> 1,000 successful M1 installations



M1 / M2 **COMPLETE**

Standard equipment:

+ SINUMERIK ONE control
+ Inline spindle 10,000 rpm
+ Tool taper SK 40
+ Automatic tool change (24 pockets)
+ Chip tank
+ IoT*connector* & NET*service*
+ 3D data model
+ JobShop Package (ShopMill, Simulation, Measuring Cycles, etc.)

M1 / M2 **PLUS**

Additional to COMPLETE:

+ Chip conveyor
+ Touch probe kit
+ Spray gun

M1 / M2 **PRO**

Additional to PLUS:

+ Inline spindle 12,000 rpm
+ Internal coolant system 20 bar
+ Bed flushing via M-function
+ Cabin roof
+ Mechanical preparation for oil-mist extractor

Application examples

BRACKET
Industry: Shipbuilding
Material: Aluminium EN-5754
Dimensions: 793 × 397 × 118 mm
Machining time: 97 min

CONNECTOR
Industry: Machine building
Material: Steel C45
Dimensions: 402 × 238 × 90 mm
Machining time: 63 min

HOLDER
Industry: Aerospace
Material: Aluminium EN-7075
Dimensions: 846 × 280 × 110 mm
Machining time: 120 min

BASE PLATE
Industry: Energy and Power Sector
Material: Stainless steel (grade 1.4305)
Dimensions: 1,000 × 125 × 16 mm
Machining time: 44 min

WORLD PREMIERE 2023

T-SERIES

ENTRY LEVEL UNIVERSAL TURNING WITH LONG-LASTING DMG MORI QUALITY

T1: ø 300 × 400 mm workpieces in a 4.5 m² footprint
(w/o chip conveyor)

T2: ø 460 × 705 mm workpieces in a 5.6 m² footprint
(w/o chip conveyor)

New SIEMENS SINUMERIK ONE as standard

LONG LASTING PRODUCTION

HIGHEST RIGIDITY

+ Rigid design due to robust bed structure (T2 = 5,500 kg, T1 = 3,400 kg)
+ Maximum part weight between centers, T2 = 350 kg and T1 = 250 kg

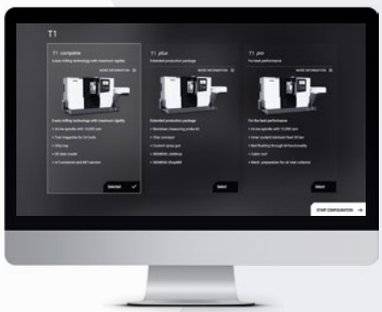
MAX. PERFORMANCE

+ Turning spindle with 3,500 rpm and 319 Nm (T1: 4,500 / 140 Nm)
+ Excellent cutting perfomance: T2: Q = 540 cm³/min., T1: Q = 280 cm³/min
+ Bar capacity up to ø 80 mm (T1 = 65 mm)
+ Easy installation & maintenance friendly

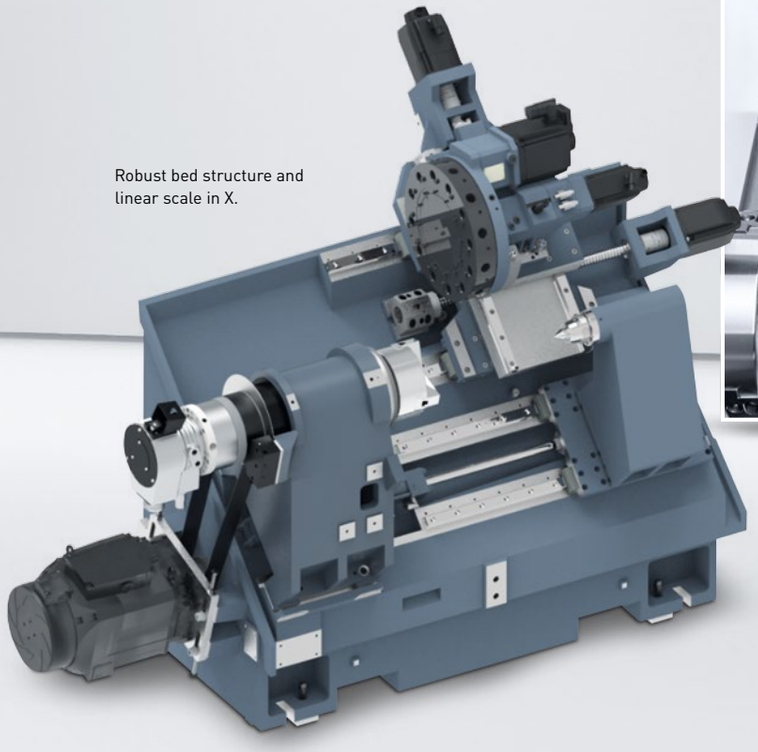
LATEST TECHNOLOGY

+ New SIEMENS SINUMERIK ONE incl. ShopTurn with 15″ screen and USB 3.0
+ IoT*connector*, NET*service* and auto shutdown as standard!
+ Linear scale in X-axis as a standard!

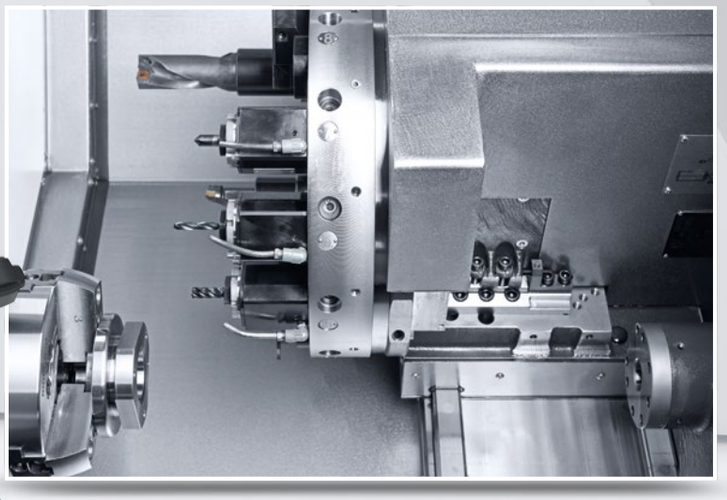
Use our online configurator to order your individual T1 / T2:
configure.dmgmori.com



T-series technical details		T1	T2
Swing diameter over bed	mm	550	650
Max turning diameter / recommended	mm	300 / 210	460 / 300
Turning length	mm	400	705
Main spindle speed max.	rpm	4,500	3,500
Power max. (40 / 100 % DC)	kW	11.7 / 9.0	19.5 / 15.0
Torque max. (40 / 100 % DC)	Nm	140.4 / 108	319 / 246
12-positional turret		VDI 30	VDI 40



Robust bed structure and linear scale in X.



Including SIEMENS SINUMERIK ONE control, powerful spindles, rigid bed structure and linear scale in X-axis as standard – the T1 and T2 from DMG MORI set standards in the entry-level class of universal turning.

T1 / T2 **COMPLETE**

Standard equipment:

+ SINUMERIK ONE control
+ Belt-driven spindle
  T1: 4,500 rpm; T2: 3,500 rpm
+ 12-position turret
  T1: VDI 30; T2: VDI 40
+ Linear scale in the X-axis
+ Chip tray, 5 bar coolant pump
+ Hydraulic hollow clamping cylinder
+ Electronic handwheel on the control panel
+ Coolant spray gun 5 bar
+ IoT*connector* & NET*service*
+ Machine 3D model in STEP format
+ JobShop Package (ShopTurn, Simulation, Measuring Cycles, etc.)

T1 / T2 **PLUS**

Additional to COMPLETE:

+ Chip conveyor with 12 bar pump
+ Hydraulic tailstock controlled by M functions
+ Foot pedal for tailstock
+ Hydraulic 3-jaw chuck
+ Mechanical preparation for oil mist extrator unit

T1 / T2 **PRO**

Additional to PLUS:

+ Machined parts separator
+ Barfeed interface

Application examples

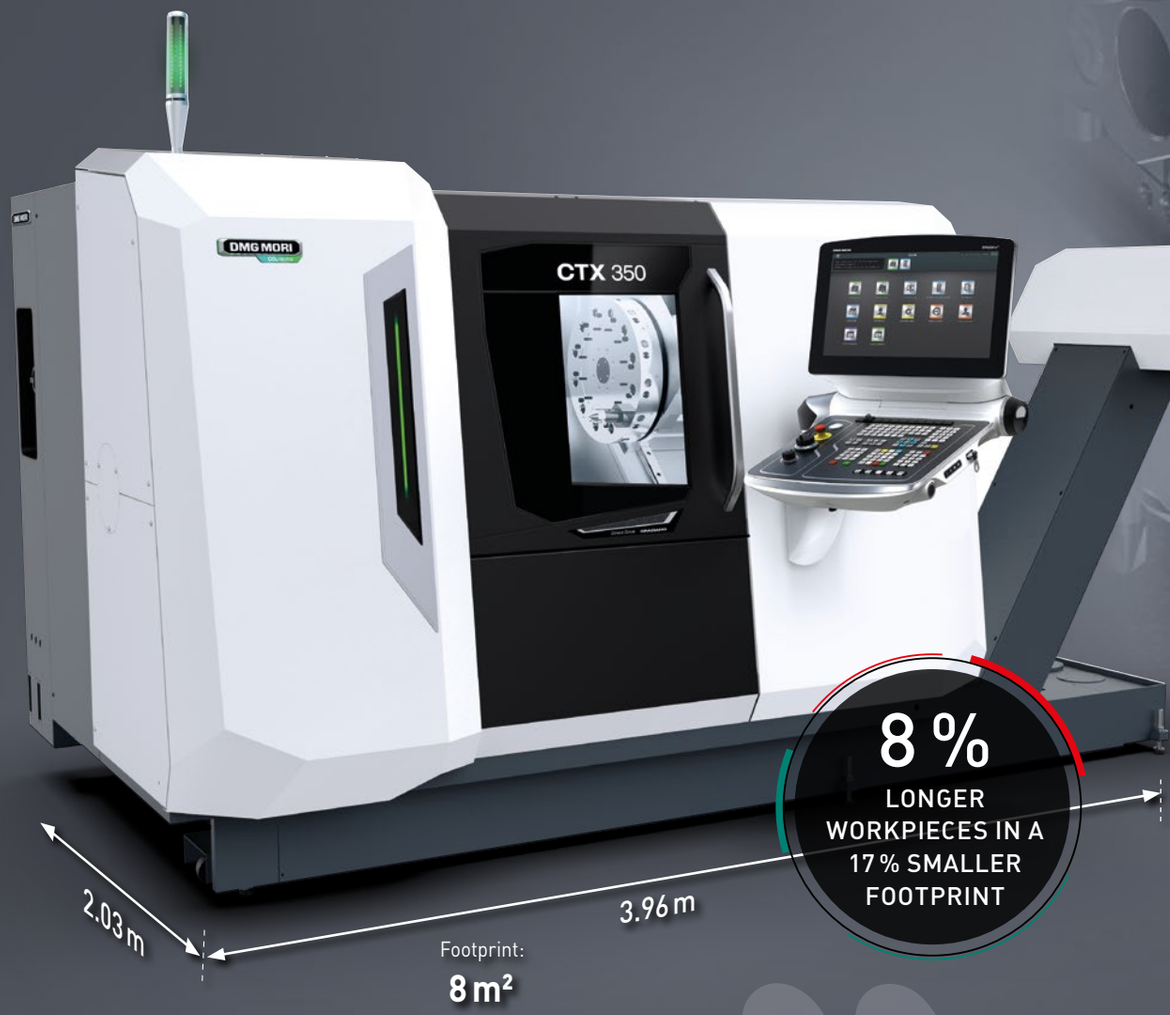
CHAIN WHEEL
Industry: Machinery
Material: Steel 15CrNi6
Dimensions: ø 100 × 115 mm
Machining time: 14.5 min

COMPENSATION FLANGE
Industry: Machinery
Material: Steel C45
Dimensions: ø 160 × 70 mm
Machining time: 30 min

CONNECTOR
Industry: Automotive
Material: Steel C45
Dimensions: ø 80 × 95 mm
Machining time: 9 min

WORLD PREMIERE 2023

CTX 350
FIRST STEP INTO A NEW GENERATION



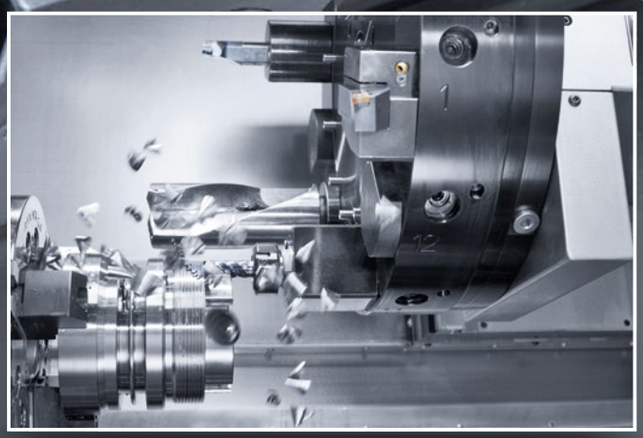
8 %
LONGER WORKPIECES IN A 17 % SMALLER FOOTPRINT

HIGHLIGHTS

+ **Workpieces up to ø 320 × 540 mm** and ø 65 mm bar capacity
+ Largest **Y-axis** in its class at **100 mm**
+ **6-sided complete machining** at main spindle (5,500 rpm / max. 192 Nm) and optional counter spindle (6,000 rpm / 62 Nm)
+ **Highly energy efficient** due to spindle drives with synchro technology
+ **12-position VDI 30 turret, up to 12,000 rpm** ready for high pressure coolant
+ **Long lasting accuracy** due to linear scale and liquid cooled spindle drives
+ **DMG MORI multitouch control panel** with SIEMENS or FANUC

Premium quality equipment for a long lasting investement – the new CTX 350 combines the best of the CTX and CLX series in universal turning.

Dr. Eng. Claudio Merlo
Managing Director
GRAZIANO TORTONA S. R. L.



INTEGRATED AUTOMATION SOLUTION

+ Autonomous loading and unloading
+ Compact solution for small diameter shaft unloading, also with bar loader
+ Easy flange handling
+ Parts dimension up to ø100 × 125 mm (length)

NEW: VDI 30 GEAR DRIVE TURRET

+ Productivity: High milling speed up to 6,000 rpm (8,000 rpm optional) and up to 17 Nm / 8 kW
+ 100 % duty cycle in milling
+ Accuracy: High quality gears and air-oil lubrication for reduced temperature variation
+ Up to 40 bar coolant

>> Disc type turret for tailstock lathe
>> Star type turret for counter spindle lathe

NEW: VDI 30 TURNSTAR TURRET (DIRECT DRIVE)

+ Speed: 12,000 rpm
+ Powerful: 24 Nm / 14 kW
+ Water-cooled built-in motor
+ Up to 80 bar coolant

>> Option

PAYZR® by DMG MORI

PAY WITH ZERO RISK

EQUIPMENT-AS-A-SERVICE
SOFTWARE-AS-A-SERVICE

1–5

NEW: 5 MACHINE MODELS!

EXPANSION OF THE EQUIPMENT-AS-A-SERVICE PORTFOLIO

VERTICAL MILLING
M1

VERTICAL MILLING
M2

UNIVERSAL TURNING
T1

UNIVERSAL TURNING
T2

TURN & MILL
CLX 450 TC

8 PRODUCTS IN THE DMG MORI STORE

	Calculation	Planning	Preparation	Production	Monitoring	Service
EaaS				1–5 5 MACHINE MODELS by PAYZR		
SaaS	6 up2parts		7 ISTOS	8 TULIP		

The complete range of digital added value is now available at: **dmgmoristore.com**

PAYZR availability limited to selected regions. Contact your local DMG MORI representative for further information and prices.

DMG MORI *STORE*

Industrial digitization has opened up a new window of fascinating opportunities for machine tool manufacturing. DMG MORI has been offering options for its new Equipment-as-a-Service by PAYZR business model since last year – and "extremely successfully", as Asef Duratovic, Head of Subscription, revealed to us in the lead-in to the interview.

What makes EaaS by PAYZR so special?
Companies have traditionally invested in factory equipment or digital technologies on balance sheet. This is what business economists call capital expenditure (CAPEX). With PAYZR, users only pay for the services provided by a machine or software solution in the form of operating expenses or operational expenditure (OPEX).

So basically it is about payment methods and taxation?
It's much more than that. Performance-based subscription or as-a-service business models such as PAYZR mark a paradigm shift. Companies can achieve more strategic and financial flexibility by not burdening their own balance sheet. The improved calculability of expenses is an added benefit. At the same time, we have enhanced EaaS by PAYZR with comprehensive service and insurance packages to minimize risks for our customers.

What type of customer is DMG MORI addressing with the EaaS by PAYZR model?
The business model is really open to any customer. Whether or not the new business model fits the strategic orientation of the customers will naturally depend on their requirements and needs. What value does the customer place on, for example, financial planning security, flexibility, or permanent access to the latest technology? The planned utilization and intensity of use also play a key role. If analysis shows that the EaaS by PAYZR is not an ideal fit, we offer our customers the appropriate financing product from our DMG MORI Finance portfolio.

Is it possible to identify a trend after the first few months regarding which customers prefer to subscribe rather than buy?
The user profile is generally very heterogeneous. Our objective of expanding our customer base has been fully achieved. Almost 60 percent of EaaS by PAYZR users were not previously customers at all but subscribed to a high-tech DMG MORI machine for the first time. Moreover, the new business model has encouraged many young companies to start manufacturing themselves instead of continuing to rely on service providers. Even traditional companies with growth ambitions take advantage of the benefits of EaaS by PAYZR and strengthen themselves by acquiring two machines rather than just buying one. For example, a Norwegian customer has optimized its machinery by subscribing to three M1s and one CLX 450 TC by PAYZR.

DMG MORI will present three more EaaS by PAYZR models at the Pfronten Open House – the M2 universal milling machine and the T1 and T2 universal turning machines. Are any others planned?
The three machine models we mentioned means that we are presenting, firstly, a larger M2 milling machine and, secondly, two universal turning machines, T1 and T2, by PAYZR for the first time. The additions to the portfolio reinforce our strategic focus in the EaaS area and open up the possibility for us to address an even larger customer base. We will continue to expand and strengthen the EaaS by PAYZR portfolio over the course of the year to include premium 5-axis milling machines. We should meet again for an update before EMO.

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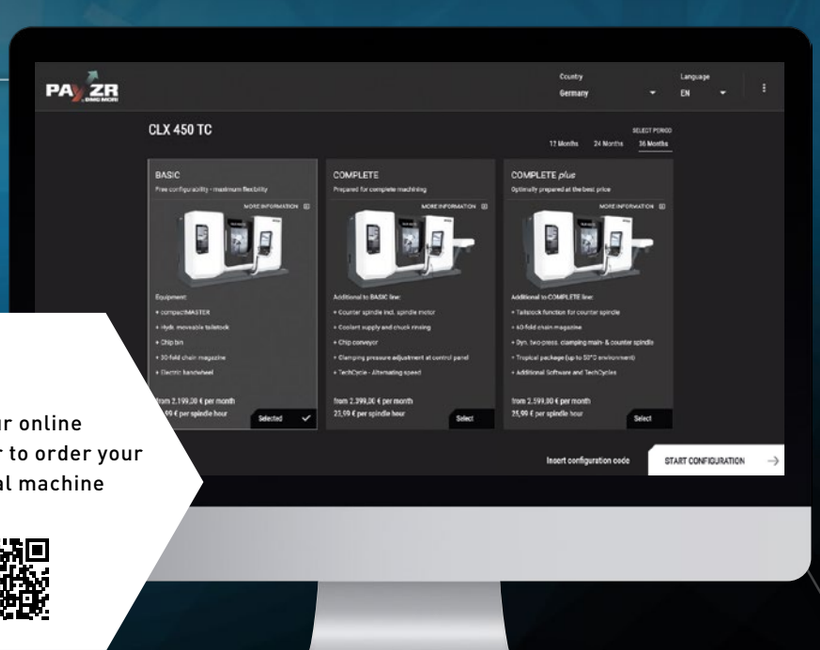


Use our online configurator to order your individual machine

Configure your machines with just a few clicks, without obligation:
dmgmoristore.com

PAYZR® by DMG MORI

PAY WITH ZERO RISK
EQUIPMENT-AS-A-SERVICE

YOUR ADVANTAGES WITH PAYZR

+ **Maximum planning reliability through price** and **cost transparency and full flexibility**
+ **Full financial flexibility –** no investment risk, no deposit, no obligation to use a minimum number of spindle hours
+ **Flexible monthly operating expenditure** (OPEX) instead of long-term investment and capital tied up in assets (CAPEX)!
+ **Flexibility in choosing a contract term** of 12, 24 or 36 months
+ **Freedom of choice at the end of the term –** return the machine*, purchase the machine or extend the contract by 12 months
+ **10 added-value items in the all-round carefree package – always included!**

*One-off cost for dismantling, packaging and transport at the end of the contract

10 ADDED VALUE ITEMS IN YOUR ALL-ROUND CAREFREE PACKAGE – ALWAYS INCLUDED

1. TRANSPORT
Transport to you is included.

2. PACKAGING
The packaging of the machine on its way to you is included.

3. SET-UP & COMMISSIONING
Set-up and commissioning are included, of course!

4. TRAINING
We will take care of the training of an employee!

5. MAINTENANCE & SPARE PARTS
All maintenance and wear costs including spare parts are covered.

PAYZR availability limited to selected regions. Contact your local DMG MORI representative for further information and prices.

IN JUST 4 EASY STEPS TO YOUR INDIVIDUAL MACHINE BY PAYZR!

1 CONFIGURATION & ORDERING

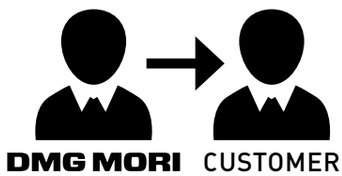
Choose your machine package and the contract term. Add individual options and accessories as you need them! Then finalize your order in the shopping cart of the DMG MORI STORE.

2 CREDIT & IDENTITY CHECK

Complete your self-assessment online for the credit check and, after positive feedback, start your online identity check with subsequent signature of your contract.

3 DELIVERY DATE COORDINATION

Our local DMG MORI sales and service company will contact you and coordinate your personal delivery date!

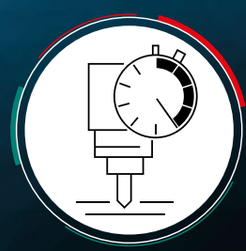


4 DELIVERY & SET-UP

We deliver your machine, install it, commission it and connect it to *my* DMG MORI!

6. MACHINE INSURANCE
Your all-round insurance cover, without an excess!

7. LOSS OF EARNINGS INSURANCE
In the event of machine downtime due to damage to an insured property, you will be financially compensated!



8. FREEDOM OF USE
No obligation to use a minimum number of spindle hours!

9. FLEXIBILITY
No long-term commitment and freedom of choice at the end of the contract.

10. PRICE AND COST TRANSPARENCY
No hidden costs or unexpected expenditure.

PROCESS INTEGRATION

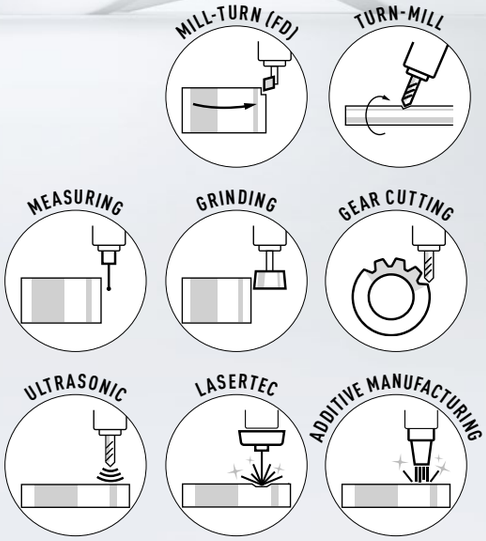
AUTOMATION

DIGITIZATION

The process integration video:
youtu.be/3vswqe1zqqY

8-IN-1 TECHNOLOGY INTEGRATION

Higher utilization of a multi-function machining center instead of partial utilization of several simple machines



AUTOMATION

For additional unattended or minimally-attended night and/or weekend shifts

PH Cell 2000
(Up to 21 pallets and 2,000 kg handling weight)

DMG MORI GREEN MACHINE

DMG MORI GREEN MODE

DMG MORI GREEN TECH

DMG MORI GREEN ECONOMY

PROCESS INTEGRATION WITH DMG MORI

EXTENDED
SPINDLE HOURS

+ Technology Integration
+ Automation

EASY
OPERATION

+ Technology Cycles
+ CELOS

ENERGY
EFFICIENCY

+ **GREEN**MODE
+ Additive Manufacturing

DIGITIZATION

+ From **CAD-CAM solutions** and post-processors to simulation using Digital Twin
+ **Adaptive in-process measurement**
  Optimization of manufacturing processes through the feedback of measurement results
+ **DMG MORI technology cycles** for up to 60 % shorter programming time

gearSKIVING

In-process Measurement

DMG MORI
Digital Twin

PLATINUM Top 1%
2022
ecovadis
Sustainability Rating

TOP 1 % OF MORE THAN 35,000 COMPANIES!

+ Energy- and emission-efficient operation
+ DMG MORI takes holistic responsibility
+ Technology Excellence for green technologies
+ 100 % climate neutral

MILL-TURN (FD)

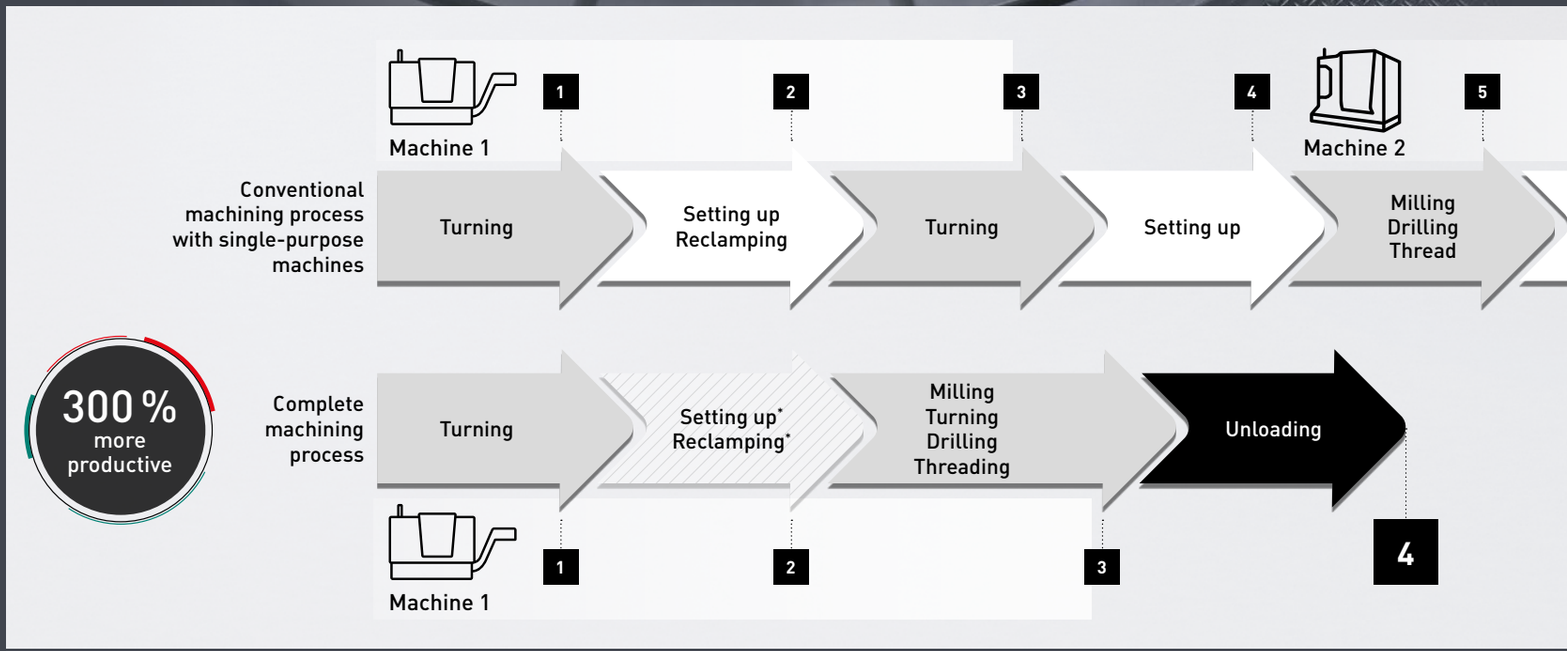
TURNING AT UP TO 1,200 rpm ON 5-AXIS MILLING MACHINES

+ **100 % MILLING:**
  speedMASTER spindles up to 20,000 rpm,
  powerMASTER spindles up to 430 Nm
  or 5X torqueMASTER up to 1,800 Nm
+ **100 % TURNING:**
  FD drives with Direct Drive technology up to 1,200 rpm
  and workpieces up to ø 5,000 mm and 35,000 kg
+ **Exclusive software & technology cycles,**
  e. g. grooving, undercutting, chip breaking, threading
  and imbalance detection, control and monitoring
+ **In-process measuring:**
  Storage, output and transfer of measurement data
+ **Automation:**
  Availability of all 5-axis automation solutions
  for the mill-turn machines

AVAILABLE FOR:

+ NMV
+ DMU eVo
+ monoBLOCK
+ H-monoBLOCK
+ DMF
+ duoBLOCK
+ Portal

MILL-TURN (FD) AND TURN-MILL – UP TO 300 % MORE PRODUCTIVITY



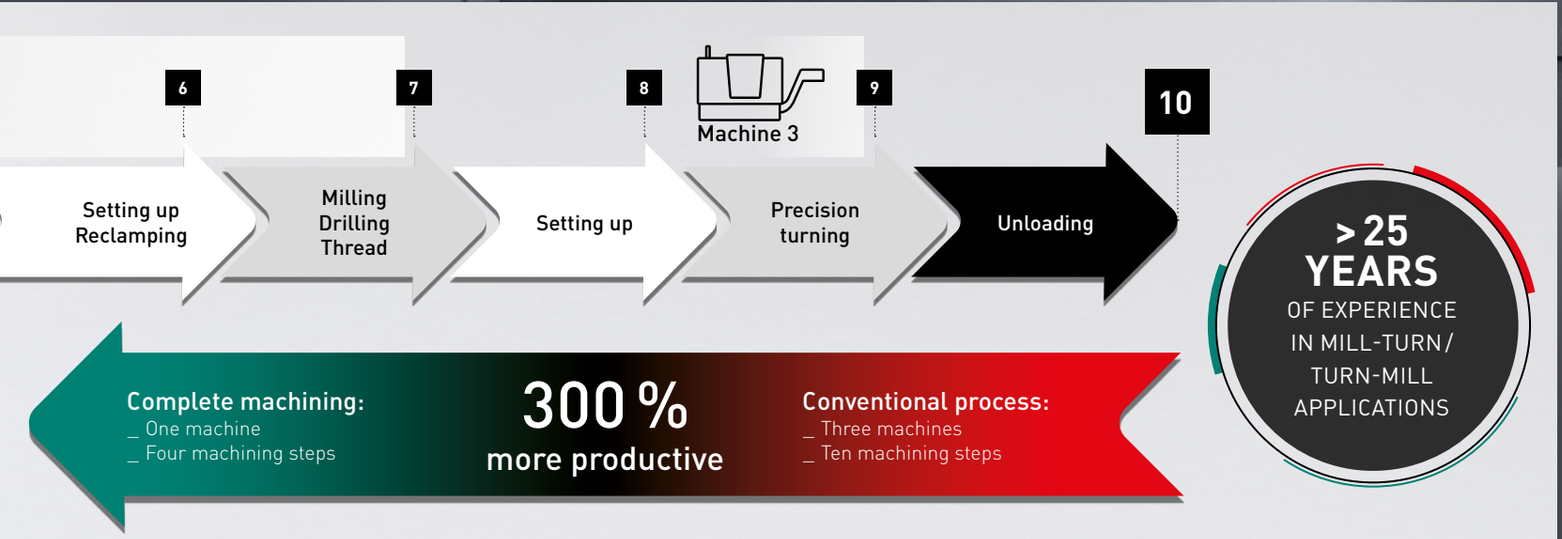
TURN-MILL

6-SIDED COMPLETE MACHINING INCL. TURNING AND 5-AXIS MILLING

+ **100 % TURNING:**
  Up to ø 1,070 mm turning diameter for machining large workpieces up to 6,000 mm in length
+ **100 % MILLING:**
  Up to 660 mm in the Y-axis and an ultra-compact and patented compactMASTER turn-mill spindle up to 20,000 rpm or 220 Nm (NT: turning-milling spindle up to 12,000 rpm or 302 Nm)
+ **100 % TOOLS:**
  Up to 180 tools for maximum flexibility in machining and short set-up times
+ **Exclusive software & technology cycles,**
  e. g. 5-axis simultaneous machining for milling free-form surfaces, grooving, undercutting, chip breaking, threading etc.
+ **In-process measuring:**
  Multidirectional workpiece measurement as well as tool measurement and drill breakage control

AVAILABLE FOR:

+ CLX TC
+ NTX
+ CTX beta TC (4A)
+ CTX gamma TC
+ NT



Complete machining:
_ One machine
_ Four machining steps

300 %
more productive

Conventional process:
_ Three machines
_ Ten machining steps

> 25 YEARS
OF EXPERIENCE IN MILL-TURN / TURN-MILL APPLICATIONS

*not required with turning & milling machines

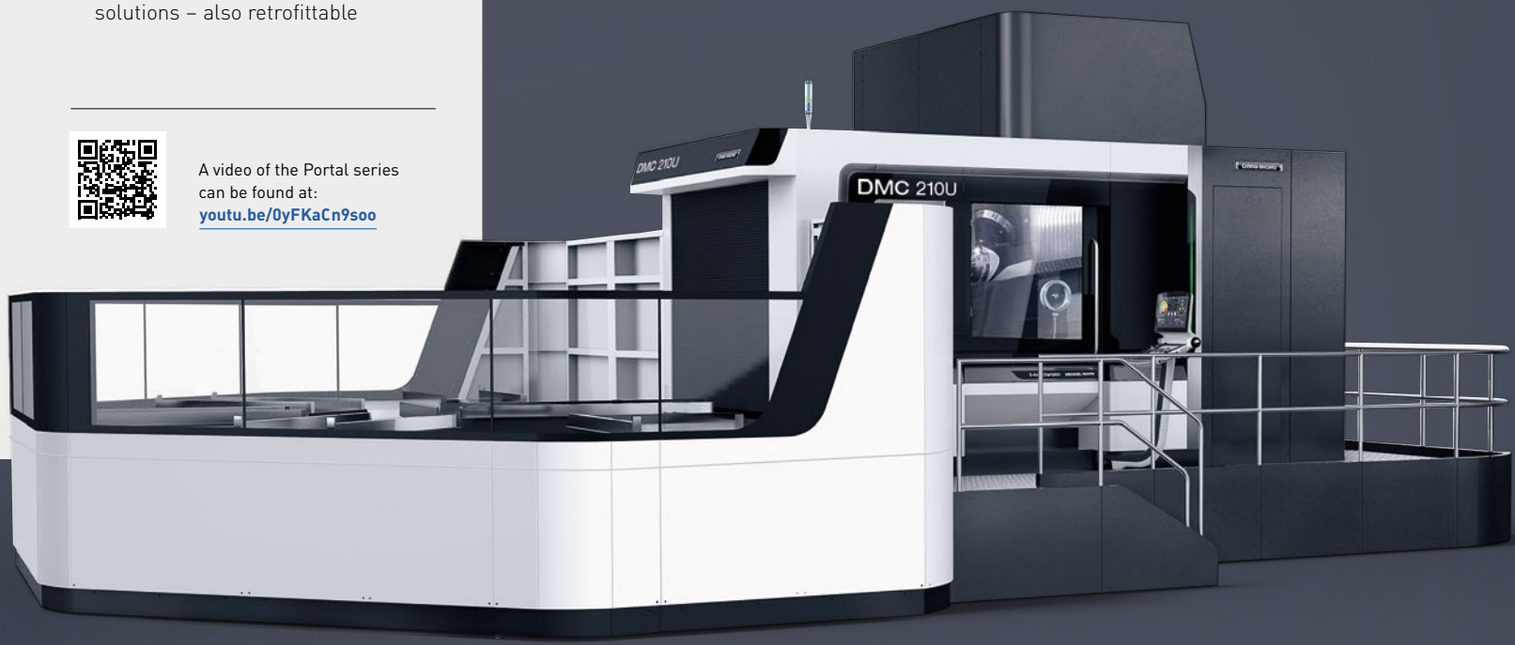
DMC 210 FD

5-AXIS MILLING AND TURNING IN A SINGLE SET-UP

+ Workpieces up to ø2,500 × 1,460 mm and 4,000 kg
+ Turning at up to 250 rpm
+ Integrated grinding possible
+ powerMASTER spindles up to 12,000 rpm and 430 Nm or 5X torqueMASTER spindles with up to 1,800 Nm
+ High rigidity for maximum cutting capacity
+ Comprehensive cooling for high, long-term precision
+ Wide range of automation solutions – also retrofittable

A video of the Portal series can be found at:
youtu.be/0yFKaCn9soo

CLOSE TECHNOLOGY PARTNERSHIP FOR **CONTINUOUS GROWTH**



Keller Technology Corporation's (KTC) long history began in 1918 in Buffalo, New York, with the manufacture of polishing machines and the offer of manufacturing services. Now, managed by the 5th generation, the company has continued to expand into new industries, as well as establishing locations in Charlotte, North Carolina and South Korea. Approximately 200 employees are responsible for manufacturing complex precision components and turnkey technology solutions for customers in demanding sectors such as medical and semiconductor. KTC has been partnering with DMG MORI since 2001. Six 5-axis simultaneous machining centers have already been installed, including three DMC models with automated pallet systems and a DMC 210 FD providing both milling and turning capabilities.

Countering competitive pressure with process integration

From development to production to assembly – in a clean room if required – KTC is a competent partner for customers in the most demanding industries. "Our offerings range from machining a single precision component, such as a vacuum chamber, to building integrated manufacturing solutions for virtually any industry," says Mark Keller, Vice President Operations, summarizing the range of services. Intense competitive pressure in the global marketplace requires highly efficient processes, he adds. "The most important pillars for this are our highly skilled employees coupled with innovative technologies and manufacturing processes."

Expanding into new industrial sectors thanks to 5-axis milling

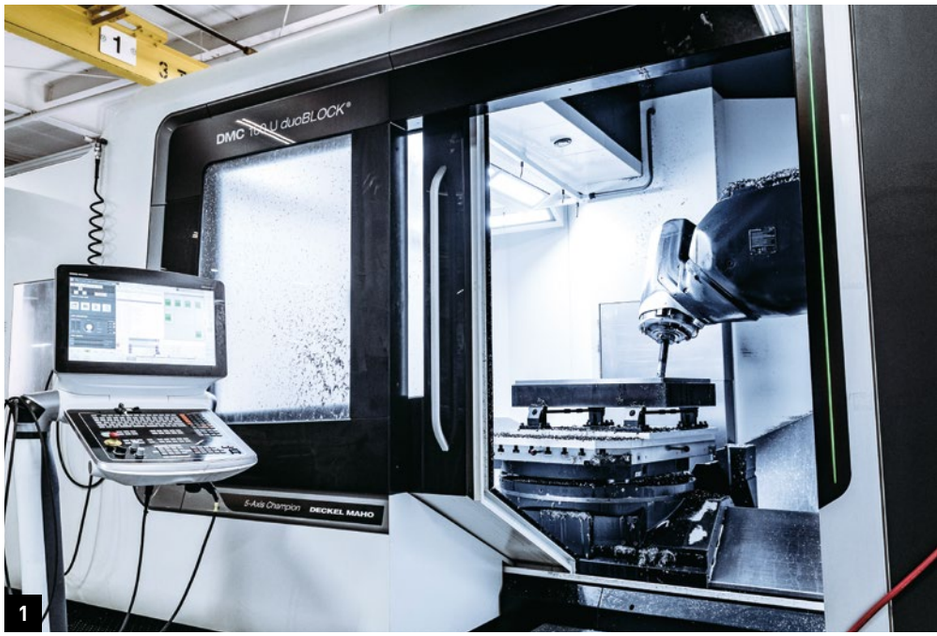
With broad manufacturing capabilities including welding and machining, KTC can respond flexibly to new orders. The first DMG MORI machine was purchased in 2001, but the partnership really started to take off during the transition to direct sales and service from our factory. As Mark Keller recalls: "Our expansion into scientific research equipment, the medical sector and continued growth in the semiconductor industry required investment in new machining technology. We were looking for a partner that would support our growth in the long term with 5-axis machine tools.

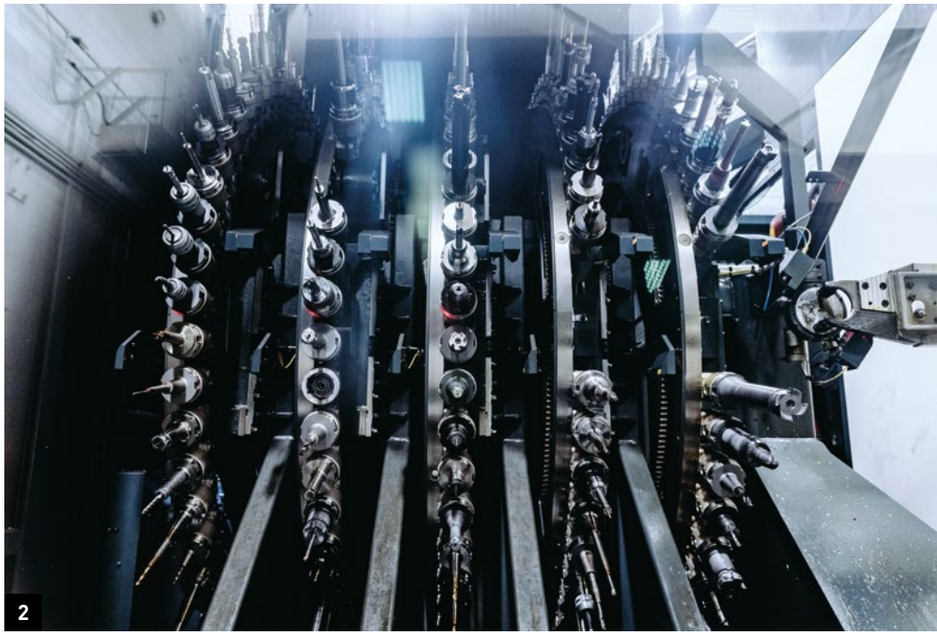
»

Keller Technology ownership group consisting of (L – R) 4th generation siblings Michael Keller and Kathie Keller, 5th generation siblings, Scott Keller, Elizabeth Keller, and Mark Keller.

In DMG MORI, we have found the perfect partner. In terms of precision, reliability, control technology, automation options, and customer support, DMG MORI has the optimal product range.

Mark Keller
Vice President Operations
Keller Technology Corporation





1. 5-Axis capability provides the ability to machine complex geometries with few set-ups and reclampings. **2.** Many complex parts require numerous tools. KTC's machines all utilize large magazines. Here a 303 tool, 5 wheel, HSK-100 magazine.

Machining our components on horizontal and vertical 3- or 4-axis machining centers would be far too time-consuming due to the necessity for multiple set-ups and reclampings. The 5-axis technology not only saves time but also reduces the opportunity for inaccuracies."

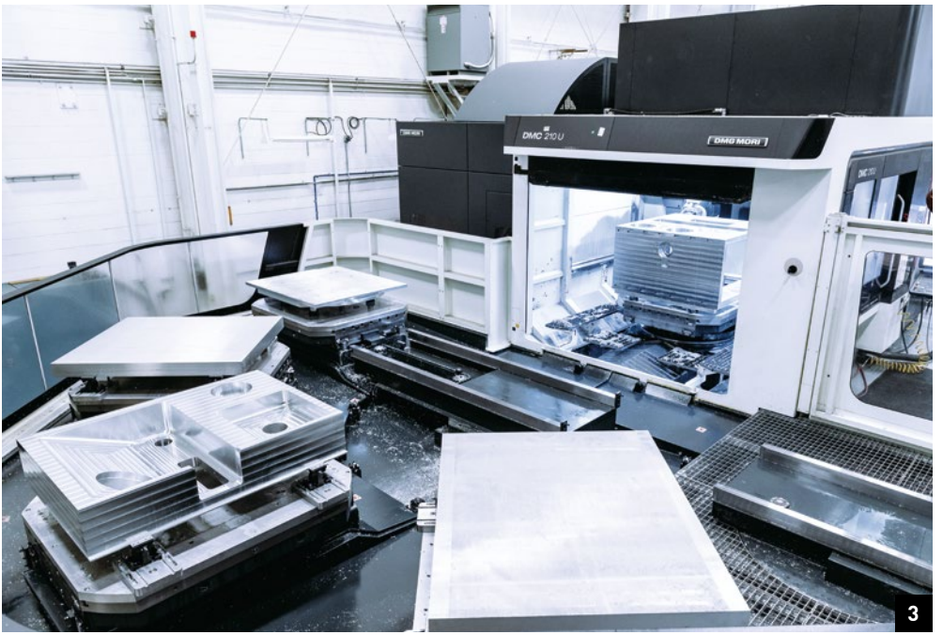
Competitive advantage through automated production

After the DMU 125 P, KTC has to date purchased two DMC 160 U duoBLOCKs, one DMC 125 U duoBLOCK, two DMC 210 Us and one DMC 210 FD system, all with pallet changers – so set-up and production can be performed simultaneously, providing maximum utilization. In addition, the two DMC 210 Us have a 5-position round pallet storage system (RPS 5) and the DMC 160 U duoBLOCK has a 6-position round pallet storage (RPS 6). Mark Keller adds: "This allows us to utilize the machines lights-out, unmanned overnight and during the weekend, so 24/7 operation is possible."

Process reliability thanks to high repeatability

Steve Ziff, Machine Shop and Programming Manager, explains why the duoBLOCK and portal series were chosen again and again for their productivity: "The large work area allows us to machine large and complex components almost completely. It has become even more economical thanks to automated production." Another aspect, he says, is the high accuracy requirements of the components. "For example, when we machine large vacuum chambers, precision is crucial." With the stable duoBLOCK and portal models, KTC

DMC 210 FD: THE NEXT LEVEL OF COMPLETE MACHINING WITH 5-AXIS MILLING AND TURNING



3

4

3. Multiple pallets and 5-axis capability allow 24/7 lights out operation.
4. DMG MORI USA Area Sales Manager, Lonny Lewis, and KTC Programming and Machine Shop Manager, Steve Ziff, showing the use of DMG MORI Messenger machine monitoring.

achieves impressive repeatability. This contributes to process reliability, especially in automated production.

The latest installation at KTC is a DMC 210 FD. After many years of experience with 5-axis simultaneous machining centers, the mill-turn center is another step toward process integration. "We are able to mill components up to ø 98.4" (2,500 mm) in diameter in 5 axes and perform turning operations on the same machine," explains Steve Ziff. Since this eliminates reclamping operations, additional precision is ensured.

85 % spindle utilization with digitization

One of KTC's major projects is digitization throughout the manufacturing process. To implement the necessary digital and connectivity platforms, the company has partnered with Tulip. "After an extensive search to identify a partner for this project, Tulip was the clear choice due to its partnership with DMG MORI and its array of applications to help interconnect our manufacturing processes – from receipt of order through to shipment to customer," explained Mark Keller. Additionally, system monitoring is carried out via DMG MORI Messenger.

In the event of a malfunction, downtime can be minimized. In total, KTC achieves a spindle utilization rate of 85 % on a 365 day 24/7 schedule.

Working together in a spirit of trust to create manufacturing solutions

A very trusting relationship has developed between KTC and DMG MORI as a result of the partnership that has grown over time. "Our local factory-direct sales representative stays close and knows our requirements very well. This assures us of the best manufacturing solutions and support," is how Mark Keller assesses the cooperation. In DMG MORI, they found a perfect partner. "In terms of precision, reliability, control technology, automation options, and customer support, DMG MORI was the ideal choice. It has positioned us well to remain competitive far into the future."

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KELLER TECHNOLOGY CORPORATION FACTS

+ Keller Technology Corporation (KTC) was founded in 1918 as the Duplex Buffing Machine Company in Buffalo NY
+ More than 200 employees for contract manufacturing of high-complexity electro-mechanical equipment, systems, and assemblies
+ Focus on complex semiconductor equipment, medical capital equipment, and hardware for science and energy research
+ Facilities in Buffalo – New York, Charlotte – North Carolina and affiliates in South Korea

KTC Keller Technology Corporation

Keller Technology Corporation
2320 Military Road
Tonawanda, 14150 New York
www.kellertechnology.com

6-SIDED TURN-MILL COMPLETE MACHINING IN MOLD MAKING

All information about the NTX at:
ntx.dmgmori.com

Part of a high precision bottle mold manufactured on one of the three NTX 1000s.

SET Mühendislik Sanayi ve Ticaret Ltd. Şti from Istanbul, with its owners Mr. Celalettin Aydemir (Senior Mechanical Engineer) and Ms. Hale Gürçay (Chemical Engineer), has been an experienced partner to the glass industry for more than 30 years, particularly for the manufacture of molds and accessories for so-called individual section (IS) machines. Well-known customers trust the quality of SET's work. Integrated 5-axis and 6-sided precision machining on three NTX 1000 Turn & Mill centers is regarded as the key to the company's success.

Comprehensive manufacturing and full service

"We manufacture every mold and each component in-house with maximum precision and full traceability in order to achieve certified fulfillment of the rigorous requirements of our international customers," reports managing director Ergun Tanaçan. In this context, he is proud of the team of employees, which exploits the potential of the innovative process chain perfectly at all times thanks to comprehensive staff training. Tanaçan then mentions the full service mentality of his company as another pillar of the business success.

Integrated process chain for glass molds

The customer only has to provide the 3D model of the end product and the technical specification of the IS system. All other aspects of the manufacturing process for hollow glass mold production are then the responsibility of SET. This includes the production of the technical drawings and NC programming with simulation, as well as the subsequent precision machining and the comprehensive quality assurance.

Three NTX 1000 machines for producing complex glass molds

The manufacturing process chain of SET currently includes around 40 CNC machines for metalcutting, coating, engraving and polishing. The core of the manufacturing operation consists of several machines from DMG MORI, including three NTX 1000 Turn & Mill precision centers for 6-sided complete machining.

SET has also recently significantly extended its repertoire in the laser texturing area with a LASERTEC 45 Shape, while the area of classic universal turning has been reinforced with an NLX 2500|700.

Turnkey project for quick commissioning

The example of the three new NTX 1000 machines, which were ordered by SET as a turnkey project, shows just how comprehensive its trust in DMG MORI as an excellent partner for machining has become. In addition to the machine, DMG MORI has also developed and implemented the entire technology solution from the machine to the tools and the programming in Japan. "The NTX 1000 machines then smoothly moved into 2 to 3 shift operation within our company within a few days, since when they have been operating problem-free", reports Ergun Tanaçan.

Continuous accuracy and reliability

As far as the managing director is concerned, this high degree of reliability is evidence of the outstanding mechanical engineering skill of the Japanese supplier. He explicitly refers to the highly rigid machine bed and the roller guideways, and also praises the thermosymmetrical headstock with integral coolant circulation. "This all but eliminates temperature-related fluctuations, which is vital for our precision requirements", says Ergun Tanaçan.

NTX 1000 – EXCEPTIONAL SURFACE FINISHES UP TO Ra 0.5 µm

Tanaçan also pays tribute to the performance of the 20,000 series compactMASTER milling spindle, whereby he is equally enthusiastic about the cutting performance as he is about the impressive surface finish. "The surface quality is the most important criterion with glass molds, because it directly influences the quality of the final products." The high-precision CNC machines from DMG MORI can reliably produce surfaces up to Ra 0.5 µm in 5-axis operation.

NTX 1000: Productive Turn & Mill Complete Machining

As well as the surface quality, the complexity of the glass molds is a challenge during machining. Ergun Tanaçan refers to the free-form surfaces: "We are reliant on 5-axis simultaneous machining to do this." The compactMASTER milling spindle turns the NTX 1000 into a versatile 6-sided complete machining center. "Production in a single clamping removes the need for manual reclampings. This avoids the potential for mistakes and throughput times are considerably shorter." The NTX 1000 therefore makes a significant contribution to increasing productivity.

Digital monitoring for maximum machine availability

SET monitors the entire machining of the glass molds in order to minimize stoppage times. "Since we know the status of every machine, we are always in a position to react quickly if there is a problem anywhere", says Ergun Tanaçan about the benefits of digital monitoring. A high degree of machine availability is essential for economical production. "The outstanding availability of the local service from DMG MORI is an important aspect in this respect,"

LASERTEC 45 Shape for laser texturing of surfaces

SET wants to continue its success story into the future with innovative manufacturing technologies. By way of an example, Ergun Tanaçan refers to the LASERTEC 45 Shape, which is representative of the pursuit of innovation and continuous improvement in added value for customers. "Laser texturing of three-dimensional free-form surfaces has opened up completely new perspectives in surface structuring", summarizes an impressed Tanaçan. "It allows us to produce any required surface within a very short time and reproducibly, without the use of etching, which is harmful to the environment and health" says Ergun Tanaçan, who gives a glimpse into the future: "We plan to automate our manufacturing with robots together with DMG MORI."

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The NTX 1000 machines make 6-sided complete machining of our molds possible – with surface finishes of up to 0.5 µm.

Ergun Tanaçan
Managing director of
SET Mühendislik Sanayi ve Ticaret Ltd. Şti

SET MÜHENDISLIK SANAYI VE TICARET LTD. ŞTI FACTS

+ Established in 1991 in Istanbul
+ SET designs and manufactures molds and accessories for the glass industry
+ Availability of a complete product range for IS
+ More than 100 employees and 40 CNC machines covering more than 8,000 m² in two modern production facilities

SET Mühendislik Sanayi ve Ticaret Ltd. Şti.

SET Mühendislik Sanayi ve Ticaret Ltd. Şti
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Cad. No: 27
34956, İstanbul/Turkey
www.seteng.com

5-IN-1: TURNING, MILLING, GRINDING

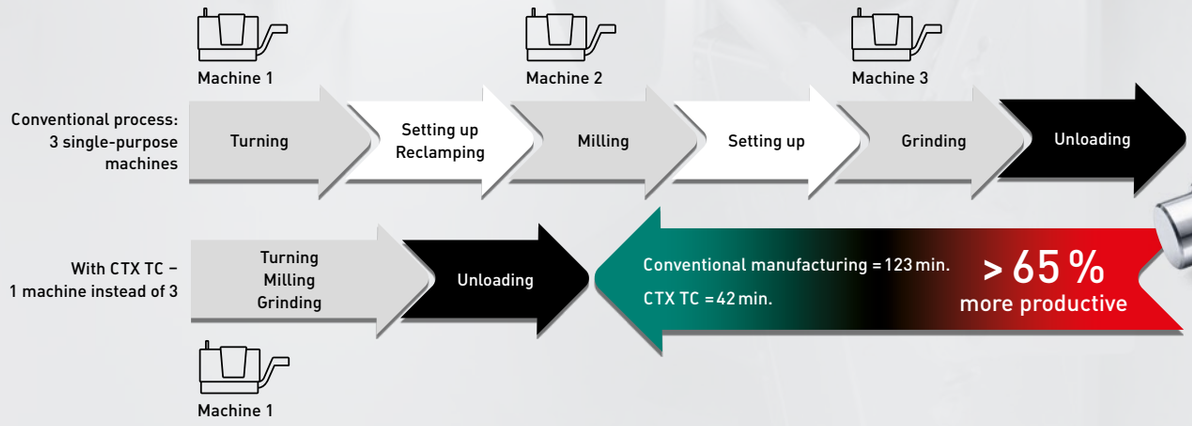
COMPLEX MACHINING – SIMPLE, PRECISE AND QUICKLY REALIZED

+ Turning, milling, grinding and measuring in one set-up
+ Process reliability and cost-effectiveness due to elimination of special machines and reduced grinding allowance
+ Grinding cycles for internal, external & surface grinding, polygon & oval grinding, as well as dressing cycles
+ Easy dressing and optimized start-up with the help of structure-borne sound sensors mounted on the machine structure
+ High surface quality through integration of grinding technology
+ Intuitive and 60 % faster programming thanks to menu guidance – DMG MORI technology cycles

A video about turning, milling and grinding:
youtu.be/WxF-grFCyR0

Ra up to 0.1 µm
Rz up to 0.8 µm
Roundness < 5 µm
IT5 for ø > 30 mm

65 % LESS THROUGHPUT TIME



WORM SHAFT
Dimensions: ø 175 × 380 mm
Material: 16MnCr5

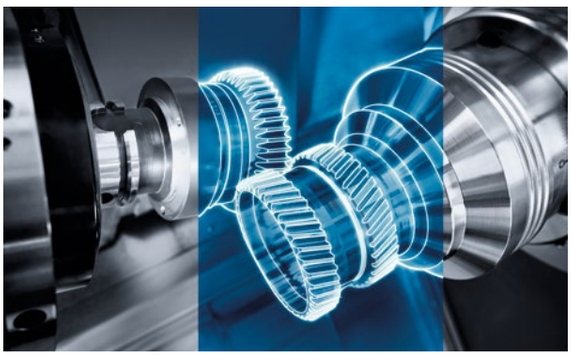
Carrying out grinding in the same clamping maximizes precision and provides the best finish quality with optimal cost-effectiveness.

+ GEAR CUTTING + MEASURING

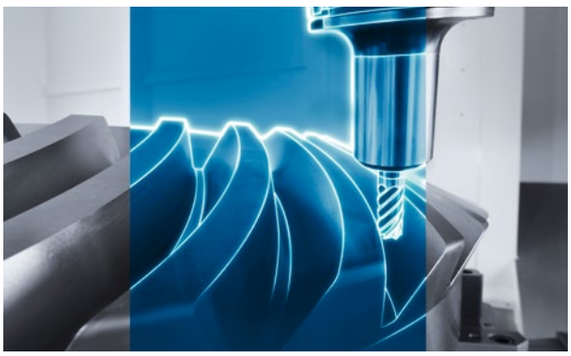
EXTERNAL & INTERNAL GEAR UP TO ø 3,200 mm AND GEAR QUALITY > 5

+ **Maximum flexibility**
  Demand-driven utilization of machines for gear cutting in addition to milling and/or turning
+ **Fast**
  Through menu-guided input of the gear parameters
+ **Simple**
  Automatic calculation of the NC program based on the gear parameters
+ **Retrofittable**
  Pure software solution – integration in new and existing machines
+ **DMQP**
  Always the optimal tools from our cooperation partners

A video on gear cutting on 5-axis milling, mill-turn and turn-mill machines:
youtu.be/fPTL1hlMZkQ



gearSKIVING – up to 8 times faster than gear shaping



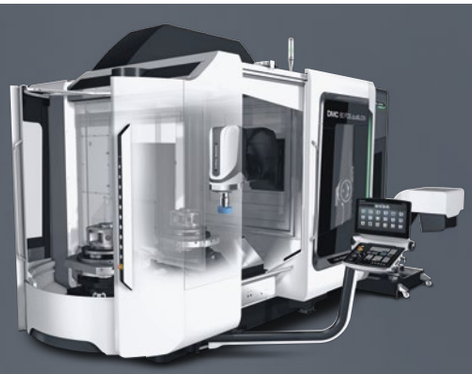
gearMILL – Gear cutting on standard machines with standard tools ≥ MODULE 3

CTX TC – GRINDING TECHNOLOGY ON TURNING-MILLING MACHINES

+ Grinding cycles for internal, external and surface grinding, dressing cycles, as well as structure-borne noise sensor technology for wheel approach and dressing
+ Off-center as well as polygon & oval grinding
+ Fully integrated measuring device for relative and absolute LIVE measurement during grinding, measurement repeatability up to 0.8 µm

AVAILABLE FOR

CTX beta TC, CTX beta TC 4A, CTX gamma TC

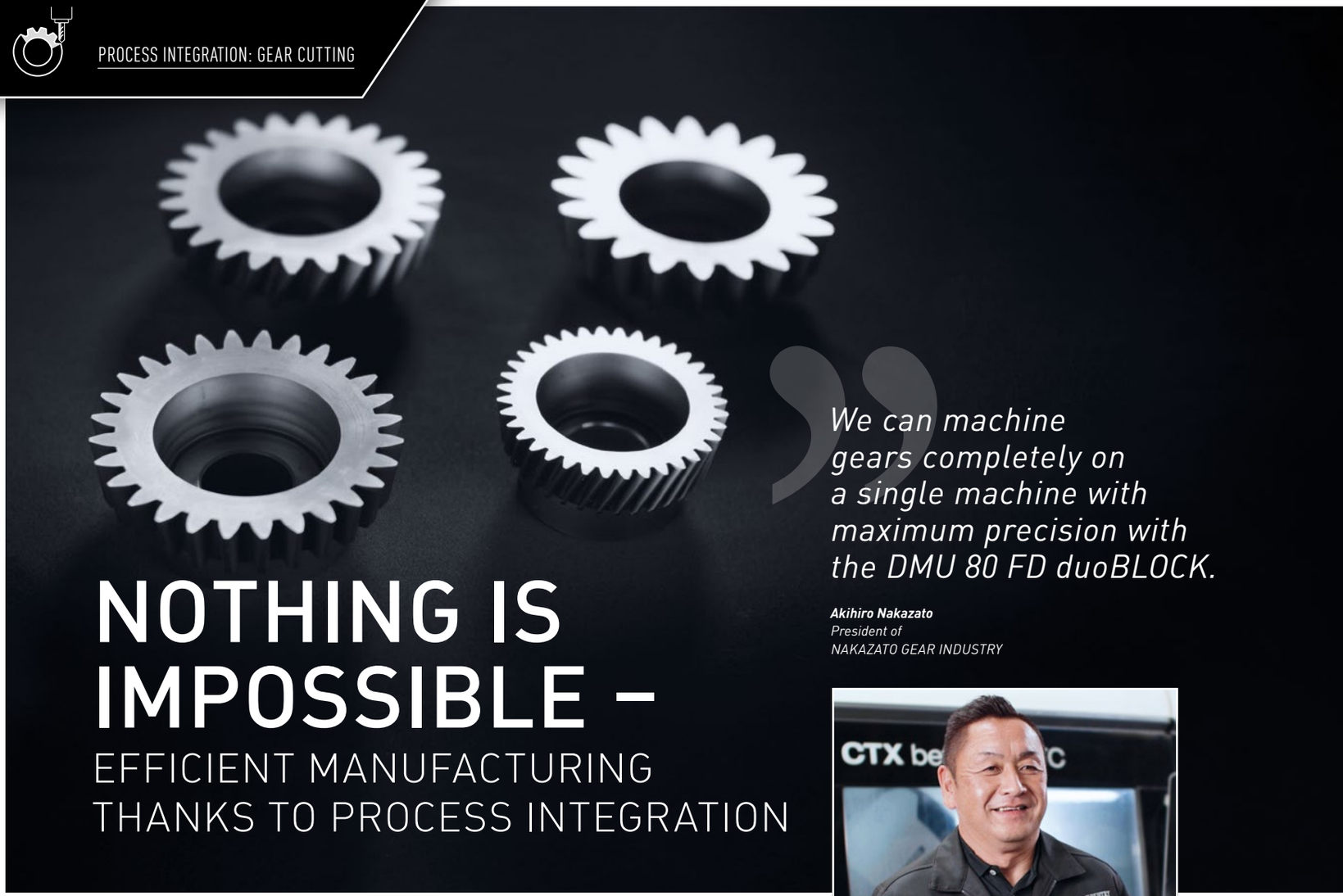


DMU/DMC FD – GRINDING TECHNOLOGY ON MILL-TURN MACHINES

+ Grinding cycles for internal, external and surface grinding, as well as surface grinding of long components
+ Dressing cycles, as well as structure-borne noise sensors for wheel approach and dressing
+ Internal coolant system nozzle unit optionally available for best possible flushing of the grinding gap

AVAILABLE FOR

DMU/DMC monoBLOCK, DMU/DMC duoBLOCK, DMU/DMC Portal



NOTHING IS IMPOSSIBLE –

EFFICIENT MANUFACTURING THANKS TO PROCESS INTEGRATION

We can machine gears completely on a single machine with maximum precision with the DMU 80 FD duoBLOCK.

Akihiro Nakazato
President of
NAKAZATO GEAR INDUSTRY

NAKAZATO GEAR INDUSTRY is a Japanese manufacturer established in 1969, with headquarters in Kawaguchi City (Saitama prefecture). The company's wide range of technical knowledge ranges from prototype manufacturing to mass production of special gears and complex components for rail, aerospace, semi-conductor and industrial machinery sectors. The portfolio of NAKAZATO GEAR INDUSTRY also includes the manufacture of gears for electric vehicles and drive gears for high-speed trains. The company's strength lies in high-precision machining in short lead times. A high production standard is made possible by machining technology that has been optimized over many years and state-of-the-art machine capacity.

Innovative gear cutting technologies

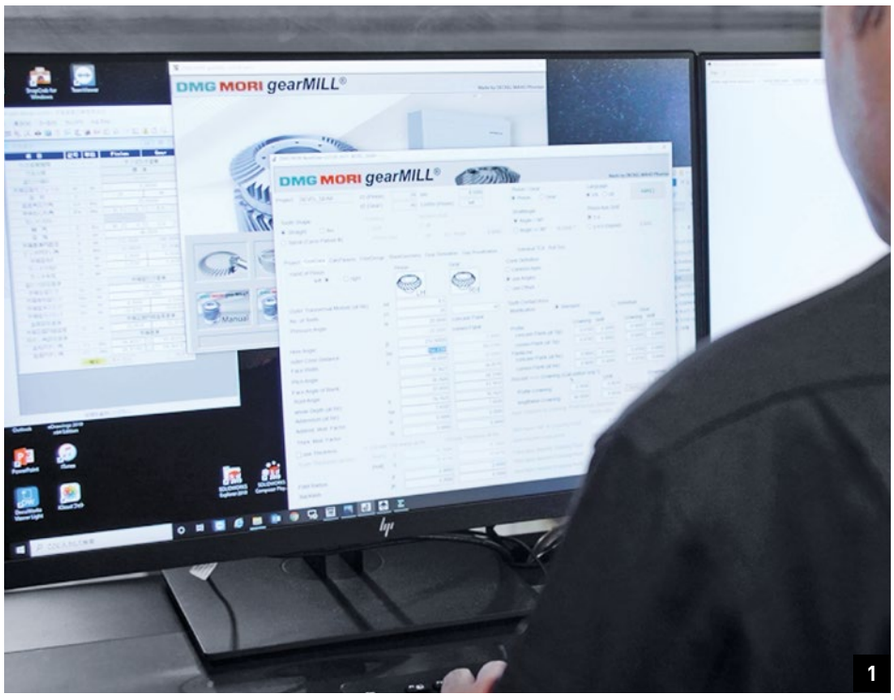
NAKAZATO GEAR INDUSTRY carries out pioneering work in the research of gear skiving, a highly productive method that is superior to conventional gear cutting. In 2013 and 2015, NAKAZATO GEAR INDUSTRY received an award for its innovative research from the Japanese Ministry for Business, Trade and Industry, and was included in the "Monozukuri" research program for small and medium-sized companies. The company continues to research and develop innovative technologies for gear production in collaboration with universities and has become a trustworthy business partner to many customers.

Economical gear production on DMG MORI 5-axis Mill & Turn center

Previously, NAKAZATO GEAR INDUSTRY used a combination of turning centers, machining centers and special gear cutting machines to manufacture gears. The machining processes were distributed over several platforms, so frequent set-ups and special tools were required for each type of gear. NAKAZATO GEAR INDUSTRY invested in a DMU 80 FD duoBLOCK with the goal of increasing productivity. The 5-axis Mill & Turn center from DMG MORI also has the exclusive DMG MORI gearMILL technology cycle.

Process integration for complete machining on a single platform

With the aid of this technology, NAKAZATO GEAR INDUSTRY uses advanced machining methods without the need for special gear cutting machinery. "The introduction of the 5-axis Mill & Turn center from DMG MORI allows us to integrate all processes in one machine and realize more productive manufacturing processes", says company president Akihiro Nakazato. The SIEMENS controller provides a high degree of synchronization accuracy. "This allows us to machine gears to an accuracy which was previously unthinkable." Since a single 5-axis Mill & Turn center can machine an entire workpiece, there are no repeated set-ups and machining times are reduced considerably.



1.+2. The gearMILL technology cycle makes gear machining with universal tools possible.

3. The DMU 80 FD duoBLOCK 5-axis Turn & Mill machine can replace several turning centers, milling centers and gear cutting machines.

EFFICIENT GEAR MANUFACTURING WITH DMG MORI TECHNOLOGY CYCLES

DMG MORI technology cycles for efficient gear manufacturing on 5-axis Mill & Turn and Turn & Mill machines

The use of the DMG MORI gearMILL technology cycle has proven to be extremely beneficial for NAKAZATO GEAR INDUSTRY, says Akihiro Nakazato: "It allows us to use universal tools such as milling cutters including end mills for gear machining. We can keep our tool costs down and deliver products faster without the use of special tools." A DMG MORI technology cycle is also used on the DMG MORI CTX beta 1250 TC Turn & Mill center. "gearSKIVING provides quick and easy programming by conversational control." The possibility of using universal tools for gear cutting has also given NAKAZATO GEAR INDUSTRY the flexibility to fulfill other machining requirements. The technology cycles for gear machining can easily be programmed by entering the component parameters.

Nothing is impossible

The versatile machine tools from DMG MORI and the gearMILL and gearSKIVING technology cycles provide a high degree of productivity and accuracy in the manufacturing of gears. These results led to NAKAZATO GEAR INDUSTRY installing another Turn & Mill center from DMG MORI in 2021 in the form of an NTX 2000 2nd generation. The manufacturer constantly develops technological innovations – such as a new approach for skiving worm gears. Akihiro Nakazato talks about his visions for the future: "We never say that something is impossible in our company. We are always determined to find a way." NAKAZATO GEAR INDUSTRY will also endeavor to achieve further growth in the future and develop new technologies in order to make a contribution to society. "We will continue to deliver high-quality products quickly in order to keep our customers satisfied."

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NAKAZATO GEAR INDUSTRY FACTS

+ Established in 1969 as a gear manufacturer
+ From prototype to series manufacture of special gears and complex molded parts for railway vehicles, aircraft, semiconductor equipment and industrial machinery
+ Pioneer in gear skiving research; uses newly developed machining methods in its own production

NAKAZATO GEAR INDUSTRY
Minamihatogaya 3 – 23 – 13
Kawaguchi City
Saitama 334 – 0013, Japan
www.nakazatohaguruma.com

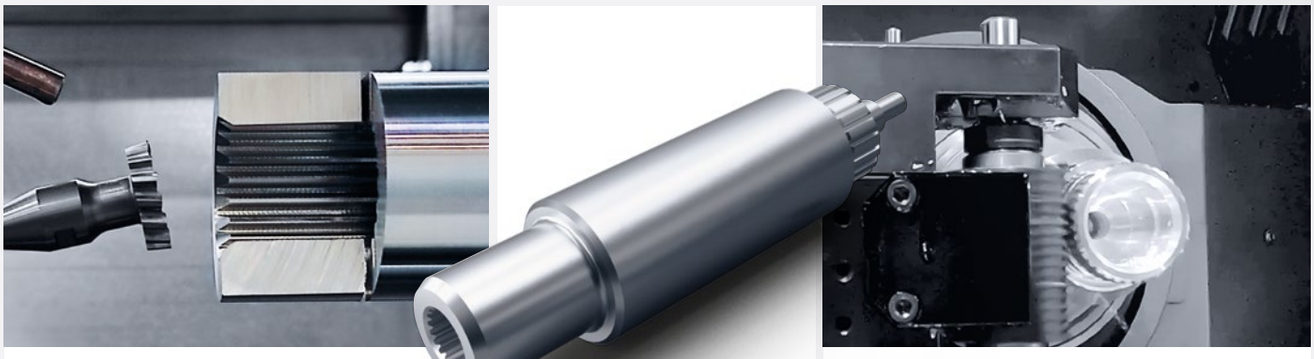
NZ – DUE, TRE & QUATTRO

HIGHLY PRODUCTIVE MACHINING OF COMPLEX PARTS

+ **Bar capacity up to ø 72 mm,** chuck parts up to ø 250 mm
+ **2 machine bed sizes**
  – **Short Version** for workpieces up to 740 mm
  – **Long Version** for workpieces up to 1,290 mm
+ **Up to 4 positions for turrets**
  – **80 mm Y-Axis** at every position
  – **–10° +100° B-axis** in all 4 positions possible
+ **TWIN spindle** on the Z-axis with ø 65 mm capacity
  – **Steady Rest** – hydraulic
  – **Swisstype** function with guide bush up to 5,000 rpm
  – **Turning** function with up to 4,000 rpm and 60 Nm (100 % DC)
+ **Automation** – Customized automation solutions, e. g. bar loader, integrated pick-up unit or robot
+ **19" DMG MORI SLIM*line* touch screen control panel** with FANUC 30iB (400 V version)

< 17.8 m² FOOTPRINT INCLUDING 4 m BAR LOADER

GEAR CUTTING



gearSKIVING

+ Gears up to MODULE ⩽ 1.5
+ Short processing times, up to 8 × faster than shaping
+ Straight and helical external or internal spur gears and splines
+ Quality IT 7 possible

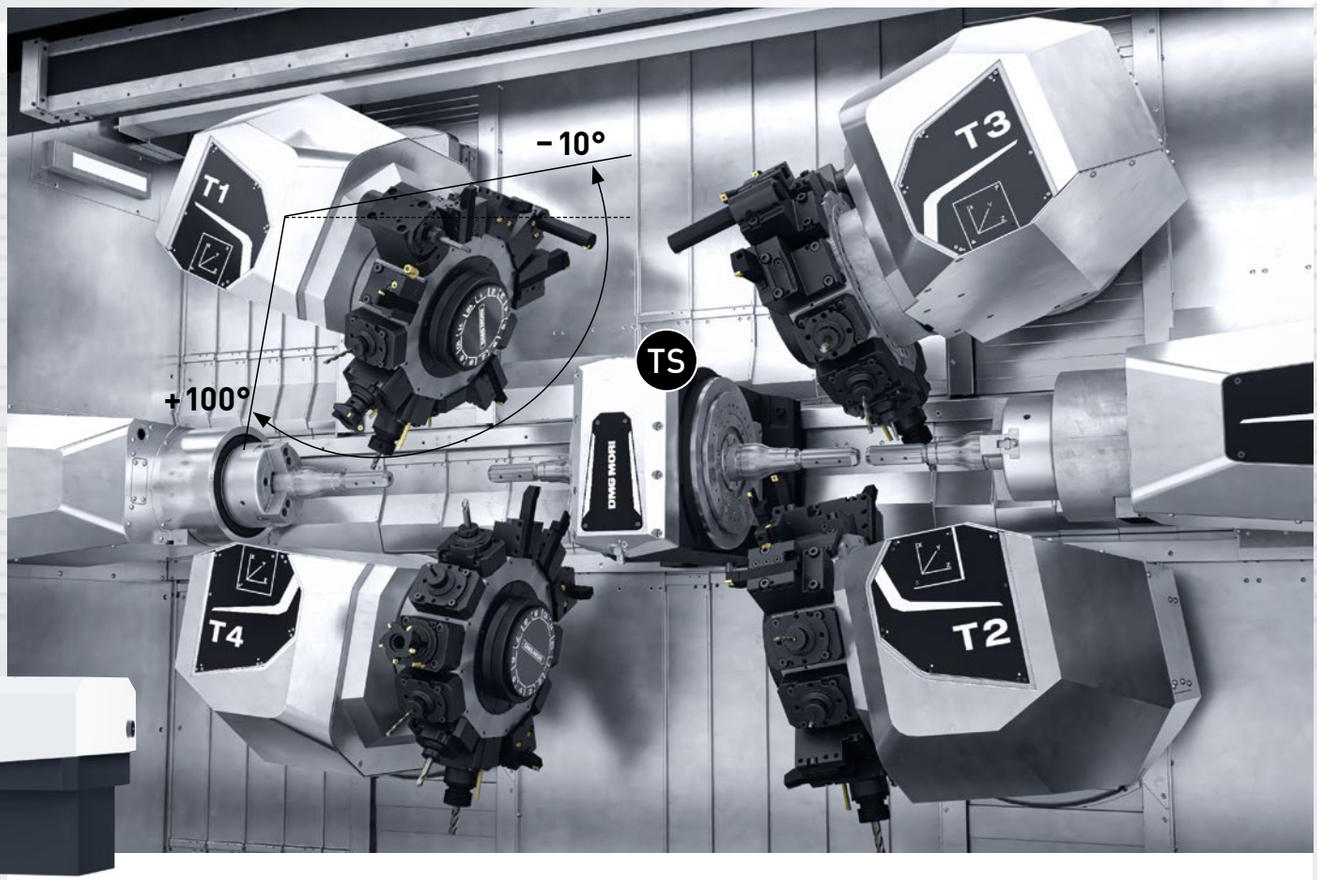
E-Mobility

ROTOR SHAFT

Dimensions: ø 60 × 350 mm
Material: Steel (1.0601)
Processing time: 100 sec.

gearHOBBING

+ Gears up to MODULE ⩽ 2.5
+ For spur gears, helical gears and worm gears
+ Tool life maximized by offsetting the cutter
+ Quality IT 7 possible



B-AXIS

+ **In all 4 positions possible**
+ **–10° / +100° swivel range**

>> Standard tools instead of special angle cutters

>> 5-axis simultaneous operation possible

TWIN-SPINDLE TS

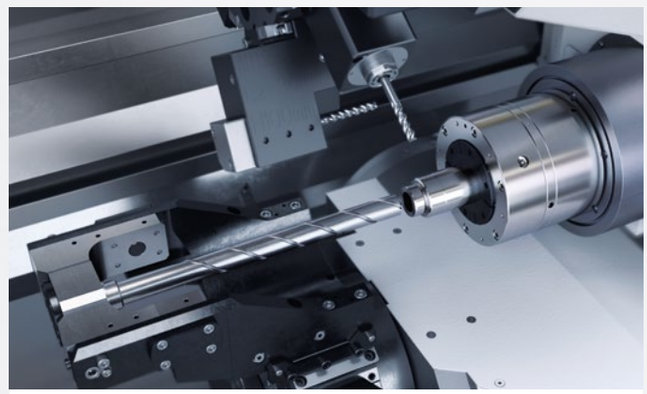
+ **Two independent work areas for 6-sided complete machining**
  - **Turning** function with up to 4,000 rpm and 60 Nm (100 % DC)
  - **SWISSTYPE** function with guide bush up to 5,000 rpm
  - **Steady rest**

5-AXIS SIMULTANEOUS MACHINING WITH 2 B-AXES

Medical

BONE PLATE

Dimensions: 18 × 54 × 4 mm
Material: Stainless Steel (1.4401)
Processing time: 720 sec.



DEEP HOLE DRILLING UP TO 450 mm

+ 450 mm maximum length
+ ø1 to 50 mm diameter
+ 150 bar maximum coolant supply

DED hybrid

MILLING, TURNING AND ADDITIVE MANUFACTURING ON 5-AXIS MILLING AND TURN-MILL MACHINES

HIGHLIGHTS

+ Automatic exchange of the laser head via shuttle; CNC-controlled without manual intervention
+ 5-axis material deposition with up to 1 kg build-up rate per hour (depending on material)
+ Fiber-guided IR diode laser with 3,000 W power as standard (optional with blue wavelength – 450 nm and 2,000 W power)
+ AM Assistant for high process reliability and holistic traceability, powder feed rate sensor and automatic powder calibration
+ Integrated thermal imaging camera for monitoring the entire working area
+ Adaptive process control and constant monitoring of the working distance
+ SIEMENS NX: Hybrid CAD / CAM-module for additive and subtractive programming

NEW
BLUE LASER FOR HIGHLY REFLECTIVE MATERIALS, E. G. COPPER

NTX / NT & *DED hybrid*

TURNING, MILLING AND ADDITIVE MANUFACTURING ON 5-AXIS TURN-MILL MACHINES

+ LASERTEC 3000 *DED hybrid* – workpieces up to ø 670 × 1,519 mm
+ LASERTEC 6600 *DED hybrid* – workpieces up to ø 1,010 × 3,702 mm
+ Tool magazine for up to 3 different AM laser nozzles
+ 6-sided complete machining of components at main and counter spindles with subsequent welding of the assembled parts

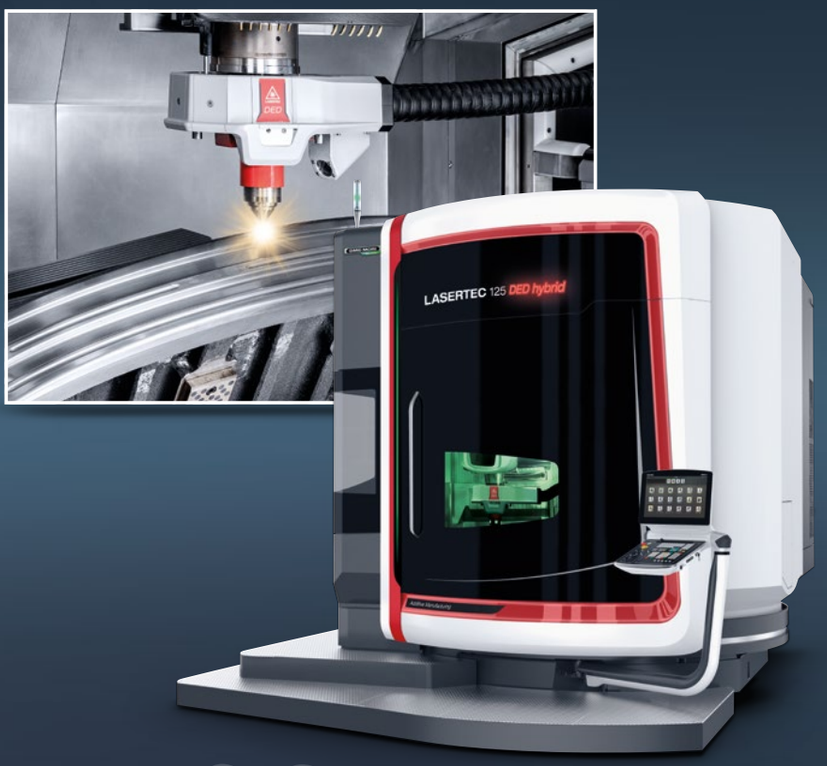
Video of the LASERTEC 3000 *DED hybrid*:
youtu.be/pVscq6cFu4I

monoBLOCK & *DED hybrid*

MILLING AND ADDITIVE MANUFACTURING ON 5-AXIS UNIVERSAL MILLING MACHINES

+ LASERTEC 65 *DED hybrid* – workpieces up to ø 500 × 400 mm / 600 kg
+ LASERTEC 125 *DED hybrid* – workpieces up to ø 1,250 × 745 mm / 2,000 kg
+ Milling: speedMASTER spindles up to 20,000 rpm and 130 Nm
+ Mill-turn (FD) option for the LASERTEC 65 *DED hybrid* hybrid for integrated turning up to 1,200 rpm

Video of the LASERTEC 125 *DED hybrid*:
youtu.be/ruTo9hIYQGw

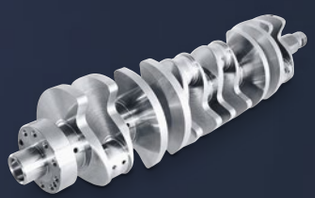


Rocket nozzle
AEROSPACE
Material: CuNiSiCr + Inconel 625
Dimensions: ø 300 × 250 mm

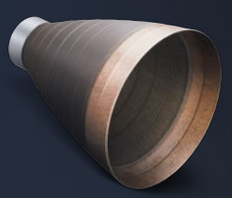
Twin-channel heat exchanger
ENERGY
Material: CuAL10 / 316L
Dimensions: ø 200 × 250 mm

Our worn dies are traditionally repaired via tungsten inert gas (TIG) welding and only last an average of 20.8 % of the number of cycles of the original die before another repair is needed. Dies repaired now by LASERTEC 65 DED hybrid result in the same life as the original die.

Mark Brown
Die Maintenance and Die Making Manager
TOYOTA



Crankshaft
BOATS & SHIPS
Material: cobalt alloy
Dimensions: ø 600 × 3,200 mm



Rocket Propulsion
AEROSPACE
Material: SUS316L
Dimensions: ø 450 × 470 mm

GLOBAL LEADER IN AUTOMATION: 13 PRODUCT LINES AND 57 PRODUCTS

SET-UP TIME

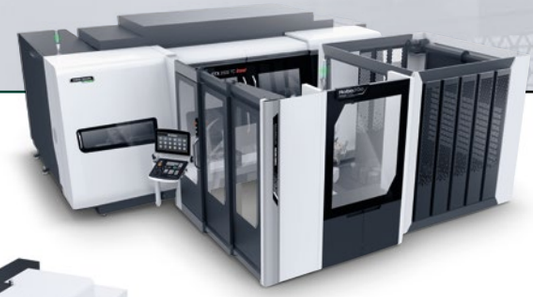
WORKPIECE HANDLING

PALLET HANDLING

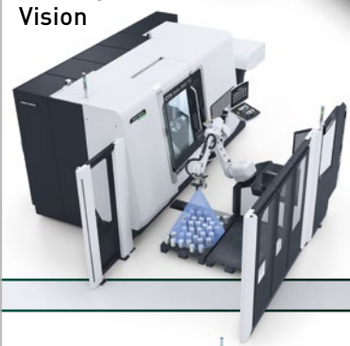
TURNING

IMTR (NTX 1000)

SR (WASINO)



Robo2Go Turning / Vision



Robo2Go Max

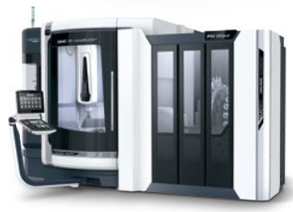
MILLING

WH Cell [1]

Robo2Go Milling

MATRIS Light

AWC (NMV / CMX V)



PH Wheel [3]

RPS [2]

PH Cell 2000 / PH Cell 300

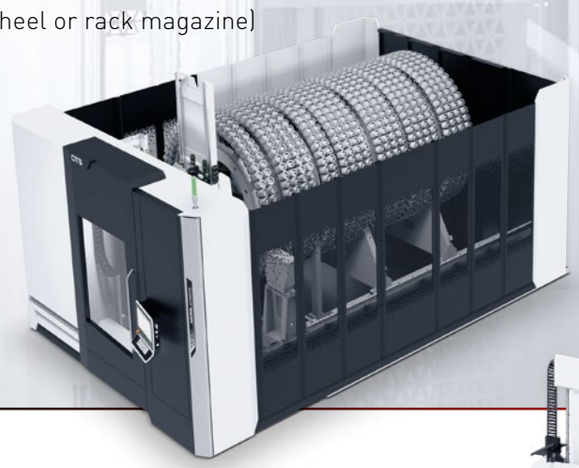
PH 150

PH 50

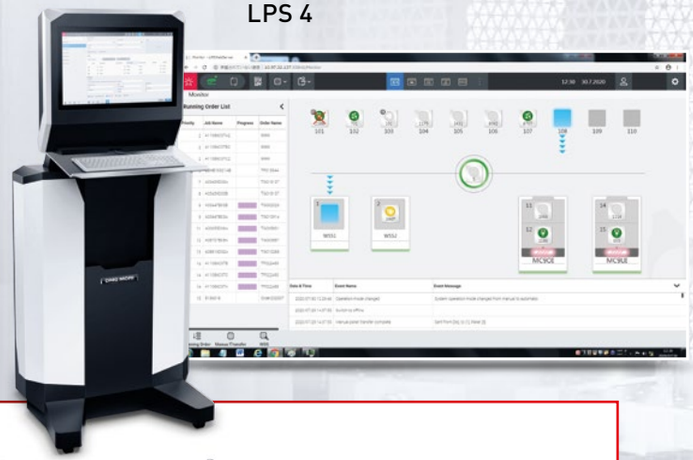
MACHINE-SPECIFIC

UNIVERSAL (1 MACHINE)

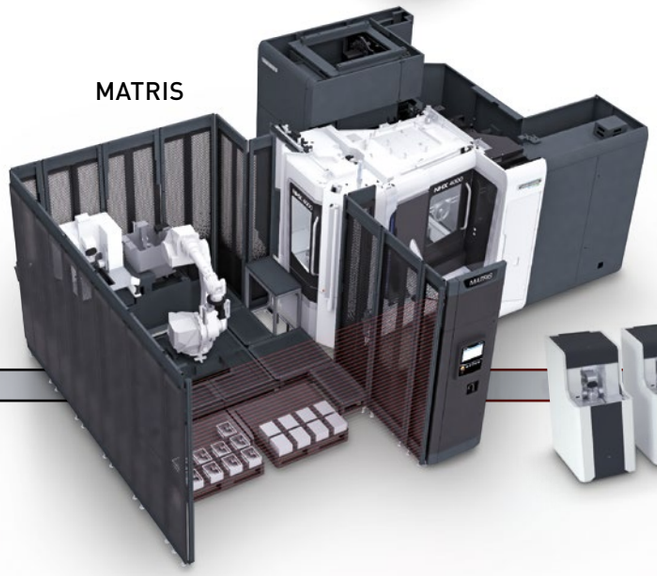
CTS – CENTRAL TOOL STORAGE
(design as wheel or rack magazine)



DMG MORI
CELL CONTROLLER
LPS 4



MATRIS



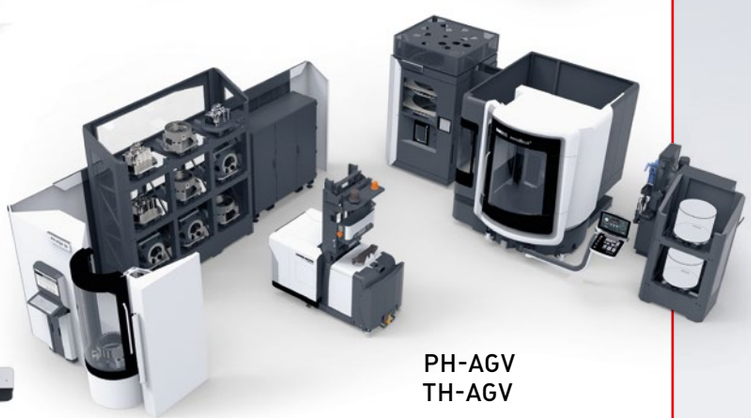
GX / GX T

WH-AMR

LPP

PH Cell Twin

CPP



PH-AGV
TH-AGV

SCALABLE (≥ 1 MACHINE)

COMPLEXITY

[1] DMP, CMX V, CMX U, DMU, DMU eVo, LASERTEC
[2] NHX, DMC H *linear*, H-monoBLOCK, monoBLOCK, duoBLOCK, Portal
[3] DMC 65 monoBLOCK

The "muraco" brand was created by Japanese manufacturer SHINWA CO., Ltd. It specializes in sophisticated outdoor products such as the "SATELLITE FIRE BASE".

MORE PRODUCTIVITY

BY MEANS OF 5-AXIS MACHINING AND AUTOMATION OF ITS MACHINES

SHINWA CO., Ltd. was established in 1974 as a machining company and has its headquarters in Sayama City, in the Saitama prefecture. With its many years of experience in machining, SHINWA now manufactures not only metal components for machine tools, but also products for its own "muraco" brand. The innovative and sophisticated design of the fledgling outdoor brand is very popular. The product range already consists of 200 products. SHINWA places considerable value on quality. The accuracy is within the range of tens of microns in the manufacturing of high-precision machine tool components. The same claim applies to the globally recognized "muraco" products. They stand for a long service life and ease of use.

Lower set-up costs and shorter throughput times by means of 5-axis machining

Due to its high-variety, small series production of machine tool components, SHINWA was faced with the challenge of reducing time-consuming set-up times. At the same time, mass production for the "muraco" product range required an efficiency increase on the shop floor. In order to minimize the set-up cost during the production of small series, in 2020 SHINWA purchased a 5-axis DMU 50 3rd generation center from DMG MORI for productive precision machining. In this way, the company succeeded in integrating the machining processes for complex parts in a single work area and reduced throughput times considerably. More demanding machining was also made possible by using 5-axis technology.

INCREASED MACHINE UTILIZATION BY RETROFITTING MATRIS LIGHT TO EXISTING MACHINES

»

1

2

1. NLX 1500 turning center and MATRIS Light from DMG MORI are used to machine the components of the SATELLITE FIRE BASE. **2.** The MATRIS Light looks after automatic workpiece handling overnight. This makes unmanned night shifts and more productive machining possible.

There are many ways of increasing the efficiency of machine operation. We have found the best solution for us with MATRIS Light. It has allowed us to minimize set-up and other machine stoppage times and extend production in unmanned night shifts.

Takuya Murakami
President of
SHINWA CO., Ltd.

MATRIS LIGHT

HIGHLY FLEXIBLE & COLLABORATIVE AUTOMATION FOR WORKPIECES UP TO 12 kg

+ **Freely movable workpiece handling, incl. robot and storage area on a trolley**
  – Workpieces up to 12 kg or 5 × 2 kg with double gripper
  – No infrastructure changes
  – No safety fence necessary
  – 600 × 900 mm footprint
+ **Collaborative robots, set-up time < 5 minutes***
  – Direct teaching without robot knowledge
  – Easy connection via Ethernet
+ **Expansion** (option)
  – Storage for up to 64 workpieces (2-position storage for max. 36 as standard)
  – Blow-off device
  – Measuring system and quality check
  – etc.
+ **Available for 21 machines**
  – **TURNING:** NLX 1500, 2000, 2500 / ALX 1500, 2000, 2500 / NTX 500, 1000, 2000, 2500 / NZX 1500, 2000, 2500
  – **MILLING:** CMX 600, 800, 1100 V/i 30 V/ NHX 4000 / CMX 50 U / DMU 50 / DMU 40 eVo

Regarding other machines, send an inquiry to our sales representative.

*When the optional tag position correction function is selected or when the machine / workpiece set-up is already concluded

DMU 50

BESTSELLER!
> 10,000
DMU 50 INSTALLED WORLDWIDE

+ **Swiveling Rotary Table for 5-Axis Simultaneous Machining**
  - Table load up to 300 kg
  - Swivel of the B-axis −35°/+110° for excellent flexibility
  - Cooled table bearings for maximum precision
+ **5-Axis Machining with up to 20,000 rpm**
  - speedMASTER 15,000 rpm with 21 kW and 111 Nm in basic version
  - speedMASTER 15,000 rpm with 46 kW and 200 Nm optionally available
  - speedMASTER 20,000 rpm with 35 kW and 130 Nm optionally available
+ **High Quality for up to 5 µm Precision**
  - Comprehensive cooling concept for excellent long-term precision
  - One-piece machine bed
  - Direct ballscrew drives
  - Linear scales in all axes

Visit our online configurator:
configure.dmgmori.com

MATRIS Light as a simple solution for automating existing machines

In the following year, SHINWA also invested in the MATRIS Light from DMG MORI. Since then, the robot-based automation system has been used to increase mass production efficiency for "muraco" products. The MATRIS Light is a simple solution for automating existing machines – particularly in tight production areas with a fixed layout. All the operators have to do is place the MATRIS Light in front of the required machine and carry out a quick set-up. Automated workpiece handling can then begin.

More efficiency by means of automation and process integration

The MATRIS Light is the optimum starting point for automation for DMG MORI customers, since it can be easily retrofitted to numerous DMG MORI machines. At SHINWA, the MATRIS Light operates with an existing NLX 1500. It automatically takes care of the loading and unloading of workpieces and carries out unmanned operations overnight.

By introducing a 5-axis machining center and a robot system from DMG MORI, SHINWA made both its high-variety, small series production and its mass production more efficient.

Automation for minimizing stoppage times

"We place a great deal of value on minimizing machine stoppage times – during loading and unloading of workpieces, set-ups, breaks and night-time operation. There are many situations in which conventional machines cannot work. The introduction of MATRIS Light has allowed us to make use of idle times such as these for additional machine up-time", says Takuya Murakami, president of SHINWA CO., Ltd. He is also satisfied with the continuous overnight production: "It is a great feeing to go home and know that the robot will keep production running overnight." Takuya Murakami also explains why the decision was made to go with DMG MORI: "We have used DMG MORI machinery for quite some time, and already trusted their rigidity and accuracy." The company found the machine design to be very modern and appealing. "The machine tools are used by our employees on a daily basis, so we want them to like operating them. I have the feeling that DMG MORI machines improve the working environment and motivate our employees to meet new challenges."

INTO THE FUTURE WITH PROCESS INTEGRATION AND AUTOMATION

SHINWA will continue with process integration and automation in the future in order to further increase our machining accuracy and production capacity. And this will take place using DMG MORI machines, which improve the working environment and motivate our employees.

SHINWA was impressed by the performance and the innovative design of the DMG MORI machines. Takuya Murakami describes the company's future vision: "We want to develop the international market presence of the "muraco" outdoor brand. We will use our ex- pertise and creativity to develop other unique products which will impress our customers." The spotlight will also be on optimizing the manufacturing. "SHINWA will continue with process integration and automation in the future in order to further increase our machining accuracy and production capacity."

«

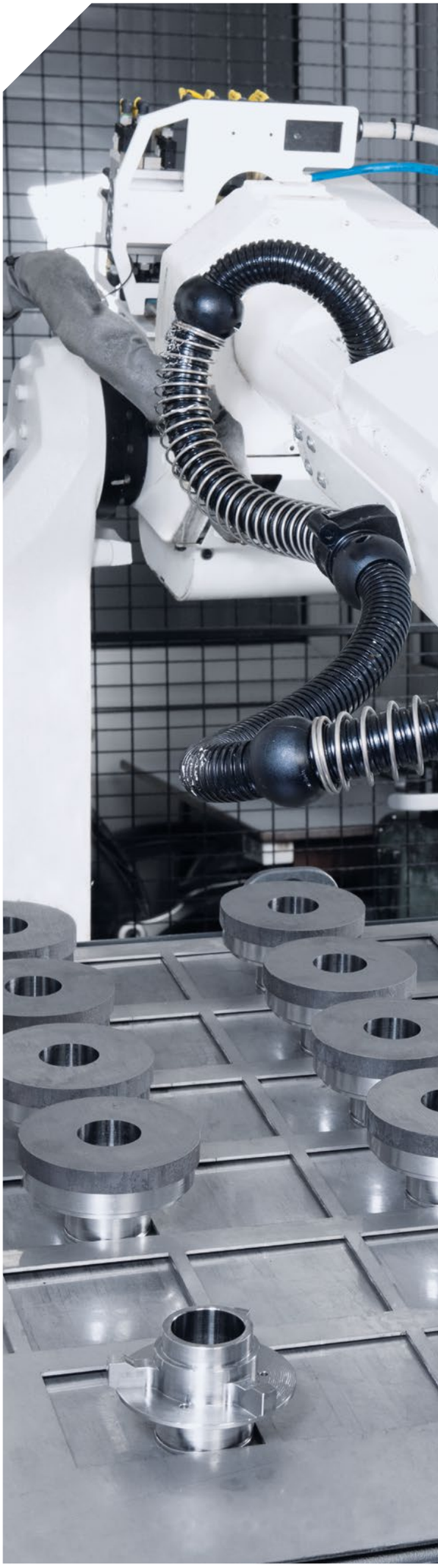
SHINWA CO, LTD. FACTS

+ Established in 1974 as a machining company
+ Many years of experience in component machining for machine tools; considerable expertise in machining technology and materials
+ Development, production and sale of outdoor products of its own "muraco" brand

shinwa | m

SHINWA CO., Ltd.
Negishi 649 – 7, Sayama City,
Saitama 350 – 1325, Japan
https://muracodesigns.com

FLEXIBLE ROBOT AUTOMATION FOR SMALL BATCH SIZES



Founded in 1926 in Berlin by Jakob Dichter, AMBEG Dr. J. Dichter GmbH continues to be a leading manufacturer of machines for the automated production of primary packaging materials made of tubular glass. Packaging manufacturers for the pharmaceutical industry put their trust in the expertise of the steadily growing company. AMBEG has almost doubled the number of its skilled workers to 150 over the last few years and continues to invest in modern manufacturing technology, including DMG MORI machining and turning centers. Today, particular attention is paid to automated manufacturing. After AMBEG installed a DMU 50 with Robo2Go Milling, a DMU 65 monoBLOCK with flexible robot automation was also purchased. A CTX beta 800 TC with Robo2Go Turning has also already been ordered.

Machines for glass packaging in the pharmaceutical industry

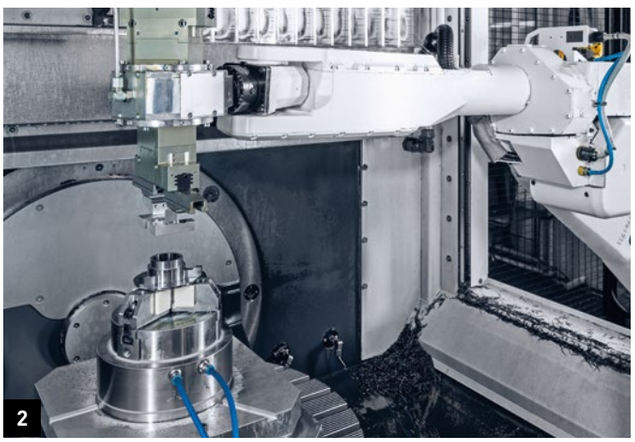
"Glass syringes and vials continue to be important packaging in the pharmaceutical industry," explains Andreas Dichter, managing director of AMBEG. He heads up the company, which is its third generation. "For example, annual flu vaccinations are administered using single-use glass syringes." The production of glass packaging takes place using the same principles as it did almost 70 years ago. The AMBEG glass processing machines are equipped with a carousel with up to 20 stations. Glass tubes are used as the raw material, which are shortened to the required lengths and molded. The diameter of the tubes ranges from ø 6 to ø 55 mm. The glass is heated to around 800 °C by several gas burner to prepare it for processing. The finished molded glass products are subjected to camera-based visual inspection and measurement before being heated to 600 °C in a furnace and then slowly cooled. "This stress relief procedure makes the glass packaging very stable," says Andreas Dichter, explaining the process.

Economical and reliable production with DMG MORI

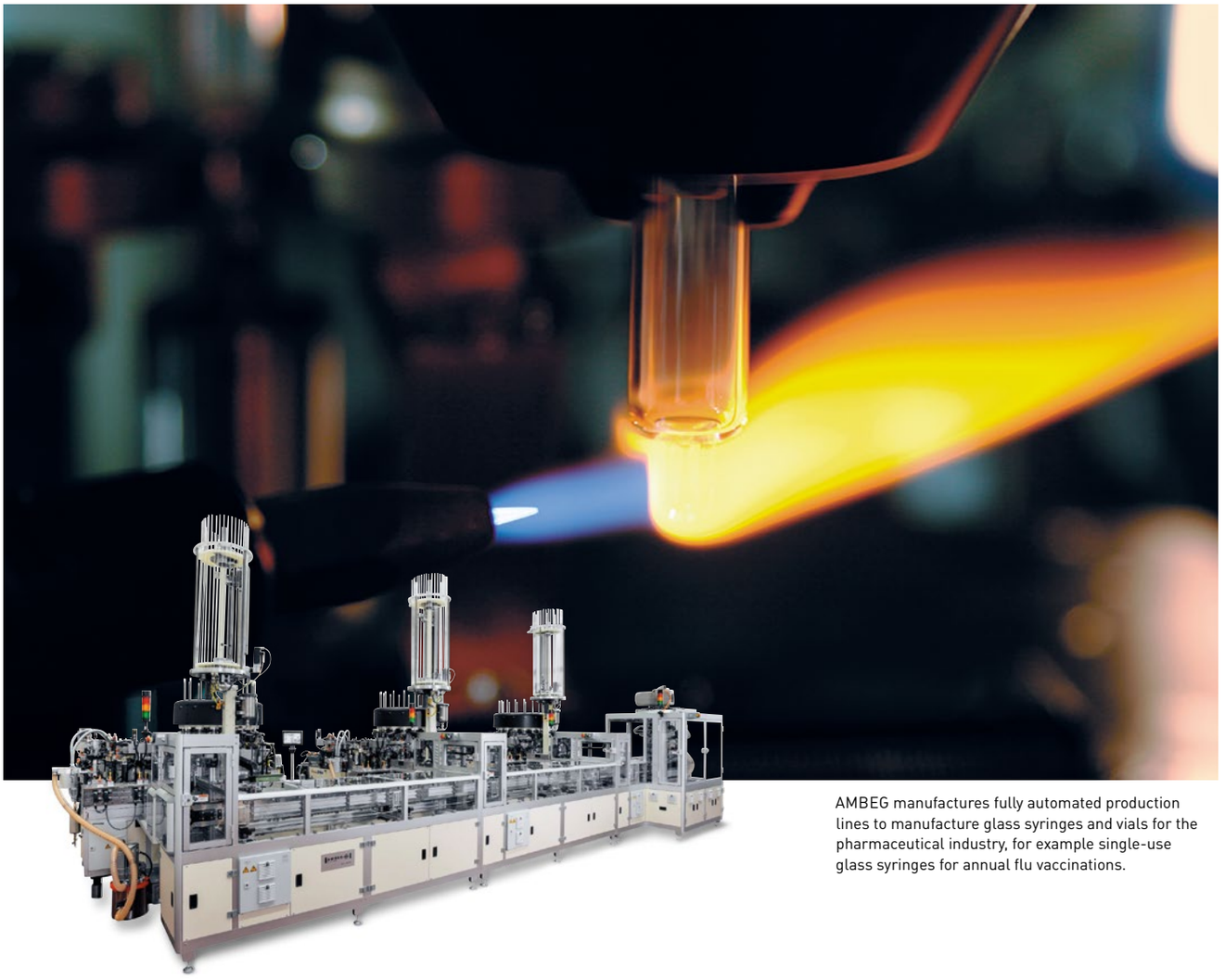
AMBEG has already sold over 4,000 glass processing machines. A minimum of ten months is needed for their development and production. According to Andreas Dichter, it is currently closer to 15 months due to the high demand: "This is why we have dramatically increased our production capacity over the past few years and, where possible, taken on a lot of new employees." AMBEG has been relying on CNC machines from DMG MORI for its manufacturing for decades. "We can always find the right solutions that work economically and reliably in our broad product range." The machine tool manufacturer's automation solutions are particularly important to ensure production capacity continues to increase, especially in view of the current difficulty in recruiting skilled staff.

»

Component for a tubular glass chuck, 16 of which are used in every glass processing machine.



1. The storage trays of the Robo2Go Milling can be adjusted in a few simple steps for maximum flexibility when changing workpiece size.
2. The lateral design of the Robo2Go Milling ensures accessibility to the working area is fully retained. **3.** The CELOS APP enables easy control of the Robo2Go Milling directly via the machine control. Thanks to its intuitive operation, setting up the new workpiece takes place in less than 5 min, including a new storage tray arrangement.



AMBEG manufactures fully automated production lines to manufacture glass syringes and vials for the pharmaceutical industry, for example single-use glass syringes for annual flu vaccinations.

AMBEG has experience in automated manufacturing in the area of turning, with a CTX alpha 500 with bar loader already in use. Finished parts are automatically produced. "Automation of milling processes was a new step for us," says Andreas Dichter, looking back. The batch sizes are not very large. "That means we need very flexible automation solutions." AMBEG finally found what it was looking for in the Robo2Go product family. A DMU 50 with Robo2Go Milling was installed at the start of 2021.

FLEXIBLE AUTOMATION FOR SMALL BATCHES

Teaching without any robot programming knowledge

The Robo2Go has already been compatible with turning machines and turn-mill centers for several years. Robo2Go Milling has also been used to automate machining centers such as the DMU 50 since 2020. "The fact that DMG MORI provides the machine tools as well as the automation from a single source simplifies installation enormously," is the opinion of Andreas Dichter. The easy operation of the flexible Robo2Go products is a key feature. The team at AMBEG has already experienced this: "Teaching the Robo2Go does not require any special robot programming knowledge." The CNC machine automation is operated via the CELOS control panel.

Autonomous multi-machine operation

For maximum flexibility, the Robo2Go Milling magazine can be fitted with different storage trays, which are adapted to the quantity and size of the workpieces. This is how AMBEG manufactures chucks, for example, of which 16 are required per glass processing machine. Based on their positive experience with the automated DMU 50, AMBEG also installed a DMU 65 monoBLOCK with Robo2Go Milling shortly afterwards to increase production capacity in the area of milling. Andreas Dichter comments: "This allows our employees to easily operate several machines at the same time and leave them to run fully automatically for long periods."

We can always find the right solutions that work economically and reliably in DMG MORI's broad product range. The fact that DMG MORI provides the machine as well as the automation from a single source simplifies installation enormously.

Andreas Dichter
Managing Director
AMBEG Dr. J. Dichter GmbH

Growth with more factory space and further automation

AMBEG relocated the acceptance of glass processing machines to Köpenick to gain more space for production. Andreas Dichter would like to continue the good experience with automated manufacturing with a CTX beta 800 TC. The turn-mill center will also be installed with a Robo2Go in the next few months. "Chucks, which we previously used to machine on five sides in one set-up, can now be completely manufactured on six sides, which further reduces our throughput times and increases our production capacity."

«

AMBEG DR. J. DICHTER GMBH FACTS

+ Founded in Berlin in 1926
+ 150 skilled staff
+ Development and construction of machines for the manufacture of tubular glass packaging

AMBEG Dr. J. Dichter GmbH
Ella-Barowsky-Straße 65 – 68
10829 Berlin Germany
www.ambeg.de

Robo2Go MILLING

FLEXIBLE WORK-PIECE HANDLING FOR SMALL TO MEDIUM BATCHES

+ Handling of components from 20 to 200 mm
+ Robust design for all requirements: Robot payload optionally 25 or 35 kg
+ Full accessibility to the machine is maintained
+ Alignment and turnover station for automated 6-sided complete machining
+ One APP for control of all Robo2Go variants
+ Set-up of a new workpiece in < 5 min

A video of the Robo2Go Milling can be found at:
youtu.be/BH-TQPaF9ME

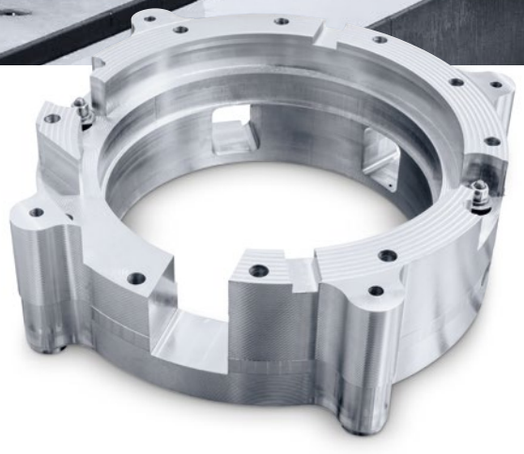
SUCCESSFUL TRANSITION TO SELF-EMPLOYMENT IMMEDIATELY AFTER APPRENTICESHIP, THANKS TO 5-AXIS MACHINES

Brothers Michael and Philipp Ramerseder made the move into self-employment in 2014 shortly after completing their apprenticeship at a major supplier to the automotive industry. Since then, APM Maschinen- und Metallbau GmbH has grown to over 20 employees and today supplies numerous customers in the construction and agricultural machinery industry, automotive engineering, and electrical engineering. With specialist expertise, the young team gets maximum performance out of modern manufacturing technology. Six machining centers from DMG MORI have been installed since 2015. APM focuses on productive 5-axis machining of complicated workpieces.

The latest addition on their shop floor is a DMC 160 U duoBLOCK and a DMP 70, which produces a component in high volumes with the help of automation provided by a WH 3 Cell.

Continuous growth with 5-axis machines from DMG MORI

"Our challenge lies in reliably delivering extremely complex precision parts within a very short period of time – sometimes within 24 hours," Michael Ramerseder says, explaining APM's daily business. There is clearly a high demand for this service, looking at the rapid development of the young company.



Large machine components up to a diameter of ø 1,600 mm, such as this flange, are machined on the new DMC 160 U duoBLOCK.

"With the exception of the first year of the pandemic, we have experienced continuous growth." Philipp Ramerseder attributes this success to the fact that APM is perfectly equipped to fulfill the high demands of customers: "We always find cost-effective ways for machining and for this we rely on powerful CNC machines from DMG MORI – mainly 5-axis models."

5-axis machining on DMG MORI machines since 2015

APM started multi-axis machining of complex workpieces in 2015 on its very first machining center, an *eco*MILL 50. Satisfaction with the DMG MORI models soon led to further investments. "The acquisition of our DMU 90 P duoBLOCK in 2018 was a big step for us," reflects Michael Ramerseder. "The much larger work area and the 5-axis simultaneous capability of the machine enabled us to massively expand our range of components, generate new orders and make further investments." They again expanded their capacity within a year – including a DMU 50 3rd Generation. "Our success lies in 5-axis machining. It increases cost effectiveness, speeds set-up and, at the same time, leads to considerably higher process reliability."

DMP 70 with WH 3 Cell: Automated series production of more than 200,000 parts

After the economic situation went through a significant upturn in 2021, APM was able to win a large production order that required further investment. It involved a component for fuel optimization of heavy goods vehicles. "The quantity of over 200,000 meant that we really needed an automated solution," says Philipp Ramerseder looking back at the purchase of the DMP 70. DMG MORI offers the compact, 5-axis simultaneous machine center in combination with the WH 3 Cell workpiece handling system.

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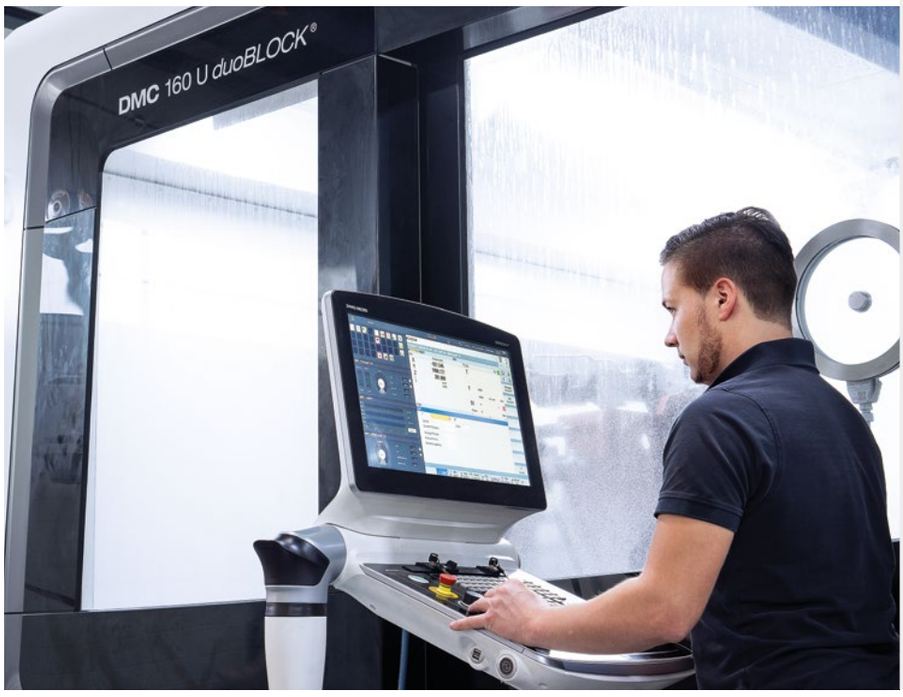


The DMC 160 U duoBLOCK is the latest machine from DMG MORI for APM, the successful acceptance took place during the Pfronten Open House in May 2022.

DMC 160 U duoBLOCK

HEAVY-DUTY MACHINING OF WORKPIECES UP TO 4,000 kg WITH UP TO 1,800 Nm

+ **Workpieces** up to ø1,600 × 1,300 mm and 4,000 kg
+ **speedMASTER spindles** up to 20,000 rpm and 200 Nm, **powerMASTER spindles** up to 16,000 rpm or 1,000 Nm or **5X torqueMASTER** with 1,800 Nm
+ **duoBLOCK design** for maximum rigidity and high machining performance
+ **Integrated cooling** for high long-term precision
+ **FD: 5-axis milling, turning + grinding**
+ Various automation solutions – **also retrofittable**

A video of the duoBLOCK series: youtu.be/Ql0LzkJXUAY

DMP 70 WITH WH 3 CELL

VERTICAL HIGH-SPEED MACHINING CENTER

+ **Workpieces (5-axis)** up to ø290×250 mm and 100 kg
+ Compact production machine for applications in the **medical and aerospace industries,** the **job shop** and **other challenging sectors**
+ 10,000 rpm inline spindle with up to 78 Nm; 24,000 rpm inline spindle with up to 52 Nm optionally available
+ Up to **2 g acceleration** for **the shortest possible chip-to-chip time of only 1.5 seconds**
+ **Complex machining possible with** optional **5-axis simultaneous table**
+ **WH 3 Cell –** modular handling of workpieces up to 5.5 kg

Click here for the DMP 70 video:
youtu.be/mD9q3qbHZdc

DMP 70 AND WH 3 CELL IN A 8.8 m² FOOTPRINT

APM already had experience with automated manufacturing using a third-party workpiece handling solution on the DMU 50 3rd Generation, but this time they wanted the machine and the automation to come from a single source. One advantage was the fast installation: DMG MORI delivered the automated DMP 70 within just two months. The DMP 70 with WH 3 Cell is the perfect solution for Udo Obermüller, production foreman at APM, above all because of the intelligent palletizing: "The workpiece handling system picks up the raw parts from the preformed plastic trays in which they are delivered by the customer and places them back there as a completely finished part." The component is even laser engraved. APM connected its own unit to the WH 3 Cell for this.

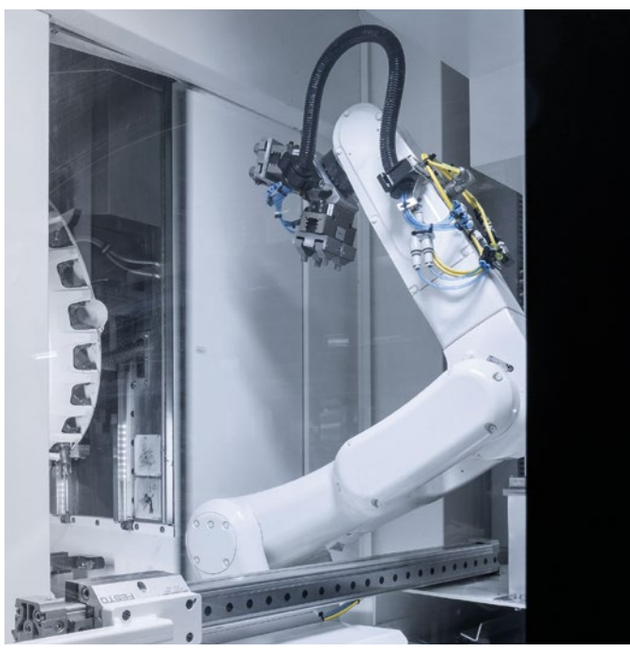
DMC 160 U duoBLOCK: Precision machining of large components

While APM produces small workpieces on the DMP 70, the DMC 160 U duoBLOCK with automatic pallet changer handles the other end of the component range. With a working volume of 1,600×1,600×1,100 mm, the machining center offers sufficient space for large components. They include gearbox housings for tractors and components for test benches, for example. "The stable construction of the duoBLOCK and the optimal temperature compensation enable precise machining at all times," according to Udo Obermüller. The cycle times for the complex components offers sufficient time for simultaneous set-up of the next workpiece on the second pallet. "We can thus fully utilize the machines right through to unmanned night and weekend shifts."

MPC 2.0: Process monitoring for reliable manufacturing

The DMC 160 U duoBLOCK is equipped with the DMG MORI MPC 2.0 (Machine Protection Control) technology cycle to ensure reliable autonomous operation. It monitors vibrations

Minimum space requirements: DMP 70 and WH 3 Cell occupy less than a 9 m² footprint. Depending on the workpiece dimensions the WH 3 Cell offers space for over 1,000 workpieces.



The WH 3 Cell robot offers workpiece handling up to 5.5 kg.

We always find cost-effective ways for machining and for this we rely on powerful CNC machines from DMG MORI – mainly 5-axis models.
Our success lies in 5-axis machining.
Eliminating unnecessary set-ups saves time and also produces better quality parts.

Philipp Ramerseder, *owner (left)*
Udo Obermüller, *production foreman (center)*
Michael Ramerseder, *owner (right)*
APM Maschinen- und Metallbau GmbH

and immediately stops the feed movements of the machine if limits are exceeded. Philipp Ramerseder says about the benefits: "Reducing serious crashes protects the fixtures and tools and thus increases machine availability."

Investment in future-proof technologies

Efficient manufacturing solutions, such as the automated DMP 70 for set-up during production on the DMC 160 U duoBLOCK means APM can produce more competitively. Michael Ramerseder would like to continue this strategy: "Unmanned manufacturing for our series production enables sustainable and healthy growth. The strategies we developed working with the latest CAM technology in combination with intelligent tooling strategies and DMG MORI machining centers offer us a great competitive advantage. That's why we will continue to invest in future-proof manufacturing concepts."

«

APM MASCHINEN- UND METALLBAU GMBH FACTS

+ Established in 2014
+ 20 employees
+ Manufacturing of complex precision parts
+ Customers from the areas of construction and agricultural machines, automotive and electrotechnology

APM high precision.

APM Maschinen- und Metallbau GmbH
Gewerbepark 5
94157 Perlesreut / Prombach
Germany
www.apm-maschinenbau.de

INNOVATIVE AND SUSTAINABLE AIR COMPRESSORS

Compressed air is one of the most important driving forces in production. Xiamen East Asia Machinery Industrial Co., Ltd. (EAMI) with headquarters in Xiamen, Fujian province, has been focusing on this area since its foundation in 1991. The range of services covers research, development and manufacture of air compressors and their sale. To keep up with increasing production requirements, EAMI purchased two DMC 75 Hs from DMG MORI in 2010. The shop floor now comprises 42 models from the machine tool manufacturer, including 30 horizontal machining centers such as the NHX 8000 and several NHC models. EAMI also operates vertical machining centers and CNC turning centers. Moreover, two fully automated production lines each consisting of four NHC 4000s and served by a mobile robot, were purchased at the end of 2021. Again, the concept and installation were from a single source – DMG MORI.

Machines, automation and training by DMG MORI ensured smooth company expansion

Looking back at the many years of cooperation between EAMI and DMG MORI, Han Wenhao, General Manager of EAMI, is certain: "It is true to say that DMG MORI was instrumental in the expansion of EAMI and provided us with a lot of support along the way." The machines are stable, reliable and very resilient. "In addition, the expert support and tailor-made training has enabled verifiably efficient production and smooth development."

High-precision processing for oil-free air compressors

At EAMI, chip removal is an important factor in the manufacturing processes of mechanical products in the region. It has a direct impact on the product quality. This means the requirements placed on the processing machines are also very high.

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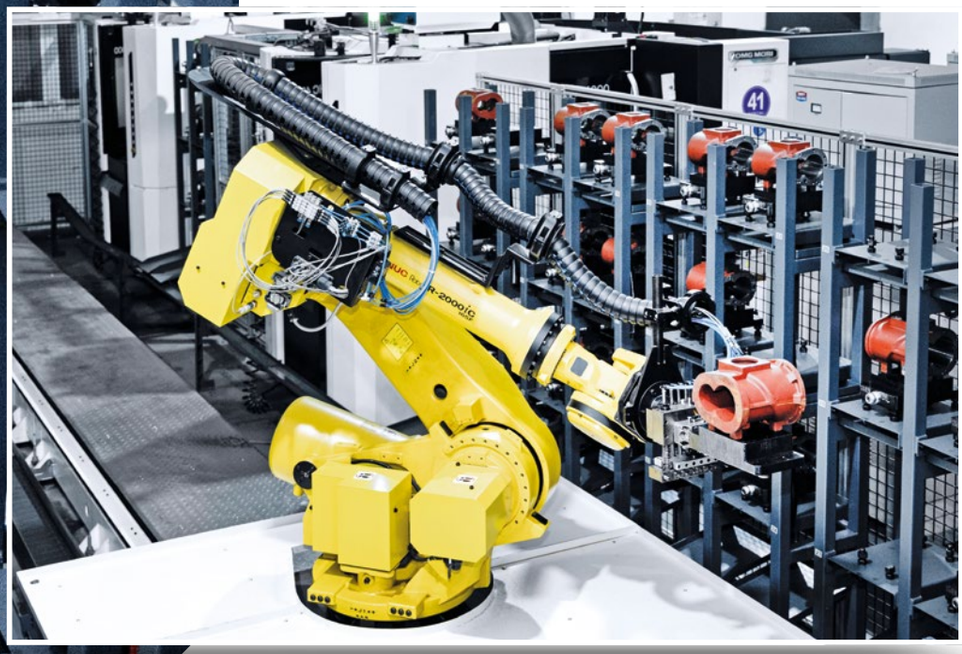


EAMI relies on horizontal machining centers from DMG MORI to manufacture housings for the air compressors. The small and medium sizes are manufactured on two production lines, each consisting of four NHC 4000s. Loading and unloading takes place fully automatically via a mobile robot.

All housings are measured on coordinate measuring machines as part of quality control. These large housings are manufactured on the NHX 8000 and NHC 8000 machines.

NHC 4000

ENTRY INTO HORIZONTAL MACHINING

+ Workpieces up to ø 630 × 900 mm and max. 400 kg on 11.5 m² footprint
+ Powerful spindle with 15,000 rpm and 232 Nm or 20,000 rpm and 81 Nm
+ Direct Drive table is with 100 rpm available
+ FEM-optimized machine design and stepped moving column
+ Fast and easy set-up thanks to three-point support
+ Extensive cooling and multi-sensor compensation

Particularly in the case of new products from EAMI, such as oil-free dry compressors, eliminating lubricating oil during air compression generates more heat, which results in high temperatures and high operating speeds. "This means that the machining accuracy of the core parts has to be improved to ensure the stability and service life of the compressor at high speeds," says Han Wenhao.

NHX & NHC – UP TO 4-FOLD IMPROVED ACCURACIES

EAMI uses DMG MORI machining centers primarily for manufacturing housings and bearing blocks, which are the core components of the company's products. With their precision, performance and stability, DMG MORI machines perfectly fulfill the machining requirements of EAMI. These machines ensure the concentricity, parallelism, squareness, flatness, and surface quality of housing parts, even under harsh working conditions. These components have complex geometries and tend to deform if not properly clamped. "DMG MORI machining centers have considerably improved our machining results and repeatability," reports Han Wenhao. "We were able to improve positional tolerance on the mold from the original 0.04 – 0.06 mm to 0.01 – 0.02 mm. We can now also achieve concentricity of 0.01 to 0.02 mm. Machining efficiency has been considerably improved compared to the previous horizontal machining center."

Automated manufacturing enables efficient production

"Automation is an important way to increase manufacturing efficiency with few personnel," is the opinion of Han Wenhao. "It is all about achieving intelligent manufacturing." Above all in recent years, it has become increasingly challenging to recruit qualified staff. At the end of 2021, EAMI chose a proactive approach to counteract this problem. Together with DMG MORI, two production lines for machining bearing blocks and housings were completely automated.

Two production lines with four horizontal machining centers and a mobile robot

Every production line is made up of four NHC 4000s and a mobile robot, which feeds workpieces set up on the pallets into the machine and unloads the finished parts. While the machine is producing, the operator is able

to prepare new pallets. "Both production lines are ideally suited to long, minimally manned manufacturing," Han Wenhao says, evaluating the process. After the workpieces have been fixtured, the machines can run autonomously for long periods of time. "We also use them for unmanned night shifts." Multi-machine operation is possible. The results speak for themselves: Only one operator is required to operate a production line at full capacity for a 24-hour period. Previously four employees working two shifts were needed.

Automated series production of different components in small batch sizes

The project involving automated manufacturing of bearing blocks and housings demonstrated to EAMI how forward-looking a production approach like this is. EAMI is now in a position to mass-produce a diverse range of small workpieces. However, most of the time the batch sizes are small. DMG MORI has therefore met the requirements for flexible production. In addition, DMG MORI has been able to deepen its know-how about the interaction of hardware and software in automated production. Both companies plan to maintain this mutual cooperation.

Partnership for a green future

The broad product range, quality of the machines, technical support and reliable customer service were the main factors for EAMI choosing to cooperate with DMG MORI. A common vision is another basis of the continuing cooperation, emphasizes Han Wenhao: "As a traditional, multinational company, DMG MORI has always maintained strong creativity. And the same is true for EAMI." Working together with DMG MORI and expert partners provides the opportunity to benefit from the advantages of large companies. "Like DMG MORI, we will also continue to strive for innovation and excellence – not least in the area of sustainability." DMG MORI had already achieved carbon neutrality from raw material to machine delivery by the beginning of 2021. This makes it a true green pioneer for sustainable development in the machine tool industry. For its part, EAMI produces sustainable compressors such as the permanent magnet compressor with variable frequency. Han Wenhao looks to the future: "We would like to engage in an active dialog with DMG MORI, further consolidate deep cooperation and work together on sustainable developments for a green future."

«

DMG MORI machining centers have considerably improved the accuracy of our workpieces. Thanks to automation, we have been able to minimize the effects of a shortage of skilled staff and also expand production in unmanned night shifts.

Han Wenhao
General Manager
Xiamen East Asia Machinery Industrial Co., Ltd.

XIAMEN EAST ASIA MACHINERY INDUSTRIAL CO., LTD. FACTS

+ Xiamen East Asia Machinery Industrial Co., Ltd. is a major manufacturer of compressors with the brand name JAGUAR
+ 30 years of experience in the manufacture of air compressors, refrigeration dryers, adsorption air dryers and air tanks
+ More than 700 employees and 70,000 m² production space at the Xiamen site in China

JAGUAR®

Xiamen East Asia
Machinery Industrial Co., Ltd.
611 Xike street, Tong'an District
Xiamen, China
www.jaguar-compressor.com

AUTOMATED TOOL MANUFACTURING FOR SOLID FORMING

1

PH CELL 2000

MODULAR ROUND PALLET STORAGE FOR UP TO 21 PALLETS IN A 16.5 m² FOOTPRINT

+ 2,000 kg max. transfer weight
+ Pallet size 500 × 500 mm up to ø 1,100 mm
+ Fast pallet change time < 45 seconds
+ Retrofittable with machine preparation
+ Short commissioning time within 3 days due to defined interface and modular design

Video of the PH Cell 2000: youtu.be/vMU9CWLZM6E

With around 6,000 employees, the Hirschvogel Group is a leading supplier to the automotive industry in the area of solid forming of steel and aluminum as well as finishing processes. With locations in Germany, Poland, China, India, the USA and Mexico, the group serves all major markets. Their headquarters in Denklingen – the company was founded there in 1938 – is also the headquarters of Hirschvogel Umformtechnik GmbH. Countless components are produced by hot, cold, or warm forging. Around 200 skilled workers manufacture the molds on site in the tool shop. Automated monoBLOCK machining centers from DMG MORI ensure flexible and efficient manufacturing of the complex components. The latest installation is a DMU 85 H monoBLOCK with PH Cell 2000.

More components for electromobility

In cooperation with automobile manufacturers, Hirschvogel got involved early on in product development and the production of prototypes. Consequently, the company has played an active role in the transformation of the market. At the same time, Hirschvogel has continued to reliably serve the traditional market. Ralph Schramme comments: "This has meant we have had to continuously optimize our processes to meet increasingly high demands on capacity and flexibility." The limited toolmaking production space requires highly efficient manufacturing solutions. "We can continue to increase our capacity in the long term with 5-axis machining centers and automation solutions from DMG MORI."

Testing automation solutions for international use

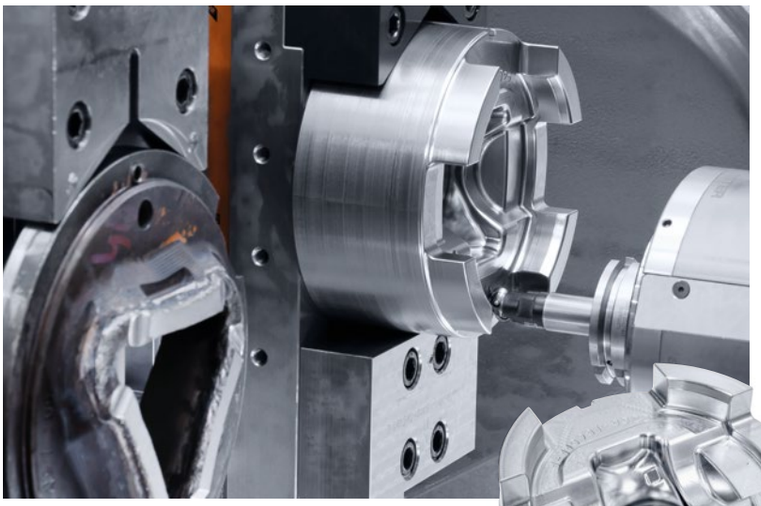
Hirschvogel has been using a rotary pallet storage system on monoBLOCK and duoBLOCK machines as well as a DMU 65 monoBLOCK with a PH 150 for a long time. "We often replace two machines by using this kind of manufacturing solution," says Ralph Schramme. "Minimally manned production through the night or at the weekend also provides us with additional scope for production." The central toolmaking facility is responsible for testing manufacturing solutions for use at other sites. "We have now installed a DMU 65 monoBLOCK with PH 150 at sites in India, Mexico and Poland."

DMU 85 H monoBLOCK: Reliable manufacturing thanks to horizontal machining

The latest installation for toolmaking by Hirschvogel is a DMU 85 H monoBLOCK with PH Cell 2000. The horizontal spindle of the machining center offers two decisive benefits, says Matthias Lenggeler, foreman in the area

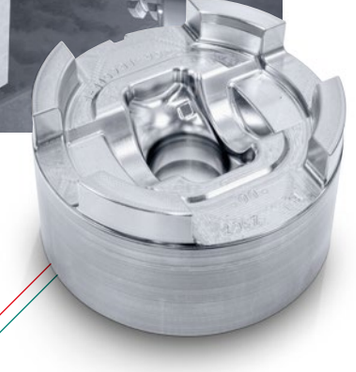
PH CELL 2000: 17 PALLETS (630 × 630 mm) ON 16.5 m²

of toolmaking milling, explaining the acquisition: "On one hand, chip evacuation due to gravity ensures high process reliability and, on the other, the vertical travel is considerably larger." The versatility of the machine is ideal for the diverse range of parts used in toolmaking. "We mainly machine individual



1. + 2. Hirschvogel relies on automated 5-axis machining centers, such as the DMU 85 H monoBLOCK with PH Cell 2000, to increase production capacity in the very limited production space.

Depending on their size, the pallets in the PH Cell 2000 are loaded with one component or a fixture for several components, including new and repaired molds.



Hirschvogel manufactures dies for hot, cold or warm forging on the DMU 85 H monoBLOCK

We need to continuously optimize our processes to meet the increasing and changing market requirements – in a limited production space. We are able to replace two machines with an automated 5-axis machining center from DMG MORI.

Ralph Schramme
Head of the central toolmaking facility of Hirschvogel Umformtechnik GmbH

parts or very small series," Matthias Lenggeler says describing their daily business. The automation solution needs to be just as flexible. The PH Cell 2000 was designed by DMG MORI with just this flexibility in mind. The modular storage system offers up to 21 pallet positions, depending on the size of the pallet. Hirschvogel uses pallet sizes of 630 × 630 mm, which provides space for 17 pallets. A further advantage according to Matthias Lenggeler: "The positioning of the pallets on three levels ensures a compact footprint." The PH Cell 2000 only needs a footprint of 16.5 m².

Easy operation thanks to CELOS with Pallet Master

A further feature of the PH Cell series is the simple commissioning within just a few days, thanks to a defined interface and the modular construction kit. The CELOS-APP Pallet Master takes care of the control system directly via the machine control or the optional additional control panel. The PH Cell 2000 is designed for machining larger components. It can handle a transfer weight of up to 2,000 kg. "This gives us the option of not only machining small molds, but also larger mold components," adds Matthias Lenggeler. "Depending on requirements, we can alternatively load a pallet with a fixture for several components."

Counteracting the shortage of skilled staff with automation and new technologies

"Automated manufacturing solutions are standard for us, as they allow us to optimally utilize our production space," emphasizes Ralph Schramme. They also provide a sensible means of counteracting the shortage of skilled staff at home and abroad. "We will also look into new technologies, for example, additive manufacturing." It is only possible to continuously improve your processes by investing in innovation.

«

HIRSCHVOGEL FACTS

+ Founded in 1938 at the current headquarters in Denklingen
+ With around 6,000 employees, the Hirschvogel Group is a leading supplier to the automotive industry in the area of solid forming of steel and aluminum
+ Production of components for hot, cold, or warm forging
+ Worldwide locations in Germany, Poland, China, India, the USA and Mexico

Hirschvogel Group

Hirschvogel Holding GmbH
Dr.-Manfred-Hirschvogel-Straße 6
86920 Denklingen, Germany
www.hirschvogel.com

PH-AGV – AUTONOMOUS PALLET HANDLING

UP TO 5,000 kg

At Husky Technologies, a PH-AGV 5000 from DMG MORI enables fully automatic loading and unloading of three DMG 160 U machining centers, which are also supplied with tools fully automatically.

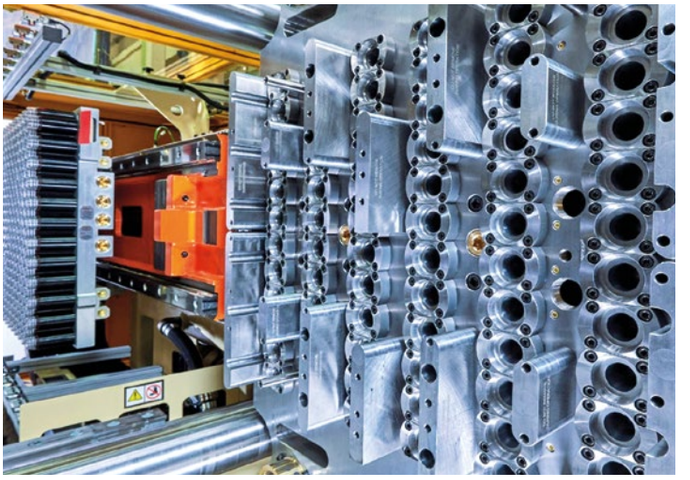
Founded in 1953 in Bolton, Canada, Husky Technologies is a leading provider of injection molding solutions for the packaging industry – both food and medical. The company employs 4,000 people worldwide, around 1,000 of whom work at the Luxembourg plant in Dudelange. Here, molds are primarily developed and built for the production of preforms. These are blanks from which PET containers are formed. Husky Technologies optimized the milling of the base plates of these molds in 2020 with three DMC 160 Us from DMG MORI and a fully automated tool storage system. This year, the process was further automated using a material storage system for 422 components and a PH-AGV 5000, a self-propelled transport system that autonomously loads the machines.

Molds for up to 144 PET shapes

Beverages, shower gels and detergents – PET containers have been an integral part of everyday life for many years. "Since PET can be recycled 100 percent and has a low carbon footprint, the plastic is considered a sustainable packaging material," explains Laurent Huberty, Manufacturing Technology Team Manager at Husky Technologies in Dudelange. PET is also becoming increasingly important in the medical sector as an alternative to glass. One advantage of PET is the space-saving transport of the material. This is because the final shape of the bottle is not created until the filling process. The starting product is always a much smaller preform that already has the finished thread. "Here in Luxembourg, we produce the molds for manufacturing these preforms and the associated closures," adds Laurent Huberty. Depending on the size of the preform, one mold offers space for up to 144 cavities.

DMC 160 U: Machining on one instead of multiple machines with up to 10 µm accuracy

The production of these tools is associated with high accuracy requirements. Their precision has an impact on the quality of the packaging closures, for example. As a result, even the machining of the base plates is very demanding, according to Laurent Huberty: "In the past, we required several different machines to manufacture the plates. The DMC 160 U allows us to combine all these processes on one machine." With DMG MORI's machining centers we achieve accuracies of up to 10 µm, he says. »



On the three DMC 160 U duoBLOCKs,
Husky produces molds for up to 144 PET shapes.

PH-AGV

PALLET AUTOMATION

+ **Modular concept with free layout design**
  - Automated guided vehicle systems without guide rails or tracks
  - Collaborative: Man and machine in one system
  - Contour navigation
+ **Pallet sizes from 500 × 500 mm to 1,600 × 1,250 mm**
+ **Workpieces up to 5,000 kg (including pallet) and ø 1,600 mm**
+ **For machine and material pallets**

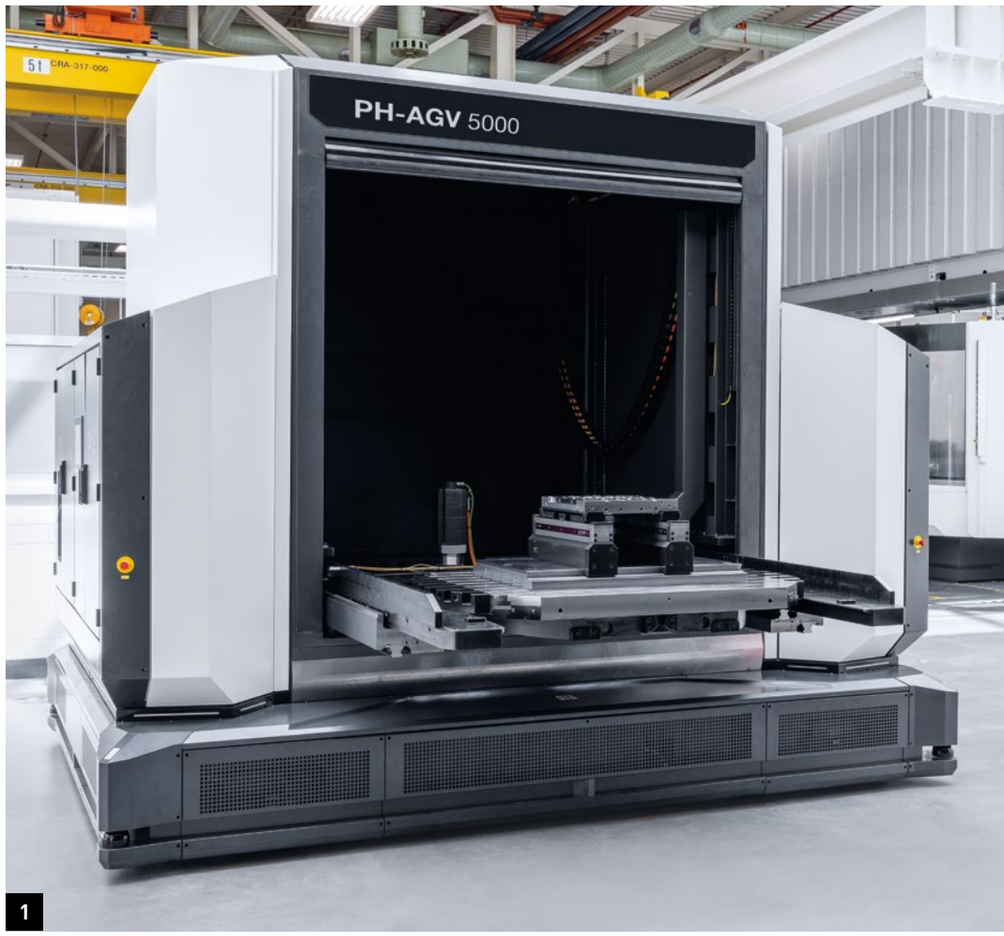
A video of the PH-AGV 5000 can be found at:
youtu.be/4CGHswm0_EA

Automated storage for 3,000 tools

Husky Technologies copes with the requirement for multiple tools when machining the panels with a tool storage system that has space for 3,000 cutters and automatically loads each of the three DMC 160 U machines. To do this, a robot brings the respective tool from the storage unit above into the Tool Loading Station (TLS) of the machining centers. The process is automated to such an extent that even tool service lives are automatically taken into account. Laurent Huberty comments, "The system knows the remaining tool life of each cutter and changes it in time when a job requires a fresher tool." The measurement of the tools and the loading of the storage unit are carried out by experienced engineers in the tool preparation department, he adds.

Up to 5,000 spindle hours per year – thanks to automated loading

Global development in recent years has presented Husky Technologies with additional challenges. "In the past we had difficulty keeping up with high demand while minimizing production costs," says Laurent Huberty, describing the situation. "To remain competitive in the long term, it is necessary to continuously evaluate and improve our production processes. Due to high labor costs and the ever-increasing shortage of skilled engineers, the answer in our case is consistent process automation."



1

2

1. The PH-AGV 5000 transports components weighing up to 4,000 kg from a decentralized storage unit to the machine and loads them directly onto the pallet changer.
2. A laser that scans the area in the direction of travel ensures the safe operation of the PH-AGV 5000, which can travel at speeds of up to 9 km/h.

Thanks to the PH-AGV 5000, loading and unloading of pallets is completely automatic, allowing us to shift labor to more highly qualified tasks in tool preparation or programming.

Laurent Huberty
Manufacturing Technology Team Manager at Husky Technologies in Dudelange.

With the PH-AGV 5000, DMG MORI has an ideal solution for automatic loading of the DMC 160 U, he said. "Through automation, we would like to reach 5,000 spindle hours per year on each of the three machines in the future in a single-part manufacturing environment."

CONSISTENTLY AUTOMATING PROCESSES

Linear storage for 422 components and fully automatic machine loading by PH-AGV 5000
As a next step, Husky Technologies plans to install additional pallet storage racks so that the PH-AGV can operate autonomously for several hours. The driverless transport system moves components weighing up to 4,000 kg from a remote storage facility to the machine and loads them directly onto the pallet changer. To supply material to the three DMC 160 U machines, Husky Technologies has installed a linear storage rack with space for 422 components. "Depending on the current job, the required component is automatically brought to the loading terminal," says Laurent Huberty, describing the process. The plate must first be clamped into the PH-AGV 5000's loading station, he says. "From there, the driverless transport system independently picks up the prepared pallet and takes it to one of the three machining centers." On the way back, the PH-AGV 5000 returns a previously finished plate if necessary, he adds. "Loading and unloading is completely automatic, allowing us to shift labor to more highly qualified tasks in tool preparation or programming."

PH-AGV 5000: Safe transport through the production environment
The most important aspect for Husky Technologies when operating the automated guided vehicle system is safety. As the PH-AGV 5000 moves through the normal production environment, it also has to interact with people walking by. The AGV can achieve a speed of up to 9 km/h. "Safety is provided by a laser that scans the area in the direction of travel. If an obstacle is detected nearby, travel is slowed down or stopped if necessary."

Flexibility, independence and quality
With automated manufacturing, Husky Technologies will be able to keep up with increasing demand. "This gives us more flexibility and, above all, will allow us to fulfil our commitments to customers," Laurent Huberty said. This also benefits quality: "Since only our own skilled staff are responsible for production, we have the end result completely in our own hands."

«

HUSKY TECHNOLOGIES FACTS

+ Founded in Bolton, Canada in 1953
+ 4,000 employees worldwide, 1,000 of whom work at the Luxemburg plant
+ Leading supplier of injection molding solutions for the packaging industry in the food and medical sectors

HUSKY®

Husky Injection Molding System S. A.
Zone Industrielle Riedgen, B.P 93
L-3401 Dudelange
Luxembourg
www.husky.co

SOLVING PROBLEMS

CAUSED BY CHIPS, COOLANT & MIST

Process integration and automated systems increase productivity by enabling longer machine operation. However, the amount of chips, coolant and mist also increase at the same time and efficient solutions are required to prevent machining difficulties. DMG MORI has identified chips, coolant and mist as the "3 biggest troublemakers in machining" and has established a specialized department to develop countermeasures. Only implementing process integration and automation and failing to address the 3 troublemakers can lead to machining defects and machine stoppages, which would result in productivity not improving as much as expected. Therefore, DMG MORI has developed the optimal solutions for chips, coolant and mist.

3 CHALLENGES IN MACHINING – A HINDRANCE TO STABLE PRODUCTION & A CLEAN WORKING ENVIRONMENT

3 troublemakers in machining

Chips

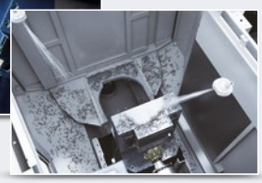
Coolant

Mist

DMG MORI OFFERS THE FOLLOWING SOLUTIONS

CONTRIBUTING TO SDGs AT THE PRODUCTION SITE

Solutions with peripherals

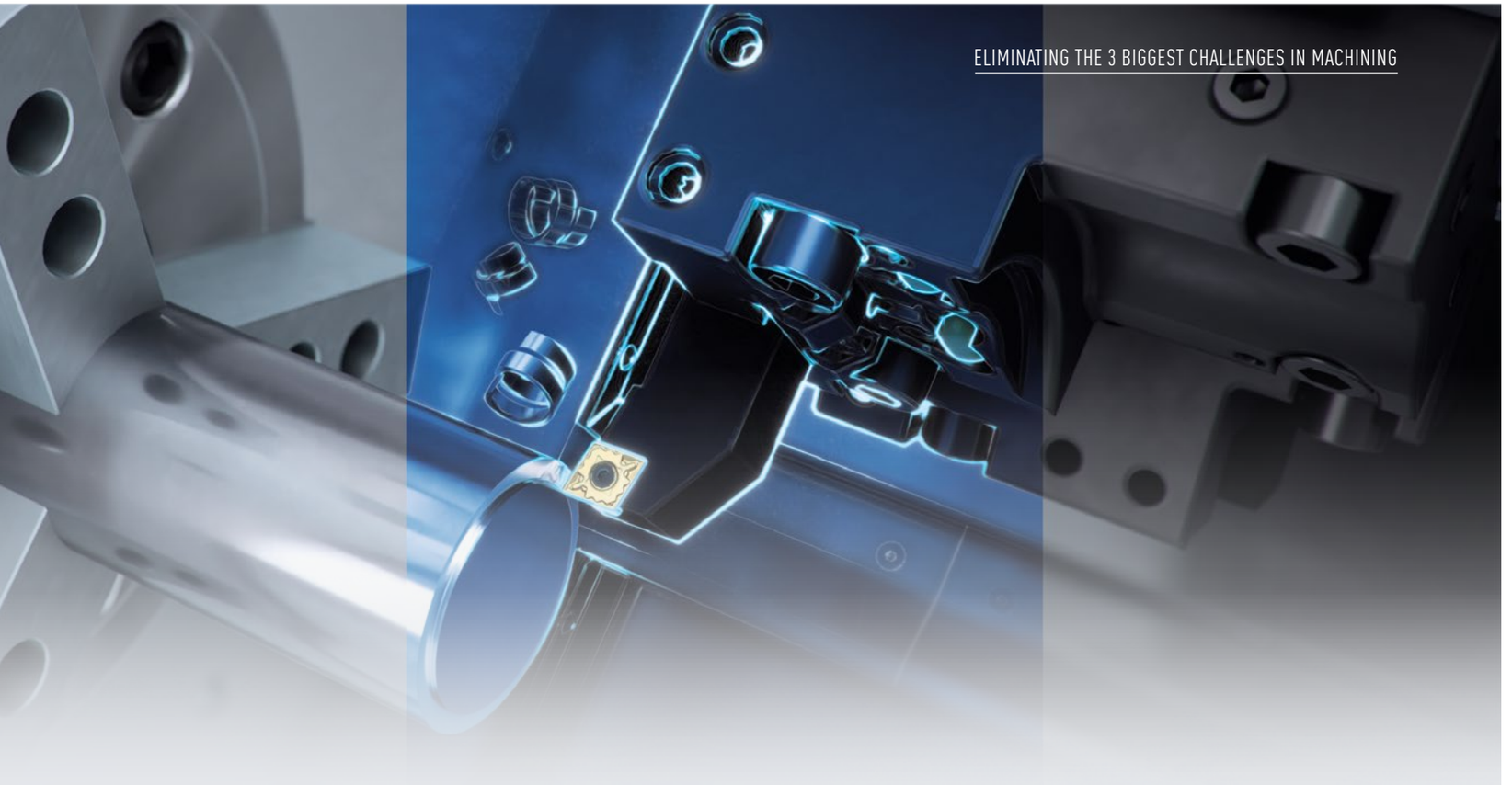


Chip breaking

AI Chip Removal

Zero Sludge Coolant Tank

*zero*FOG

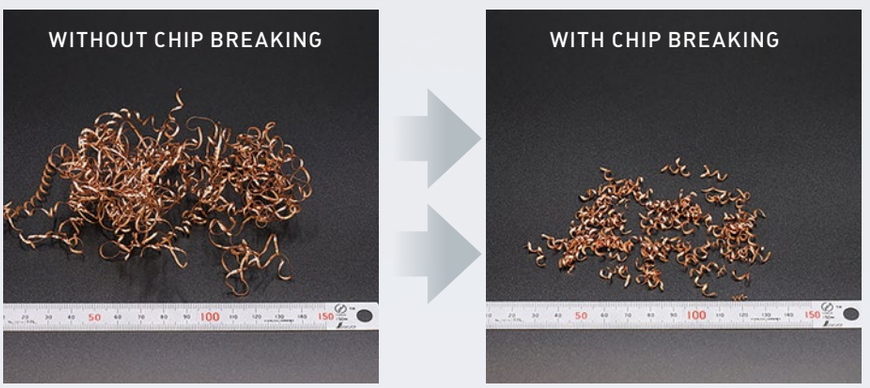


TECHNOLOGY CYCLE "CHIP BREAKING"

EASILY CREATE MACHINING PROGRAMS TO BREAK UP LONG CHIPS

STABLE CHIP BREAKING EVEN FOR MATERIALS THAT ARE PRONE TO GENERATING LONG, STRINGY CHIPS

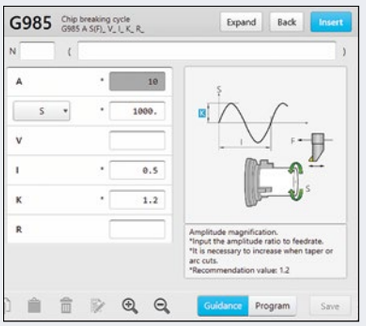
+ Chip Breaking applies vibrations to the feed axis that are synchronized with the spindle rotation
+ Ideal for materials where coolant usage is limited
+ Reduces the need for manual chip removal, minimizing the workload of operators



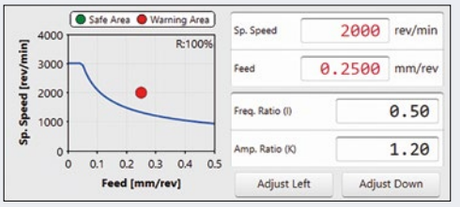
Chips after machining

3 OPERATOR-FRIENDLY FUNCTIONS

+ Guidance function: Programs can be easily created in an interactive format
+ Vibration load prediction function: Visualization of safe machining conditions
+ Safety function: Automatic avoidance of dangerous machining conditions



Guidance function

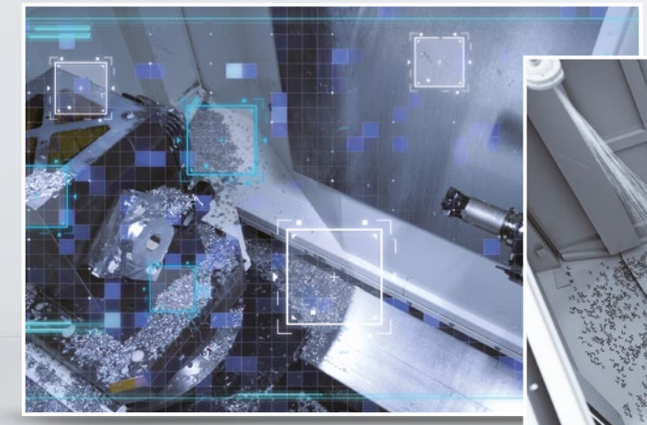


Vibration load prediction function

AI CHIP REMOVAL

EFFICIENT CLEARANCE OF CHIPS WITH AI

Scan the QR code to view a video of AI Chip Removal:
youtu.be/mIEvH0ntDdw



CO_2 emissions*
CUT BY 12 TONS EVERY 10 YEARS

Motor-driven coolant nozzle to clear chips

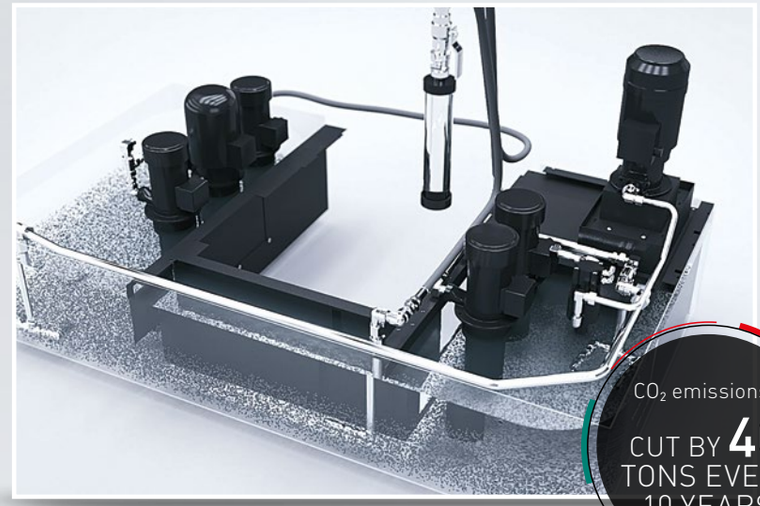
High-accuracy analysis of chip accumulation with AI

*Assuming machine operation of 16 hours per day, 240 days per year and a cleaning rate of 30 %.
Also calculated with a CO_2 emission factor of 0.424 kg / kWh.

ZERO SLUDGE COOLANT TANK

HIGHLY EFFICIENT COLLECTION OF SLUDGE IN THE TANK

Scan the QR code to view a video of the Zero Sludge Coolant Tank.
youtu.be/rEBLA2eRUTc

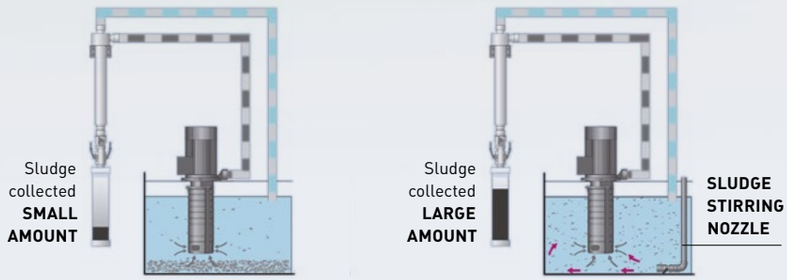


CO_2 emissions*2
CUT BY 40 TONS EVERY 10 YEARS

REDUCES CLEANING OF THE COOLANT TANK SIGNIFICANTLY

Multiple coolant nozzles are arranged to stir coolant and efficiently collect fine sludge in the tank: 99 %*1 of sludge collected

EFFECTS OF SLUDGE STIRRING



+ Prevent clogging of pipes / Prevent nozzles and coolant pump breakage
+ Extend coolant life

*1 This is an experimental result with test sludge. Collection ratio may differ based on the sludge type.
*2 Assuming that the entire tank volume (700 l) is exchanged once every four months. Also calculated with emission factor of 2.92 t-CO_2/t for waste oil incineration.

*zero*FOG – BUILT-IN MIST COLLECTOR

MIST COLLECTION SYSTEM FOR A CLEAN WORKING ENVIRONMENT

CO_2 emissions* CUT BY 13 TONS EVERY 10 YEARS

HARMFUL MIST CANNOT ESCAPE FROM THE MACHINE

+ High-speed fan driven by a specially developed high-efficiency motor for powerful suction of mist
+ Mist collector with stable suction power
+ Mist collection efficiency over 99.97 % for 0.3 µm particles

*Compared with conventional products. Assuming operation of 16 hours per day and 240 days per year. Also calculated with a CO_2 emission factor of 0.424 kg / kWh.

COMPACT DESIGN

+ Directly attached to the machine body, no additional floor space necessary
+ Compact, built-in and ductless design
+ No on-site installation work necessary

Scan the QR code to view a video of *zero*FOG.
youtu.be/REnne6gEwa8

LOW MAINTENANCE

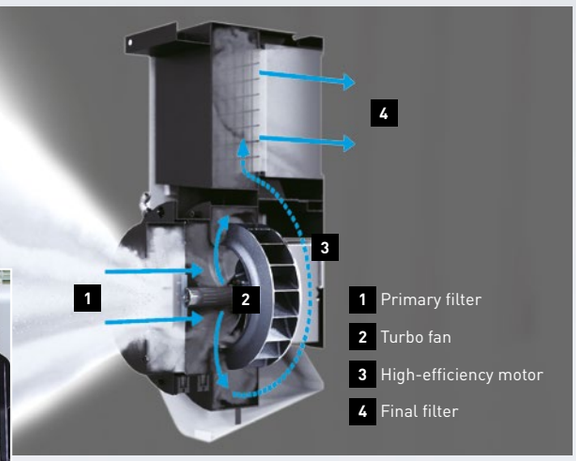
+ Automatic cleaning of primary filter by high-pressure air, no manual cleaning required
+ Easy exchange of final filter by just one touch
+ Notification of filter exchange timing

ENERGY-SAVING

+ Contributing to sustainable production due to 35 % less CO_2 emissions and electricity consumption compared to conventional products

Inside comparsion: Without mist collector

With *zero*FOG



Turbo fan made by DMG MORI achieves high suction and ventilation power

CONNECTIVITY
by DMG MORI

1 WHY CONNECTIVITY?

+ Without data you don't know where needs improvement
+ Empower your digital solutions like status monitoring system or planning with machine data and explore the potential to increase your productivity
+ Protect your investment and business through transparency

2 WHAT YOU GET?

+ Standard machine data interface – ready for DMG MORI applications or your digitization project
+ 17 machine signals for DMG MORI machines from 2013 (can be extended as an option) and minimal dataset for DMG MORI machines before 2013, 3rd party and peripheral devices
+ Data access on premises or via the cloud

"You can only manage, what you can measure."

3 YOUR PATH TO CONNECTIVITY

- Request connectivity from your DMG MORI Sales Representive
- DMG MORI checks your installed base (DMG MORI and third party machines)
- If needed – Installation of IoT*connector* or IoT*connector* flex

"Connectivity solution for the entire shop floor"

MACHINES
DMG MORI &
3rd party machines

DATA ACCESS
Access on premises or via the
cloud using all common protocols

CYBERSECURITY
Leading security
and auditing standards

HOLISTIC & INTEGRATED MANUFACTURING PROCESS CHAIN

FROM CAD / CAM TO TOOL MANAGEMENT AND SEMI-AUTOMATED PROGRAMMING

+ Safe and reliable processes thanks to simulation capabilities and reproducible process sequences
+ Integration of machine-specific technologies (adaptive measuring, grinding operations)
+ Automation of programming using feature recognition or variant programming
+ Transparency about tools & fixtures thanks to the use of a central database

PROCESS KNOW-HOW TRANSFER

+ Know-how transfer in the form of customer-specific implementations from design to production
+ Implementation of turnkey projects
+ DMG MORI Digital as a competent technology and solution partner

ADAPTIVE IN-PROCESS-MEASUREMENT

+ Creation and integration of measuring operations into CAM programming
+ Freely definable measuring paths
+ Optimization of manufacturing processes using measurement results

POSTPROCESSOR DEVELOPMENT

+ Development of machine-specific post processors
+ Development in coordination with DMG MORI application development department
+ Machine and NC code simulation

OUR KNOW-HOW – OUR PARTNERS – YOUR ADVANTAGE:

+ Largest and globally operating OEM partner: Experience from > 5,000 productive installations worldwide, > 1,500 new users per year
+ Integration of our know-how, proven in our application development department, into systems
+ Automated programming
+ Shortened ramp-up times of new component production on the machine due to optimized processes with consistent reliability

SIEMENS
Ingenuity for life

SIEMENS NX CAD / CAM (Turning / Milling / Additive)

+ SIEMENS NX CAD / CAM, the leading system for your digitization
+ Cross-technology, modular, process-oriented

HEXAGON ESPRIT CAM System

Hexagon ESPRIT CAM (Turning / Milling)

+ High performance CAD / CAM system
+ Supports all possible configurations and manufacturers of CNC machines

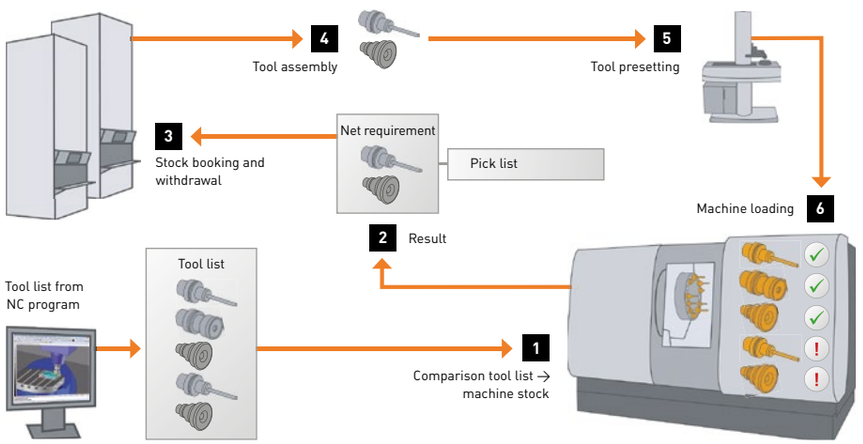
At a time when the downtime of CNC machines has to be reduced more and more in order to ensure efficient and sustainable operation, a closed but at the same time transparent process chain is increasingly important.

This is the only way to reduce errors, machine downtime and rejects to a minimum.

Using our processes, which have been tested in practice and continuously optimized, you will increase your competitiveness.

As a competent solution provider, DMG MORI Digital with its Powertools division is always there to support you, whether before, during or after the introduction of a machine or an automation solution. Please feel free to contact us.

Torsten Böck
Division Manager Powertools
DMG MOR Digital GmbH
cadcam@dmgmori-digital.com



tdmsystems

TDM Systems – 100 % tool management

+ **DIGITAL**
  Software, interfaces and data
+ **EXPERIENCE**
  30 years of know-how in development, engineering, project management, service
+ **STRENGTH**
  Of our employees, a network of partners and affiliation to the Sandvik Group

CELOS DYNAMIC*post*

DIGITAL TWIN OF YOUR SHOP FLOOR: RELIABLE BRIDGE BETWEEN CAM AND MACHINES

The newly developed CELOS DYNAMIC*post* is PC software that integrates three functions into one: post processor, machining simulation and cutting force optimization[1], which previously had to be purchased separately. CELOS DYNAMIC*post* supports all the functions unique to DMG MORI machines.

The NC program created by CELOS DYNAMIC*post* is reliable and designed to maximize machine performance. By saving the time for NC program adjustment, customers can significantly reduce the lead time from programming to machining start. Moreover, CELOS DYNAMIC*post* can replace test cuts on real machines with digital simulation. This saves energy and contributes to achieving Sustainable Development Goals.

Post processor is a function to convert a tool path (machining path) created by CAD/CAM into an NC program matching the machine tool control.

CELOS DYNAMICpost is software that creates a seamless connection between CAD/CAM and your DMG MORI machine to maximize your machine's performance. We invite you to experience safe and highly efficient machining.

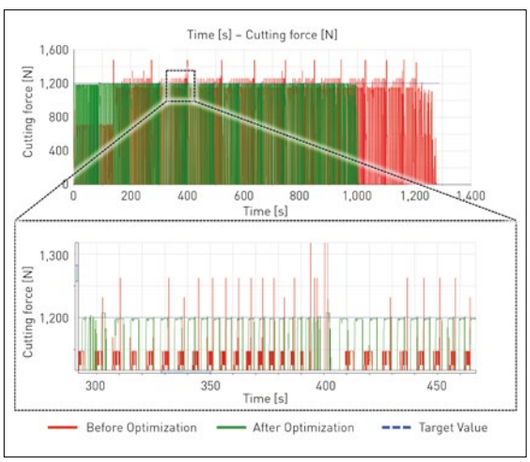
Hironari Sakamoto
General Manager
Program Simulation Software Development Department
DMG MORI Digital Co., Ltd.

I. POST PROCESSOR & HIGHLIGHTS

+ Dedicated post processor to generate NC programs that match DMG MORI machines
+ DMG MORI machines' specific functions are supported
  – Application Tuning Cycle: Large reduction in roughing time

II. CUTTING FORCE OPTIMIZATION[1]

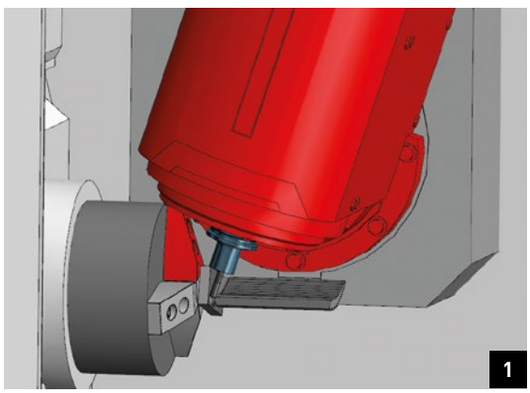
+ Cutting force optimization function to optimally control machining conditions[1]
+ Controlled cutting force reduced machining time by 20 % and tool breakage[2]
+ Simulation results of cutting force can be checked graphically
  – Identify areas with high cutting loads in advance that can lead to tool breakage



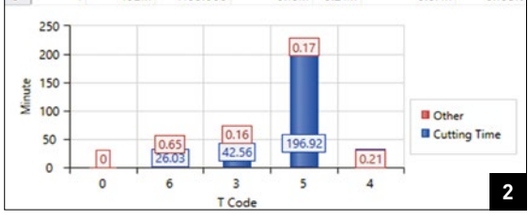
III. MACHINING SIMULATION

Accurate machining simulation for NC programs

+ Interference check function to prevent collisions during machining, interference areas are displayed in red
+ Time study function for accurate cycle time estimation
+ Comparison function between CAD-designed 3D model and simulated cutting geometry
+ Supports not only programs created with CAD/CAM, but also simulations using the MAPPS conversational programming function[3, 4]


1

	T Code	Comment	Max. Speed	Cutting Time	Other	Cutting + Other	Percentage
1	0	-	0.000	0.00M	0.00M	0.00M	0.001%
2	6	16R2EM	2228.000	26.03M	0.65M	26.68M	9.998%
3	3	8BEM	5968.000	42.56M	0.16M	42.72M	16.008%
4	5	6BEM	5968.000	196.92M	0.17M	197.08M	73.855%
5	4	10EM	4138.000	0.16M	0.21M	0.37M	0.138%



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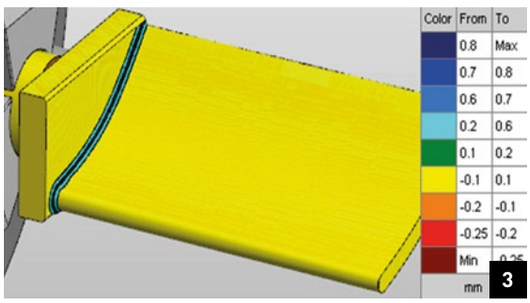


3

CELOS DYNAMIC*post* is available for these models:

+ **5-axis machining** – DMU 50 3rd Generation, DMU monoBLOCK-Series, DMU duoBLOCK-Series, DMU Gantry-Series, DMU eVo-Series, DMU H-monoBLOCK-Series
+ **Turn-Mill center** – NTX Series
+ **Horizontal machining center** – NHX Series

Supported models will be expanded sequentially

Post processor compatible CAD/CAM:

SIEMENS NX, Mastercam

Supported CAD/CAM will be expanded sequentially

[1] Only available in Optimization Edition
[2] The values listed may not be obtained depending on the type of machining
[3] SIEMENS conversational programming software, ShopMILL, and ShopTURN are not supported
[4] Can also be used for NC programs created with your own CAD/CAM software

DMG MORI DIGITAL TWIN – VALUABLE CROSSOVER BETWEEN THE DISCIPLINES

DMG MORI Digital Twin is the digital replica of your individual DMG MORI machine tool. This replica contains the work area with all components, including all functionalities such as movement and control functions as well as the NC and PLC and their cycles. From this, the DMG MORI Digital Twin creates integral additional benefits from three perspectives:

DEVELOPMENT

Your DMG MORI machine, developed sustainably and at an accelerated pace. Perfectly tailored to your individual needs.

CUSTOMER

As a product for immediate use of the digital twin, for example for program optimization, quote management, or detailed PRODUCTION PLANNING.

SERVICE

The DMG MORI Digital Twin creates the basis for data- and knowledge-based services and maximum process performance throughout the entire lifecycle.

YOUR BENEFITS

+ **40 % faster production ramp-up –** carry out unproductive activities digitally
+ **Up to 30 % reduction in costs** less testing on the machine
+ **100 % collision-free** complete digital simulation and optimization

DMG MORI DIGITAL TWIN – VIRTUAL TO REAL CUSTOMER BENEFITS

The DMG MORI Digital Twin represents a program for the future within its strategic triad of automation, digitization and sustainability. The Digital Twin serves as the interface technology to strengthen all of these three pillars. Dr. Daniel Niederwestberg, Head of the Digital Twin Division at DMG MORI DIGITAL GMBH and Dr. Naruhiro Irino, Operating Officer of ADVANCED Technology at DMG MORI Co. Ltd., explain just where and how this creates concrete added value.

Dr. Niederwestberg, why is DMG MORI involved so intensely with the subject of the digital twin?

Quite simply: It has become increasingly clear that our customers are facing new and growing challenges in a quickly changing world. A shortage of skilled workers, short product lifecycles, and a greater range of variants with smaller batch sizes require more flexibility and a clear focus on the core business. At the same time, the market dynamics and a changing supply chain call for higher machine utilization, more manufacturing transparency, and the qualification of the employees to perform their tasks in a goal-oriented manner. Digital twins have fascinating features that help our customers to master these challenges.

»

DIGITAL TWIN HIGHLIGHTS

Increase in productive spindle hours

+ Shifting non-productive activities such as programming and prove-out to the virtual world
+ Prevention of machine breakdown due to collisions

Reduction of non-productive times

+ Reduction of cycle times thanks to process optimization and transparency of cost drivers
+ Prevention of waste thanks to previous simulation and simplified error detection

Qualification of employees

+ Reduced error rate thanks to early training and, if required, ongoing training
+ Simplification of complicated tasks through increased transparency

What specific benefits does the DMG MORI Digital Twin offer?

In short: The DMG MORI Digital Twin virtually lays the foundation for higher utilization rates in real terms, better process reliability, reduced unit costs, and more expert operation.

How does it do that?

First of all, the machine is made available to the customer as a DMG MORI Digital Twin shortly before making the investment decision. The prospective user is then able to create NC programs at an early stage, simulate them immediately and successively match all process parameters perfectly. At the same time, their employees can virtually get to know the new manufacturing equipment early on. The result of all these actions is that the productive added value of the new installation can be utilized on the shop floor within a short period of time.

What is the next step?

During the lifecycle of the machine, the goal is to generate sound virtual knowledge from the usage data under real-life conditions for continuous improvement. This takes place in a continuous control loop of simulation, analysis and optimization. There is a wealth of benefits to tap into. These can basically be traced back to three aspects:

1. Increase in productive spindle hours
2. Reduction in cycle times
3. Qualification of employees

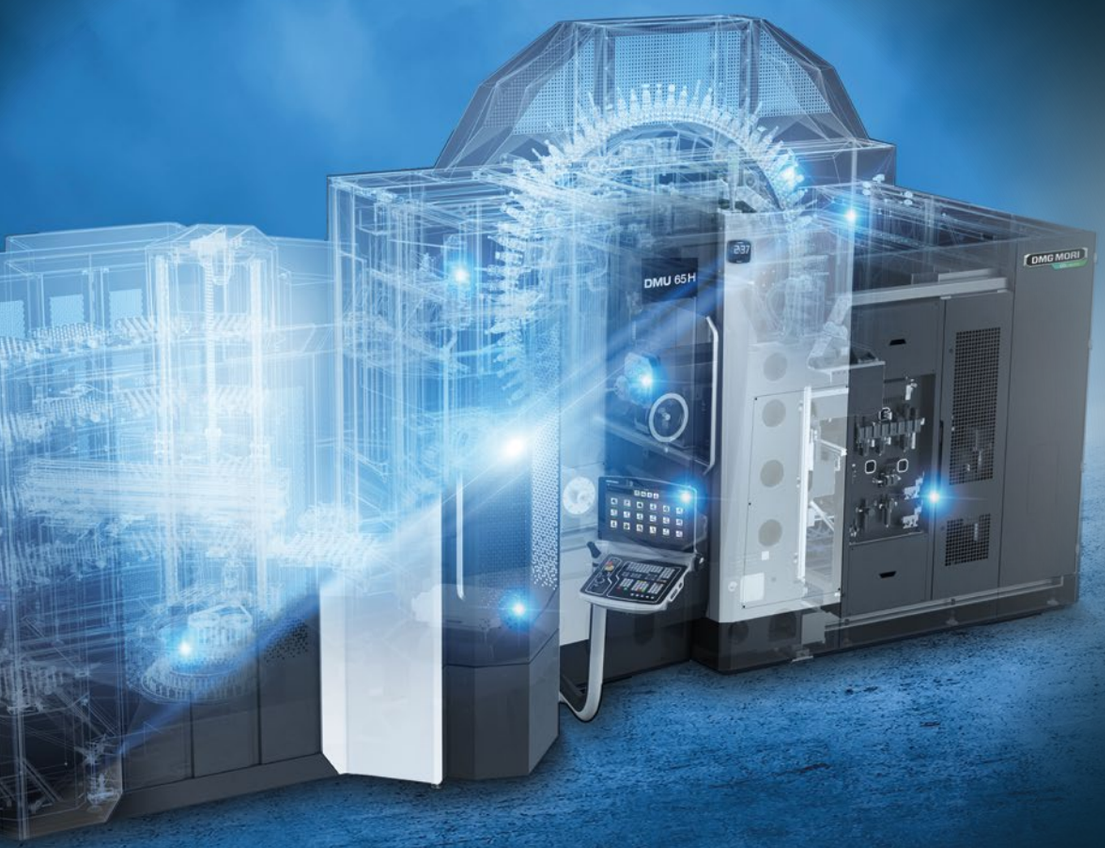
DMG MORI DIGITAL TWIN IS A 100 % REPLICA OF THE MACHINE, PROCESS AND COMPONENT

Dr. Irino, where exactly does "Digital Twin Test Cut" play a role?

The DMG MORI Digital Twin maps the dynamic machining conditions of an existing machine tool in a digital space. Where it would otherwise be necessary to perform time-consuming test cuts, the Digital Twin Test Cut allows us to virtually map each manufacturing task in a realistic way before

The DMG MORI Digital Twin enables every customer to use their machine and automation for exactly what they bought it for: 24/7 manufacturing of high-quality components in a self-learning ecosystem.

Dr. Daniel Niederwestberg
Head of the Digital Twin Division
DMG MORI Digital GmbH, Pfronten



DMG MORI TEST CUT HIGHLIGHTS

+ Simulation instead of real machines
+ Safe test machining and fast results
+ No workpiece or tool costs
+ Low effort for estimating cycle times

implementation. It is then possible to precisely simulate, analyze and consequently optimize the machining results, including the cycle time. This digital service focuses less on the early decision-making phase and more on the manufacturing challenges faced by customers in their daily work.

And that works at the push of a button?
It is not as easy as that. In addition to the DMG MORI machine, the workpiece, tools, fixtures and the NC program also need to be prepared and set up in virtual space. The results are generally delivered to the user within two working days. Compared to reality, this saves time and costs for employees, materials, tools and materials. This in turn reduces the environmental impact.

In addition, we are able to proactively improve workpiece quality "in the loop" and significantly reduce production times through optimized process parameters.

Does the service offer apply from 3-axis to 5-axis or are there any restrictions?
There are basically no restrictions whether it is a 5-axis machine or a mill turn machine if the machine is available as a DMG MORI Digital Twin. Currently, various processes such as gear hobbing and skiving have been realized. We are also trialling a supercomputer, Fugaku, at the RIKEN Center for Computational Science in Kobe, Japan, to simulate a five-axis process in free-form surface machining, which would take 8 hours in the real machining can be done digitally in just 10 minutes.

Thank you very much for the interview

«

The DMG MORI Digital Twin enables open interaction of machines and processes for perfect planning, control, simulation and analysis.

Dr. Naruhiro Irino
Operating Officer of Advanced Technology
DMG MORI Co. Ltd., Iga

my DMG MORI
FAST SUPPORT IS OUR MISSION

The most important thing for the future development of *my* DMG MORI is you! Because no one is in a better position to judge what is really important than the people who use our customer portal every day. Their wealth of feedback is the basis of new ideas! We have taken this to heart and developed three new functions for *my* DMG MORI that will really help you move forward!

> 75 %
OF OUR CUSTOMERS ALREADY USE *my* DMG MORI

YOUR 3 NEW FEATURES

NEW

1. CONTINUOUS DIRECT CONTACT – THROUGH TO THE SOLUTION

+ Continuous availability of service experts
+ Add photos, documents or files via direct messaging at any time

NEW

2. ACCEPT OFFERS WITH ONE CLICK

+ Accept, change or reject offers
+ Time savings thanks to simplified processes
+ History of all offers at a glance

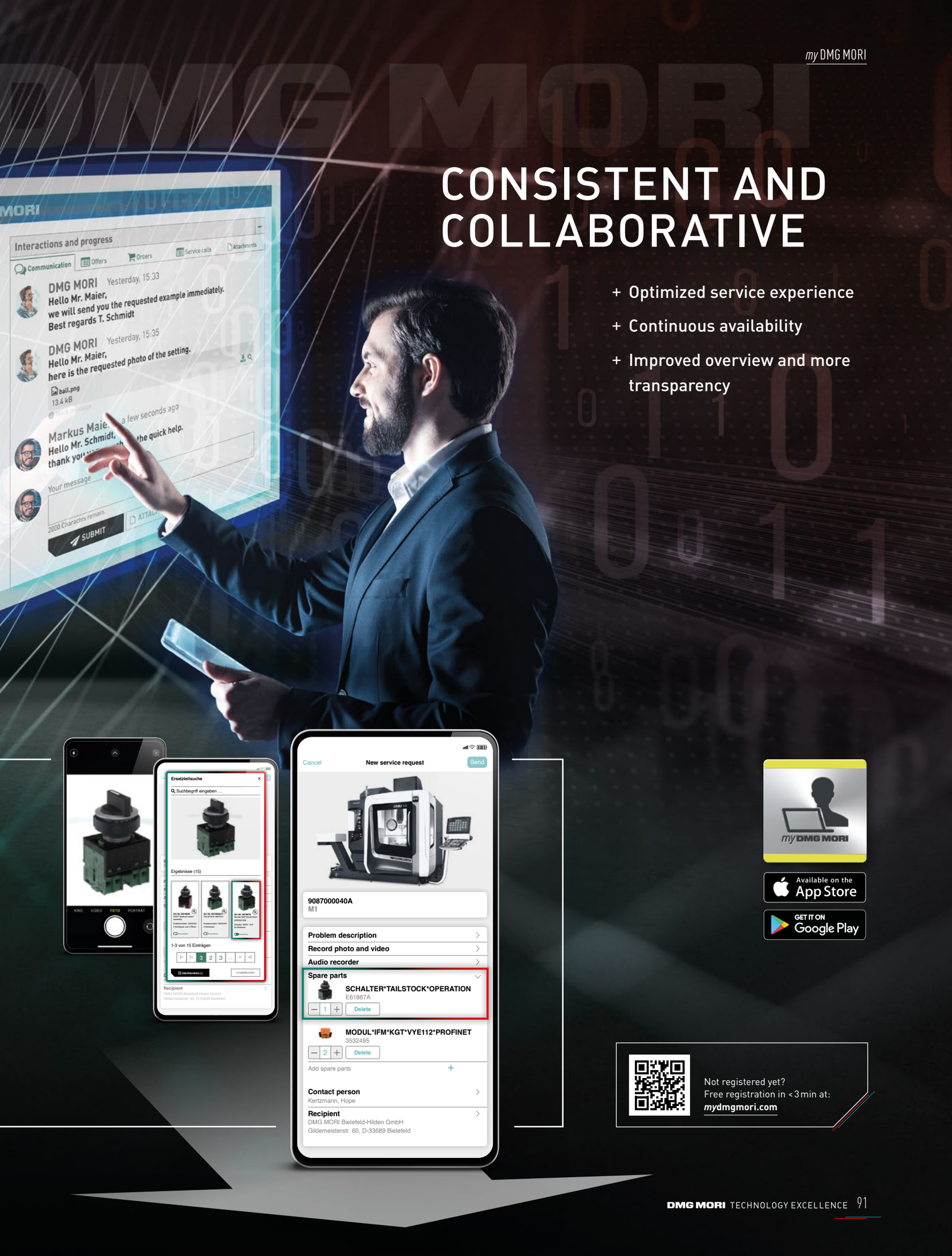
NEW

3. IDENTIFY REPLACEMENT PARTS

+ Identify and order replacement parts simply by uploading a photo or scan
+ Integrated acceptance of service requests

CONSISTENT AND COLLABORATIVE

+ Optimized service experience
+ Continuous availability
+ Improved overview and more transparency



myDMG MORI

Available on the App Store

GET IT ON Google Play

Not registered yet?
Free registration in <3 min at:
***my*dmgmori.com**

DMG MORI GREENMODE – PURE ENERGY EFFICIENCY

ENERGY EFFICIENCY AS STANDARD*

COMPONENTS

1. Structure-optimized machines
2. Braking energy recovery
3. LED lighting
4. Frequency regulated pumps and efficient motors
5. Energy-efficient cooling units
6. Zero sludge chip conveyor
7. *zero*FOG oil mist separator
8. Automated switching on and off

PROCESSES

9. AI-based chip disposal
10. Energy dashboard

*Depending on the type of machine

UP TO
40 %
ENERGY SAVING**

The DMG MORI energy certificate for your state subsidies – we would be pleased to put you in touch with a subsidy specialist.

NEW

GREENMODE – ENERGY PACKAGE AS AN OPTION

COOLANT FLOW CONTROL
→ 22 % ENERGY SAVING

The smart pressure and flow controller

AIR CONTROL
→ 5 % ENERGY SAVING

New on-off switching with monitoring

FEED CONTROL
→ 3 % ENERGY SAVING

Intelligent performance-related feed

** Compared to previous machine models

*** Example calculation according to German standard prices, depending on type of machine (0.34 cent/kWh; 3,000 machine hours/year)

1.7 YEAR
AMORTIZATION PERIOD***

*DMG MORI **GREEN**MODE is our solution for maximum energy efficiency for all machines.*

Alfred Geißler
Managing Director
DECKEL MAHO Pfronten GmbH

VERTICAL MULTI-PROCESS GRINDING

For over 25 years, Schittl GmbH from Deutsch Kaltenbrunn in Austria has specialized in high quality machining. With many years of experience and professional expertise, the approximately 50 engineers guarantee top-class results even for the most demanding customer projects. Amongst other things, Schittl supplies customers in the fields of automation and energy with precision components made of a wide range of materials. The team now achieves its good machining results on 15 CNC production centers from DMG MORI. Schittl uses a wide range of machines, from automated CMX 70 and DMU monoBLOCK universal machining centers to DMF traveling column machines and a DMU 340 Gantry to CTX beta TC and CTX gamma TC series turn-mill centers. The latest addition in 2022, and a highlight on the shop floor, is a TAIYO KOKI CVG 13, also from DMG MORI. The vertical grinding machine enables the company to adopt completely new approaches to the manufacturing process with the highest precision.

Process integration – accelerated manufacturing and increased quality

As a traditional manufacturing service provider, Schittl continues to receive increasingly demanding orders. "Particularly after the economic crisis in 2008, it became even more important to remain competitive," explains Roman Gradwohl. He has been the head of his father-in-law's company since 2011. The need to manufacture high-quality and complex components has required extensive investment – in the further training of the company's specialist staff as well as in modern manufacturing technology. "Investments like this always need to be accompanied by tangible progress." By this, he is referring to integrated processes such as 5-axis simultaneous machining including high metal removal rates and integrated turn-mill machining. "Our goal is to accelerate the manufacturing process and ideally to continuously increase the quality."

Schittl kick-started the new direction towards high technology with two DMU 85 monoBLOCKs. The simultaneous 5-axis machining centers enabled the team to manufacture efficient and precise components of diameter up to ø 1,040 mm and with complex geometries. These were followed by a DMF 360 and a DMU 340 Gantry for even larger workpieces. "The cutting performance of the DMF 360 is so high that we were able to almost halve the machining time," reports Roman Gradwohl. Schittl manufactures high-precision machine beds on a large gantry machine with travels of 3,400 × 2,800 × 1,250 mm. "For us, it is the perfect combination of precision, size and cutting performance."

5-AXIS SIMULTANEOUS MACHINING FOR COMPLEX LARGE COMPONENTS

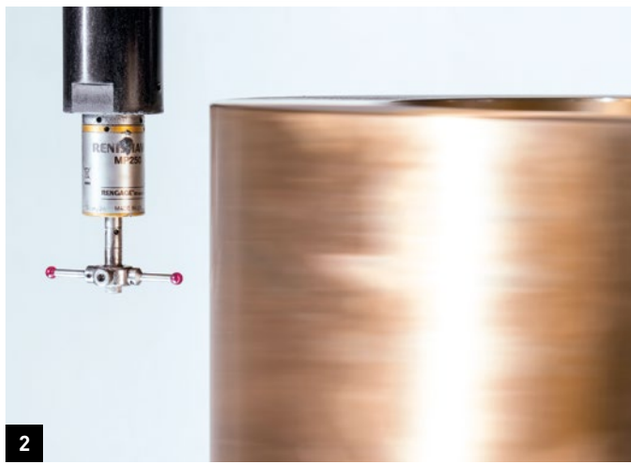
»

The final machining of high-precision connecting components like these takes place on the CVG 13 so that accuracies of up to 2 µm can be achieved.

Vertical grinding is the method of choice, particularly for large and heavy components up to a diameter of 1,350 mm and a length of 700 mm. We have been able to achieve accuracies of 2 µm on the CVG 13.

Roman Gradwohl
Managing Director
Schittl GmbH


1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1. Suitable for cylindrical ID and OD grinding as well as face grinding
2. In-process measuring guarantees perfect results

TAIYO KOKI

CVG 13 – HIGH PRECISION VERTICAL GRINDING

HIGHLIGHTS

+ Two highly stable grinding spindles 180° offset, incl. 6-position grinding wheel changer HSK-E100:
  – Highly stable external grinding spindle, max. grinding wheel ø355 mm.
  – Highly stable internal grinding spindle, max. grinding wheel ø250 mm
+ Full B-axis with 0.0001° spindle positioning
+ C-axis function incl. CAM software for cam grinding, etc.
+ Twin pallet changer for short set-up times (optional)

Automated 5-axis machining for unmanned night shifts

Schittl was able to achieve automated 5-axis machining on a CMX 70. Roman Gradwohl says about the added value: "In the area of small parts production in batch sizes up to 100, the PH 150 pallet handling system provides great support because we can set up several pallets for unattended production and also operate the machine during unmanned night shifts."

Schittl relies on turn-mill centers from the CTX beta TC and CTX gamma TC series for turning, finishing components in one operation on all 6 sides. Rough turning and milling are followed by grinding to achieve the required precision. A corresponding DMG MORI technology cycle is ideal here for small workpieces. However, the CTX gamma 2000 TC is primarily used to machine components up to 700 mm long and up to ø700 mm in diameter. "Large and heavy parts like this can be ground better in a vertical position because gravity isn't influencing the results," Roman Gradwohl says, referring to the CVG 13.

CVG 13 – vertical grinding to 2 µm

With a maximum grinding diameter of ø1,350 mm and a workpiece height of up to 700 mm, Schittl can use the CVG 13 for an extremely broad range of components, such as spindle heads or worm gear components. "We have been able to document accuracies of up to 2 µm for the components with our measuring machine. This is ideal for

CVG 13 – VERTICAL GRINDING OF WORKPIECES UP TO ø 1,350 mm TO WITHIN 2 µm

the workpieces that we produce on the CTX gamma 2000 TC, for example," comments Roman Gradwohl. The multi-process CNC vertical grinding machine is suitable for cylindrical grinding of internal and

external diameters as well as face grinding. "In-process measuring guarantees flawless results."

Vertical grinding integrated into the manufacturing process

Overall, the CVG 13 delivers such good results that Schittl has designated complete processes to the grinding machine, as Roman Gradwohl explains: "We use the turn-mill centers for roughing and finishing to leave a grinding allowance. The same applies to fits. The CVG 13 then delivers the absolute precision." This allows the multi-process CNC grinding machine to be optimally utilized.

Investments in progress also in the future

The investment in the CVG 13 achieved precisely the long-term progress that Roman Gradwohl expects from every investment. He also intends to follow this path in the future. "An expansion of our factory is currently in the pipeline. We can then reallocate the technology areas and free up some space." Discussions about a DMU 340 Gantry are already underway and he can also imagine making another acquisition for grinding: "A CVG 9 will enable us to further expand our grinding capacity in the area of small workpieces."

«

SCHITTL GMBH FACTS

+ Founded over 25 years ago as a grinding service provider for HSS tools
+ Steady expansion of the toolmaking and contract manufacturing divisions
+ Since 2010, a focus on contract manufacturing of high-precision machine parts and tools throughout Europe, now with 50 employees
+ One of the largest and highest quality apprentice trainers in the region

SCHITTL GmbH
Präzisionswerkzeuge & Maschinenbauteile

Schittl GmbH
Gewerbegebiet 1
7572 Deutsch Kaltenbrunn, Austria
www.schittl-gmbh.at


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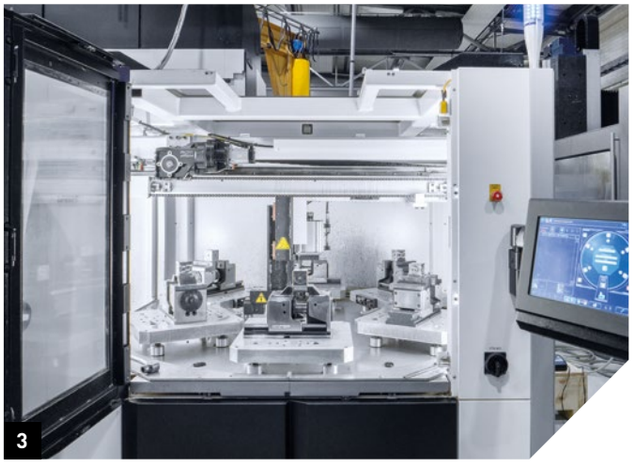
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1. Amongst other things, Schittl manufactures high-precision machine beds on the DMU 340 Gantry **2. + 3.** Schittl has been able to achieve automated 5-axis machining on a CMX 70 U with PH 150. The PH 150 has over 8 positions places for unmanned or minimally manned manufacturing.

my DMG MORI

YOUR ONLINE SERVICE MANAGER

NEW FUNCTIONS AND MORE OVERVIEW

YOUR HISTORY

YOUR MACHINES

my DMG MORI CUSTOMER PORTAL

YOUR DOCUMENTS

YOUR SERVICE REQUESTS

my DMG MORI
New functions for even more service

+ **Consistent end-to-end communication until the problem is solved**
  You can now reach your service expert until the problem is solved via *my* DMG MORI.
+ **A direct line to the service expert** with guaranteed prioritized processing.
+ **Accept offers in the portal**
  Save time and process your quotations with just a few clicks directly in *my* DMG MORI.
+ **Identify spare parts**
  You can quickly identify the spare part you need and order or request it.

*my DMG MORI is currently available in member states of the European Union, the UK, Switzerland, Norway, India, Mexico, Canada, the USA, New Zealand, Australia, Singapore and Malaysia.

You too can benefit!
Register now for free:
my DMGMORI.com

SAVE THE DATE
18 – 23/09/2023

EMO HIGHLIGHTS

+ Process Integration
+ CELOS X
+ Automation
+ World Premieres

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