THE DMG MORI MAGAZINE FOR CUSTOMERS AND INTERESTED PARTIES 2017.

DMG MORI

TECHNOLOGY EXCELLENCE

GLOBAL AND TOGETHER
REAL AND DIGITAL

Dear customers and partners,

We find ourselves in the middle of profound industrial change. Digitalization is changing our world quickly and incisively. The necessary reorientation requires fundamental development. To cope with this, we must act **globally and concertedly,** with strong partnerships and on equal terms. In this respect, DMG MORI will be an innovator and reliable partner for you.

Digital products and technologies are progressively becoming a differentiating success factor. Software is increasingly influencing the performance capability of machines and systems. The joint growth of mechanical engineering and information technology opens up new business models. With CELOS and the new, open and manufacturer-independent IIoT-platform ADAMOS, we offer a continuous, straightforward solution – from machine builders for machine builders, their suppliers and customers.

Automation is a *key* element in digital production. Automated machine tools are an integral part of future-oriented manufacture. In addition, additive manufacturing processes are being dynamically developed to industrial maturity.

All these future topics form a focal point for DMG MORI. This applies equally to the further expansion of our Technology Excellence in the core markets of Aerospace, Automotive, Die & Mould and Medical. DMQP (DMG MORI Qualified Products) Partner Management for the highest quality of peripheral products and the "Customer First" programme for further increasing service satisfaction are also important pillars of our future strategy.

DMG MORI is in an excellent position. Together with you, revered customers and partners, we will proactively shape the digital change. We would like to share knowledge with you, benefit from mutual strengths, and develop complete solutions. Together with you, we will press ahead with the factory of the future. **Tangibly and digitally!**

Dr. Ing. Masahiko Mori
President
DMG MORI COMPANY LIMITED

Christian Thönes
Chairman
DMG MORI AKTIENGESELLSCHAFT

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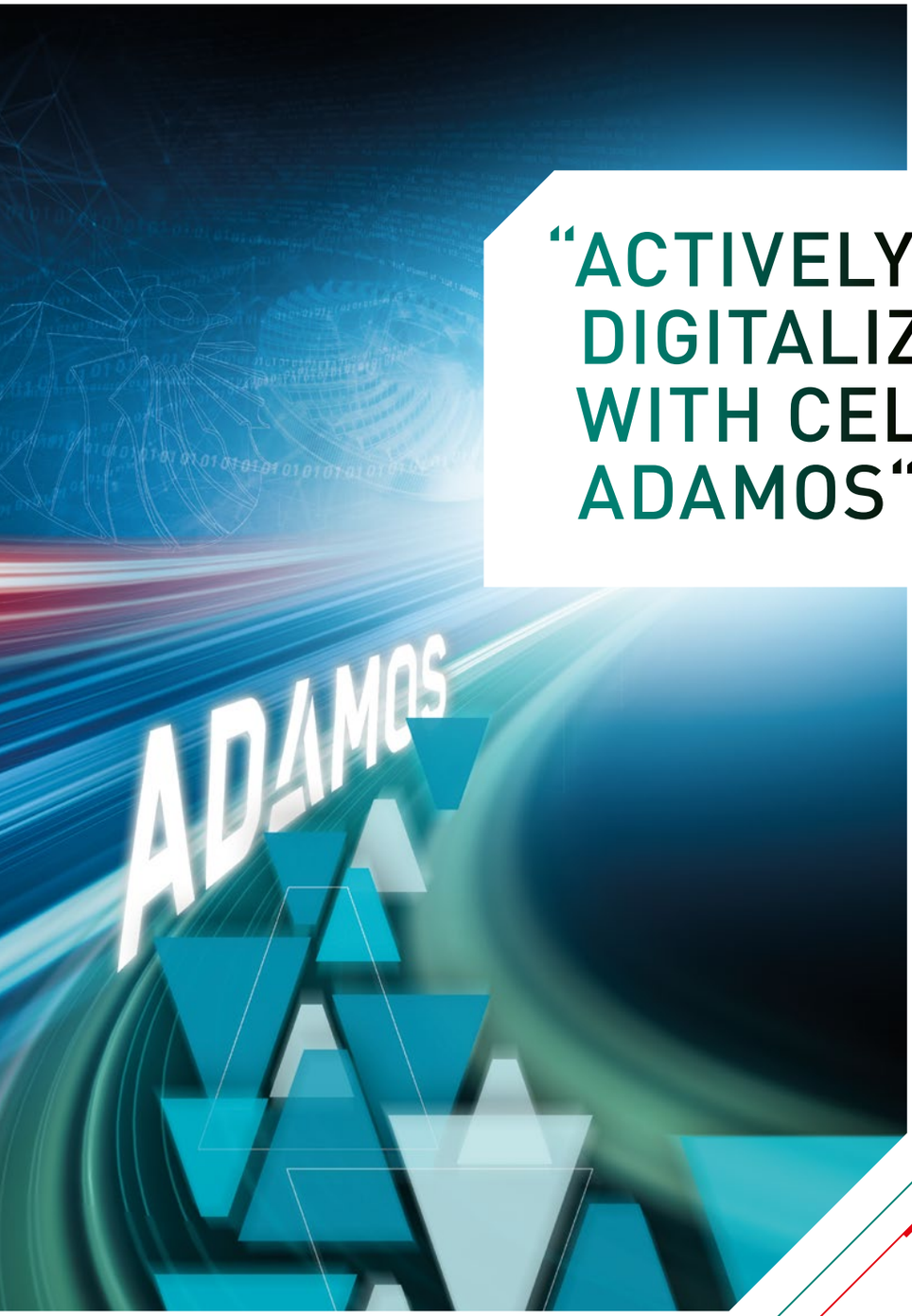
The future of manufacturing technologies is becoming increasingly digital. DMG MORI represents progress and is expanding its digital solutions. On the one hand, CELOS is being expanded to become an open, continuous ecosystem for manufacturer-neutral Digital Factories. On the other, the strategic alliance, ADAMOS, with around 200 experts will be launched on 1st October 2017. This joint venture with equal partners from the mechanical engineering and information technology sectors offers an open, manufacturer-neutral platform for the futuristic topics of Industry 4.0 and the Industrial Internet of Things (IIoT). Christian Thönes, Chairman of DMG MORI AKTIENGESELLSCHAFT, explains the details of the digital change.

CELOS as a new ecosystem for the Digital Factory, ADAMOS as a new IIoT-Alliance – it's all happening at DMG MORI…

Our future is built on traditions. We have made our machine tools fit for digitalization with the CELOS APP-based control and operating software. A good 10,000 DMG MORI machines have already been equipped with CELOS and are on the market – well over 100 machines from our product range speak CELOS. The number is continuously increasing. Today, we already support networked intelligent production with 26 APPs and exclusive DMG MORI technology cycles and Powertools. Digital products and technologies are progressively becoming a differentiating success factor. We are therefore expanding CELOS with "Open Connectivity" to become an open ecosystem for the Digital Factory. In addition, we have founded the strategic alliance ADAMOS together with partners from the mechanical engineering and information technology sectors.

What can customers expect from "Open Connectivity"?

A fundamental factor en route to the Digital Factory is the new CELOS NET*box* as an open IIoT-Connector, even for third-party machines. With CELOS PRO*tab*, we are also offering our customers a "mobile assistant" for continuous use of the CELOS functionality in the whole shopfloor area. CELOS Cockpit, also new, simulates an intelligent



"ACTIVELY SHAPING DIGITALIZATION WITH CELOS AND ADAMOS"

With ADAMOS we are offering an open network with leading mechanical, production and software/IT know-how – from machine builders for machine builders, their suppliers and customers!

Christian Thönes
Chairman
DMG MORI AKTIENGESELLSCHAFT

manufacturing control center. In conjunction with CELOS-equipped machines, we are therefore providing comprehensive solutions for digital production, with which customers can shape their individual Digital Factory one step at a time or as a whole.

How has it been possible to launch ADAMOS with so many partners so quickly?
As a machine builder, we understand our customers' requirements and know what matters. Coupled with the sector knowledge of Software AG, this has given rise to a strong alliance. The instigators are DMG MORI, Dürr and Software AG. Our common goals quickly met with enthusiasm, so that as soon as the joint venture was signed we were able to obtain additional partners in the form of Carl Zeiss AG and ASM right at the outset – what is more, they are all global market leaders in their respective fields. With ADAMOS, strong partners promoting digital integration are working on equal terms. What unites us are common goals and the firm conviction that the challenges of digitalization can only be overcome with strong partnerships. When it comes to digitalization, the mechanical and systems engineering industry itself must set standards and promote development. This can only happen globally and concertedly!

What are the objectives of the ADAMOS Alliance?
The name itself speaks volumes! ADAMOS stands for Adaptive Manufacturing Open Solutions. Adaptivity in production and openness in structures are two important pillars of the strategic alliance … Germany's first alliance of renowned industrial software companies intends to establish ADAMOS as a global industry standard and additionally recruit further machine builders as partners. ADAMOS is specially tailored to suit the requirements of the mechanical and systems engineering industry and its customers. The open IIoT-platform is manufacturer-neutral and combines the latest IT technology with leading sector knowledge. »

... open always sounds promising ...

Openness is essential for the success of the alliance from many different perspectives. It enables machine builders to offer their customers tried-and-tested solutions for digitally integrated production with little effort. Mechanical engineering companies, to which ADAMOS as a platform service provider guarantees data autonomy and access to leading software solutions, are expected to benefit from this. ADAMOS offers tried-and-tested solutions for digitally integrated production with little effort. The jointly developed ADAMOS platform with around 200 experts will be available worldwide from 1st October 2017. All machine and system builders are invited to participate in ADAMOS as equal partners.

Medium-sized companies in particular still appear to be reticent when it comes to digitalization.

Reticence still prevails. However, from our day-to-day sales and service work, we also know many businesses which already have specific ideas or have even entered into detailed project planning. What users have been missing up to now has been IIoT-compatible machines and intelligent software systems for digital workflows on the shop floor. And there has been no continuous IIoT-infrastructure for digital production or the recording and analysis of data.

FROM "OPEN CONNECTIVITY" TO THE DIGITAL BUSINESS MODEL

At EMO, we will be demonstrating specific solutions for CELOS Machine, CELOS Manufacturing and the Digital Factory based on ADAMOS and our CELOS ecosystem – specially focused on small and medium-sized companies.

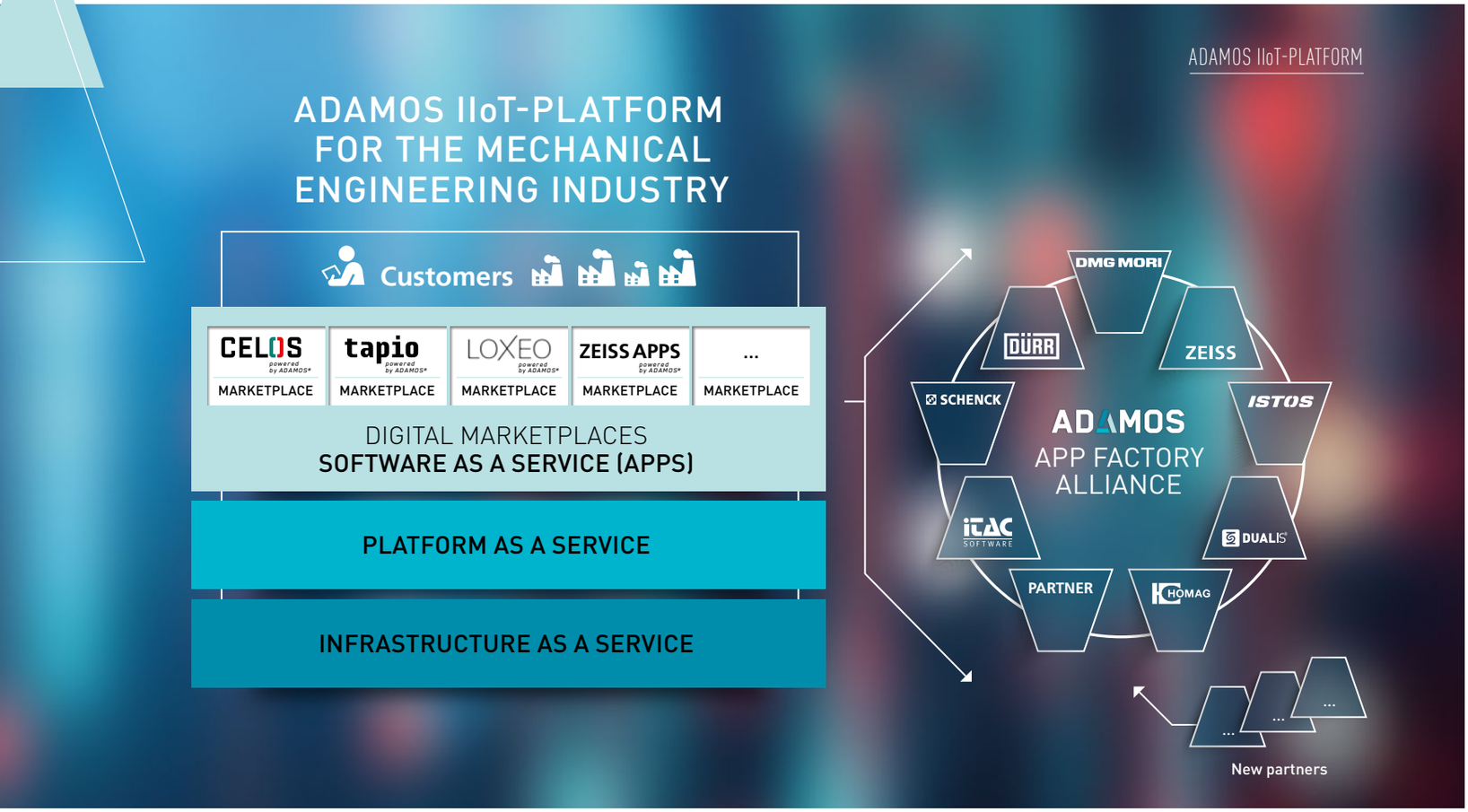
What services can customers expect from ADAMOS?

ADAMOS has two pillars. On the one hand, the ADAMOS IIoT-platform offers its customers basic functionalities such as "Platform as a Service" (PaaS). It provides IT services for production, and saves and analyses production-related data. The ADAMOS platform enables cross-company networking of production processes. In all cases, these services are based on the total mechanical engineering, production and software know-how of the ADAMOS alliance.

On the other hand, as a second pillar, the ADAMOS App Factory Alliance concentrates the technological know-how of all partner companies. This results in a development environment in which APP innovations and technology standards can be implemented jointly, quickly and efficiently.

The whole network of partners and customers will benefit from this. In future, users will obtain machines as well as complete IIoT and software solutions from "a single source" and be able to use their data with confidence. Standards and continuous end-to-end solutions will enable machine and system builders to secure their leading position in the digital age.

In doing so, ADAMOS itself has no direct contact with the user. Market access and the individualization of digital products and software systems takes place exclusively via the ecosystems of the manufacturers associated with ADAMOS. In our case, therefore, the CELOS ecosystem, which we will now expand and develop further on the basis of the future-proof and secure ADAMOS infrastructure, is oriented towards the market and the customer.



There are therefore clear advantages for ADAMOS partners. You have also described how customers will benefit. How do you see the role of your supplier companies in the digital world of ADAMOS?

A central function of ADAMOS is the provision of a continuous infrastructure for recording and evaluating data. To this end, we need intelligent analysis tools in order to derive information from the data and, from this, to generate specific statements. It matters not whether this is for predictive maintenance or as a basis for adaptive production processes.

Suppliers can, of course, also very easily connect via the standardized ADAMOS interfaces and, for their part, can then concentrate on the digital conformance of their components instead of having to worry about connectivity. With ADAMOS, this is also available from a single source for suppliers. Everyone benefits: machine builders, suppliers – but, above all, our customers!

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ADAMOS – ADAPTIVE MANUFACTURING
OPEN SOLUTIONS

MECHANICAL ENGINEERING INDUSTRY SHAPES DIGITALIZATION

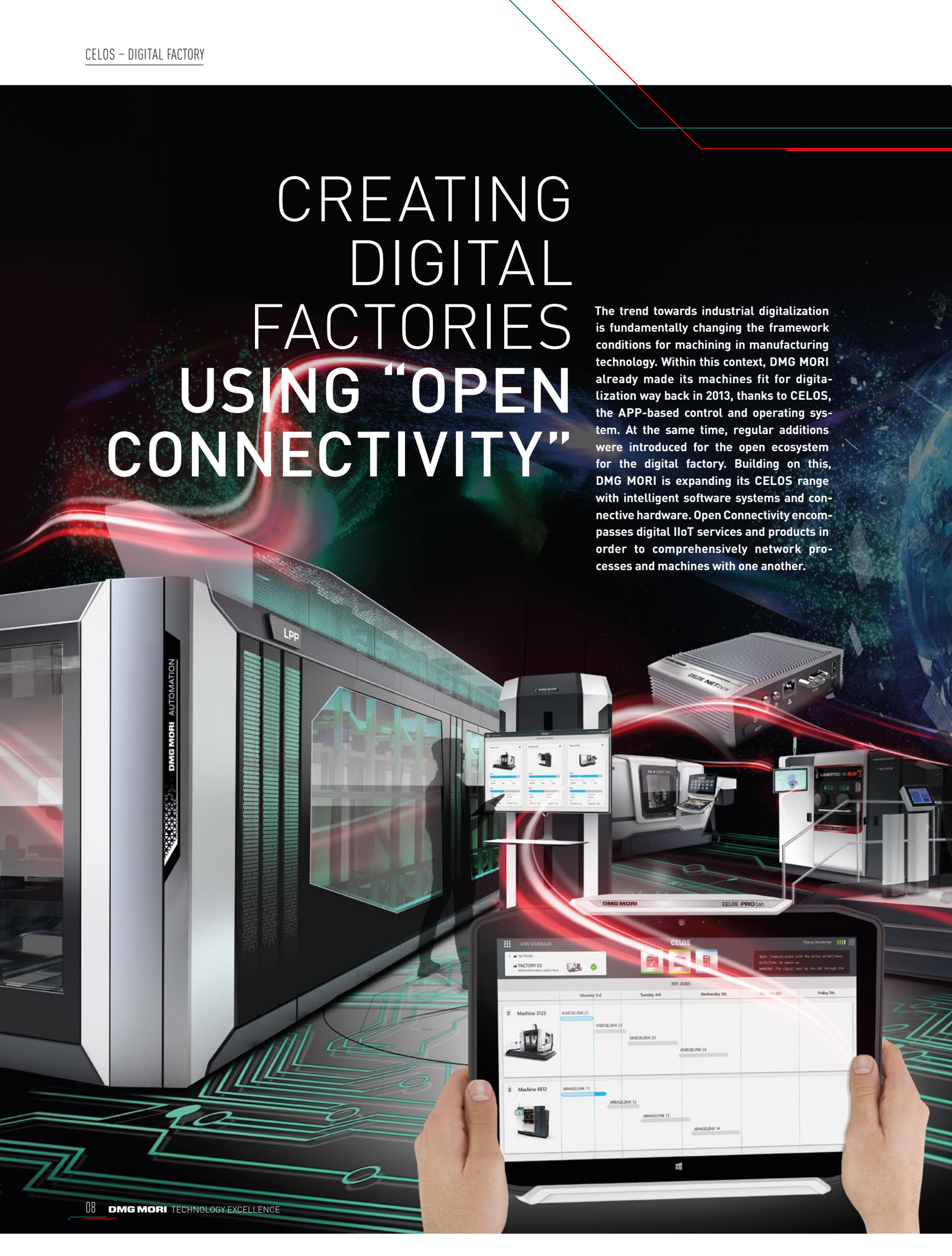
FACTS

1. **Global Alliance:** DMG MORI, Dürr, Software AG, ZEISS and ASM pool their resources in ADAMOS for Industry 4.0 and are ready to welcome further partners
2. **Open Platform:** The ADAMOS IIoT-platform is manufacturer-neutral, linking cutting edge IIoT-technology and advanced industry knowledge
3. **Broad App Portfolio:** The ADAMOS App Factory Alliance focuses on the technological expertise and industry knowledge of the partners for rapid joint development of apps
4. **Digital Marketplaces:** The partners promote their digital competences to their customers and individual marketplaces under their own brand identities (for example CELOS powered by ADAMOS)
5. **Strong Set-up:** ADAMOS GmbH and the ADAMOS App Factory Alliance will be launching on 1st October 2017 with around 200 experts, 5 digital marketplaces and more than 30 apps
6. **End-to-End:** With ADAMOS, DMG MORI offers its customers, partners and suppliers a complete digitalization strategy

You can find more
on the subject of ADAMOS at:
www.adamos.com

CREATING DIGITAL FACTORIES USING "OPEN CONNECTIVITY"

The trend towards industrial digitalization is fundamentally changing the framework conditions for machining in manufacturing technology. Within this context, DMG MORI already made its machines fit for digitalization way back in 2013, thanks to CELOS, the APP-based control and operating system. At the same time, regular additions were introduced for the open ecosystem for the digital factory. Building on this, DMG MORI is expanding its CELOS range with intelligent software systems and connective hardware. Open Connectivity encompasses digital IIoT services and products in order to comprehensively network processes and machines with one another.



The digital products of CELOS ecosystems enable consistent customer-specific end-to-end solutions.

Dr. Holger Rudzio
Managing Director
of DMG MORI Software Solutions GmbH

Since 2013, CELOS has played the main role in the digitalization road map of the DMG MORI group. Meanwhile, over 10,000 CELOS machines have been brought to market. Significantly more than 100 high-tech machines from DMG MORI's portfolio already speak CELOS, whereby overall availability will be implemented in the short term.

Moreover, the number of CELOS APPs has steadily grown over the years. Thanks to the 10 new APPs, a total of 26 CELOS APPs is now available for implementation, machine configuration and digital interaction in the workshop. Along with CELOS, customers receive intuitive solutions as an integrated basis for paperless digital manufacturing.

CELOS ecosystem with a new perspective
Furthermore, DMG MORI has consistently developed its CELOS operating and control system into an open and integrated ecosystem for digital production. Among other aspects, digital workflows for adaptive manufacturing planning and integrated tool management lie at the heart of the current version of CELOS.

At the same time, DMG MORI is working on open connectivity and provides specific products, such as the CELOS NET*box* and the CELOS PRO*tab* for continuous networking during production.

On the "Path of Digitalization"
From vision to reality
DMG MORI's current digitalization initiatives are orientated towards the vision of the digital factory. The digital factory is characterized by adaptive factory structures. Its distinguishing feature is the automated, data-based adjustment of processes in production to suit changing conditions.

"In particular, we are focusing here on small and medium-sized companies", emphasizes Dr. Holger Rudzio, Managing Director of DMG MORI Software Solutions GmbH. The reason, in his opinion, is the opportunity for gradual and, above all, individualised entry into digital manufacturing and production.

At the same time, the service commitment no longer only applies to its high-tech machines. Existing machines from DMG MORI and other manufacturers can now also be networked with the CELOS ecosystem.

CELOS Machine with "Open Connectivity"
This means that, from now on, third-party machines, machines from complementary technology areas and manual workstations can also be integrated into the CELOS network. Older machines can even be connected to a certain extent. The new "open connectivity solutions" are responsible for that.

»

DMG MORI has therefore incorporated a mobile Wizard and an intelligent IIoT connector into the digital portfolio, thanks to the new CELOS PRO*tab* and CELOS NET*box* respectively.

"Thus, virtually each machine and workstation can now be upgraded as a member of the CELOS network; this in turn opens up completely new degrees of freedom for our customers to optimize their digital workflows", promises Dr. Rudzio.

With CELOS Manufacturing workflows are under control

As a result, even the latest software developments are decisively gaining in importance and added value. This is because it is now finally possible, on the basis of a continuous data flow in the shop floor area, to enable workflows and processes to be digitally mapped, controlled, and optimized.

Advanced digital job order planning

An example of this is FACTORY PLANNING, the interactive planning tool on CELOS with its standardized interfaces for transferring orders from your ERP system. "Several factors must be taken into account for optimum planning of order processing during manufacturing, such as machinery, material and tool availability and set-up costs.

STEP BY STEP TOWARDS THE DIGITAL FACTORY

Due to the increasing number of orders, this task is difficult to carry out manually", Dr. Rudzio explains by way of introduction. In contrast, existing orders – taking into account current resources and capacities – can be centrally scheduled and rescheduled (if necessary) with software assistance using FACTORY PLANNING on CELOS.

FACTORY PLANNING takes into account the existing structure of the order, as well as the available capacity of the machines and shift schedules, even when manually rescheduling orders.

Continuous tool management

A further example of the new digital CELOS workflows is "digital tooling" from DMG MORI. All tool information necessary for the manufacturing process is managed centrally and is available throughout the entire production process: during NC programming and simulation as well as during set-up and loading through to in-process measuring.

At the same time, different systems can access the tool data simultaneously. Also, all process-related data are stored in central tool management, which makes the history of a tool transparent and fully comprehensible.

Step by step or holistically towards the digital factory

Within the overall picture of the "Path of Digitization", we at DMG MORI either provide our customers with the opportunity to realize comprehensive customised end-to-end-solutions with digital products and software systems of the CELOS ecosystems, or enable your company to transform, step by step and success by success, into a digital

CELOS MANUFACTURING

CELOS WITH HEIDENHAIN

HIGHLIGHTS

+ **CELOS from DMG MORI** with 21.5" ERGO*line* and **HEIDENHAIN TNC 640**
+ 22 CELOS APPs available for introduction
+ **Global Program Setting** – subsequent adjustment of a CAM NC program directly on the machine
+ **DXF converter** – CAD import
+ Tool-orientated machining
+ Simpler and more efficient use of radial facing slides

PLANNING | **PREPARATION** | **MANUFACTURING**

JOB MANAGER
JOB SCHEDULER
TECH CALCULATOR
ORGANIZER
MESSENGER
COCKPIT (NEW)
FACTORY PLANNING (NEW)

JOB ASSISTANT
3D PART ANALYZER (NEW)
ROBO2GO (NEW)
TOOL HANDLING
TOOL AGENT (NEW)
TOOL ANALYZER (NEW)
CAD/CAM VIEW
DOCUMENTS

SURFACE ANALYZER (NEW)
PALLET MANAGER
PALLET CHANGER
CLAMP CHECK (NEW)
CONTROL
STATUS MONITOR
CONDITION ANALYZER (NEW)
PERFORMANCE MONITOR (NEW)
ENERGY SAVING
SERVICE AGENT
NETSERVICE

CELOS APPS

26 CELOS APPS, INCLUDING 10 NEW

Find out everything about our 26 CELOS APPs at: **celos.dmgmori.com**

- PRODUCTION
- CONFIGURATION
- UTILITIES
- SUPPORT
- MACHINE VIEW

factory – for high transparency, effective processes, maximum availability and maximum production security.

Digital expertise for workshop and production engineering

"The software products and services from DMG MORI help our customers standardize and automate processes that are performed individually", according to Dr. Rudzio. Necessary information for production engineering, planning, and manufacturing is also correspondingly presented consistently, clearly and in a way that it is easy to understand.

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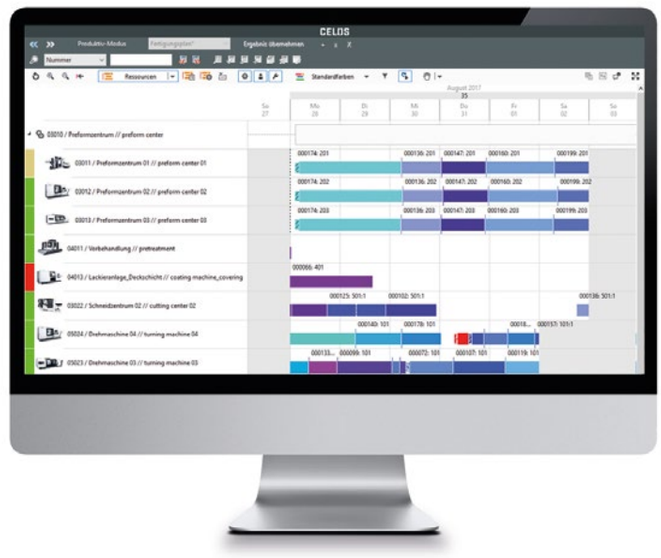


FACTORY PLANNING

ADVANCED PLANNING AND SCHEDULING

NEW

HIGHLIGHTS

+ **Organisation of orders,** taking into account various factors such as priorities, linked processes, maintenance, etc.
+ **Standardized interfaces** for transferring orders from your ERP system
+ **Connection between Office Floor and Shop Floors and CELOS PRO*tabs***

NEW

DIGITAL TOOLING

DIGITAL TOOL MANAGEMENT IN PRODUCTION ENGINEERING

HIGHLIGHTS

+ Use of the required **tool information during the entire manufacturing process**
+ **Seamless digitalization** of tool data
+ **Central management** of all necessary tool information

CELOS PRO*tab*

NEW: PRO*tab* – MOBILE ASSISTANT WITHIN NETWORKED MANUFACTURING

The CELOS PRO*tab* combines all the functionality of CELOS on an industry-standard tablet. This means that our DMG MORI customers are in a position to take advantage of all CELOS functions during the entire manufacturing process. Therefore, for the first time, the CELOS PRO*tab* allows a continuous flow of data throughout the entire manufacturing process.

Find out more about the CELOS PRO*tab* at: **protab.dmgmori.com**

HIGHLIGHTS

+ Solutions for **networking up to the Digital Factory**
+ **APP-based control and user interface**
+ **CELOS for other machine manufacturers,** for the very first time
+ The CELOS PRO*tab* complies with the IP54 and MIL-STD-810G industry standards
+ CELOS applications throughout the entire manufacturing process

CELOS NET*box*

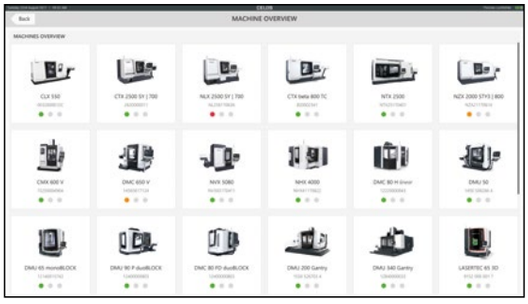
NEW: NET*box* – ACCESS TO THE CLOUD

The CELOS NET*box* connects DMG MORI machines of older generations as well as machines of third-party providers with CELOS. Thanks to standardized interfaces, the CELOS NET*box* provides information (e.g. about the status and condition of the machine) to the CELOS APPs (e.g. MESSENGER and CELOS CONDITION ANALYZER).

HIGHLIGHTS

+ **Networking of older generations of DMG MORI machines and machines of third-party providers using CELOS**
+ Interfaces allow **data exchange between the CELOS NET*box* and CELOS APPs**
+ **Variety of NC programs** via CELOS in conjunction with the CELOS PRO*tab*
+ The NET*box* **increases IT security thanks to the built-in firewall,** and protects the machine from access by unauthorized third parties

Find out more about the CELOS NET*box* at: **netbox.dmgmori.com**



Shop floor overview for production management

Factory overview for production planning

NEW

CELOS COCKPIT

THE ENTIRE MANUFACTURING PROCESS AT A GLANCE

HIGHLIGHTS

+ **Control over the manufacturing process** in the production control department
+ Transparency of production: status of all orders, bottlenecks, delays and causes
+ **Status of the respective order** in the manufacturing process with remaining runtime
+ **Production planning and control** in conjunction with CELOS FACTORY PLANNING
+ **Flexible use in your company as a pure software solution**
+ **Charge and sync station** for CELOS PRO*tabs*, in conjunction with the control station

Find out more about the CELOS Cockpit at: **cockpit.dmgmori.com**

DIGITAL ASSISTANTS FOR MACHINING

Dr.-Ing. Edmond Bassett
Head of Technology Development,
GILDEMEISTER Drehmaschinen GmbH
edmond.bassett@dmgmori.com

Highly flexible, adaptive production networks ***are the aim of digitalization. As a result, even individual parts must be manufactured highly responsively and economically within the shortest possible time. Dr. Edmond Bassett, Head of Technology Development for GILDEMEISTER Drehmaschinen GmbH in Bielefeld, explains the role that DMG MORI technology cycles can play.***

The exclusive DMG MORI technology cycles are themselves a success story. How do you assess the upcoming chapter of digitalization?

The main reasons for workshop-orientated programming are usually a need for small quantities or individual items, as well as a high responsiveness to short-term changes and urgent orders – thus essentially the ambitions of a digital factory.

Against this background, our technology cycles are immensely important tools in a digital factory from two points of view. Firstly:

DMG MORI TECHNOLOGY CYCLES = PROGRAMMING ON THE MACHINE

DMG MORI Technology cycles

60 % FASTER PROGRAMMING WITH DMG MORI TECHNOLOGY CYCLES

HIGHLIGHTS

+ **Conversational programming** with 28 exclusive cycles for handling, measuring, clamping and monitoring
+ **NEW: 3D quickSET Turning:** Re-calibration of the turn-milling machine
+ **NEW: ATC on turn-milling machines:** process-specific adaptation of machine dynamics
+ **NEW: grinding – turning –** complete machining in a new dimension

1 HANDLING CYCLES

2 MEASURING CYCLES

3 MACHINING CYCLES

4 MONITORING CYCLES

SELECTED EXAMPLES OF DMG MORI TECHNOLOGY CYCLES

1. Tool sort cycle for shorter idle times thanks to automatic arranging of the tools according to the required sequence

2. 3D quickSET for checking and correcting the kinematic accuracy of 4 and 5-axis machines
NEW: now also for turn-milling machines

3. Grinding 2.0 for internal, external and surface grinding, as well as for automatic dressing of the grinding wheel

4. MPC 2.0 – Machine Protection Control*, vibration sensor on the milling spindle, incl. cutting force monitoring
(*available as a protection package for turn-milling machines incl. Easy Tool Monitoring 2.0)

Using, for example, the Multi-thread 2.0 cycle saves employees up to 60 % of the time necessary to perform complex programming tasks compared with conventional DIN programming. It can be very easily and quickly implemented conversationally. Valuable time is saved which in turn can be used to optimize processes and workflows.

... and secondly?

Secondly, technology cycles as digital workshop assistants demonstrably increase quality, productivity, transparency and process safety during manufacture. And they expand the capabilities of the machines.

... how do they do that?

Because special machining cycles make additional machining operations possible. As a result, "DMG MORI gearSKIVING" allows the skiving necessary for manufacturing gears to be performed on standard machines. Here, gear qualities better than DIN 7 are standard.

We are also particularly proud of the "Grinding cycle" for internal, external and surface grinding with automatic dressing of the grinding wheel using a built-in acoustic sensor. This integration of technology on turn-milling machines or mill-turning machines adds a new dimension to the term "complete machining".

60 % FASTER BY CONVERSATIONAL PROGRAMMING

From your perspective, what are the other highlights?

This question can be answered only individually from each customer's perspective. Each cycle has its own significant added value. In addition to the machining cycles, our handling cycles simplify machine operations; for example, they automate processes and also provide increased security. The measurement cycles in turn increase the machining accuracy and the manufacturability of the component, thanks to, for example, regularly recalibrating the machine using DMG MORI 3D quickSET.

Monitoring cycles such as MPC – Machine Protection Control and Easy Tool Monitoring 2.0 improve the safety of the machine and process, while MVC-Machine Vibration Control eliminates any vibrations that occur.

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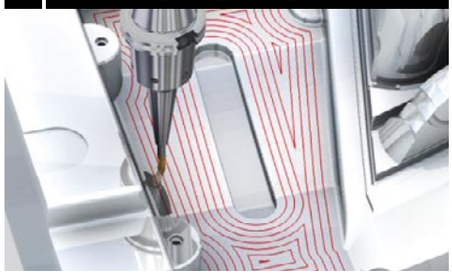
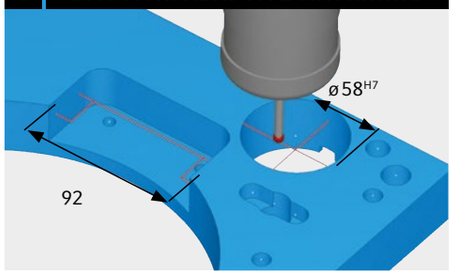
DMG MORI POWERTOOLS = PROGRAMMING DURING PRODUCTION ENGINEERING / CAM

1 NEW: FEATURE CAM

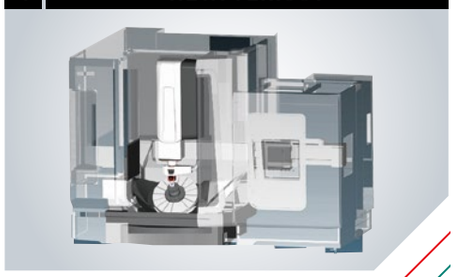


2 DMG MORI VIRTUAL MACHINE

3 DMG MORI ADAPTIVE MACHINING



4 NEW: VERICUT



DMG MORI Powertools

CAM PROGRAMMING WITH DMG MORI POWERTOOLS

HIGHLIGHTS

+ **Automatic program creation** in production engineering
+ **NEW: Technology Library, Adaptive Process, CAM Agent**
+ **24 DMG MORI experts** assist you with the introduction of SIEMENS NX, AUTODESK FeatureCAM and ESPRIT
+ **Exclusive modular DMG MORI software solutions**

SELECTED EXAMPLES OF DMG MORI POWERTOOLS

1. NEW: Feature CAM for the simplest possible programming thanks to Feature Based Machining

2. DMG MORI Virtual Machine, real 1:1 simulation for machine-specific control of your NC programs

3. DMG MORI Adaptive Machining, high-precision manufacture thanks to adaptive process control

4. NEW: VERICUT, fast high-resolution machine simulation incl. CAM interface

Find out more about DMG MORI software products at: **digitization.dmgmori.com**

SOFTWARE AND DIGITAL SERVICES BECOME MORE IMPORTANT

The speed with which digitalization is being implemented is making partnerships between established machine manufacturers and IIoT companies unavoidable.

Roberto Henkel
Digitalization Manager, Production, Schaeffler Technologies AG & Co. KG

DMC 80 FD duoBLOCK

"MACHINE 4.0" INNOVATION PROJECT BETWEEN DMG MORI AND SCHAEFFLER

HIGHLIGHTS

+ 60 sensors for continuous equipment monitoring
+ Visualisation in the CELOS Condition Analyzer APP for performance and condition analysis:
  – NC program optimization
  – Optimization of machining processes and energy and lubricant consumption
  – Early fault detection
  – Analysis of causes of damage

Schaeffler has been using a Machine Tool 4.0 developed jointly with DMG MORI at the Höchstadt site for some years. How does this machine differ from conventional systems?
It does not differ at all from a classical machine tool. However, the degree of digitalization and connectivity to linked software and systems is considerably higher. The Machine Tool 4.0 offers more intelligence thanks to smart and sensorized components and is a prime example of how a smart manufacturing system is integrated into a digital ecosystem. On this basis, for example, data-based services can be implemented with little effort.

In that case, will the software decide whether a machine is a success or a failure in the future?
Differentiation by means of traditional electromechanics alone will no longer suffice in the future. Anyone wanting to succeed in tomorrow's world as a supplier in the machine tool industry will have to complement traditional expertise with sensorized components, software and digital services. In this way, smart machines will form the basis for data-based added value and new digital business models. In partnership with DMG MORI, with the Machine Tool 4.0, we have succeeded in taking the first specific step together in the direction of such new business models.

What objectives are Schaeffler pursuing with digitalization in production and manufacturing technology?
The primary objectives of digitalization in production are improved quality, cost reductions and timely delivery. It is also necessary to keep under control and to continuously improve the increasing complexity in products, processes and services, above and beyond our international production locations. In this regard, it is necessary to use data as a basis for increasing added value. We will also be visualizing and analyzing data from production to an increasing extent and deriving reliable prognoses for all-round benefits – both with regard to production and processes, but of course also with regard to revenue. After all, digitalization has to be profitable!

Are smart components in the machine tool necessary for this – preferably from Schaeffler itself, say in the form of intelligent linear guideways?

An important aspect when optimizing systems is to increase machine availability. To this end, unplanned faults and shutdowns, for example, must be avoided, or at least they must be capable of being planned. Sensorized solutions from Schaeffler, such as intelligent spindle bearings, smart linear guideways and rotary table bearings with integral measuring systems and direct drives from IDAM for example, can make a significant contribution to this. In combination with data from the machine control, this gives rise to considerable potential for optimisation, which, in many cases, we have already been able to use in the example of the Machine 4.0.

Let's come back to the collaborative Machine Tool 4.0 from DMG MORI. What results have been achieved since installation?

The Machine Tool 4.0 is part of a manufacturing cell consisting of more than just one machine. To date, we have made an improvement of 15 % in the set-up time alone. Cycle times today are also shorter than before. But that is just an intermediate result. The continuous improvement process based on digital data is just beginning and offers even further potential.

«

SCHAEFFLER FACTS

+ 60 % added value in production
+ More than 2,000 lathes and milling machines worldwide
+ Approx. 1 billion Euro investment per year
+ Joint collaboration project "Machine Tool 4.0" with DMG MORI
+ Access to data reduces setup and cycle times
+ Exemplary installation for the group-wide production network

SCHAEFFLER

Schaeffler Technologies AG & Co. KG
Industriestraße 1-3
D-91074 Herzogenaurach
www.schaeffler.com

SR 1C and G100:
Double gripper with 4×2 lbs max. workpiece weight, workpiece dimensions max. ø3.1×1.9 in, Rotary storage with 10 spaces for stacking the workpieces

SR – Space-saving Robot

INTEGRATED GANTRY AUTOMATION FOR WASINO MACHINES

HIGHLIGHTS

+ **Integrated automation** – no additional installation space required
+ **Can be combined** with diverse peripherals for washing, measuring, marking, etc.
+ **Simple programming and set-up** thanks to integration into the machine control
+ **Condition monitoring** using the DMG MORI messenger

AUTOMATION EX-WORKS IN THE VERTICO DESIGN

WH 3 – Workpiece Handling

FLEXIBLE AUTOMATION WITH LARGE STORAGE FOR UP TO 750 WORKPIECES

HIGHLIGHTS

+ **Compact footprint** of only 18 ft²
+ **Flexible and cost-effective**
+ **High storage capacity** for up to 750 workpieces
+ **Everything from one source –** optimally tailored to the machine

WH 3 to Milltap:
7 lbs max. workpiece weight, workpiece dimensions max. 3.9×3.9×1.9 in, 15 pallets as pull-out drawers (each max. 50 workpieces)

Automation is a key element of digital production. Automation has long been for DMG MORI a strategic core issue. Currently, 2,000 automated machines are installed every year. Every fourth new machine comes with an automation solution. And every DMG MORI machine can be upgraded with standard automation or with a customized automation solution for flexible manufacturing systems. This is impressive – especially given the global customer base, with a majority of small and medium-sized businesses having smaller batch sizes right down to individual items.

A lot has happened since DMG MORI passed responsibility for automation back to the factories. The new VERTICO design has been revealed, but DMG MORI has also made further strides in the development of automation. Here is a current example: the new GX 06 gantry loader for the universal lathe sector.

LPP – Linear Pallet Handling

LPP IN THE NEW VERTICO DESIGN

HIGHLIGHTS

+ **1x NHX 5000 and 1x DMC 60 H *linear* served by a linear pallet store** with 24 spaces (19.6×19.6 in)
+ **Up to 8 machines, up to 5 set-up stations**
+ **Max. 99 pallets on 2 levels, handling** of 3 pallet sizes up to 39.3×39.3 in, 661 lbs

CENTRAL ELEMENT OF INDUSTRY 4.0

Solution promise for all applications

There is a reason behind our high level of commitment. "Automated machine tools are a fundamental part of future-orientated production," says Alfred Geißler, Managing Director of DECKEL MAHO Pfronten GmbH. Thus, DMG MORI has been asked to provide customers with a complete portfolio, from which the best possible solution can be configured together with the user for each application and all requirements.

At the same time, there are many other reasons behind our ambitions for automation. Two examples are profitability through multi-shift operations and better utilization of the machines. According to Harry Junger, Managing Director of GILDEMEISTER Drehmaschinen GmbH, a further aspect is that "the repeatability of an automation solution is higher than with any manual clamping and unclamping of workpieces."

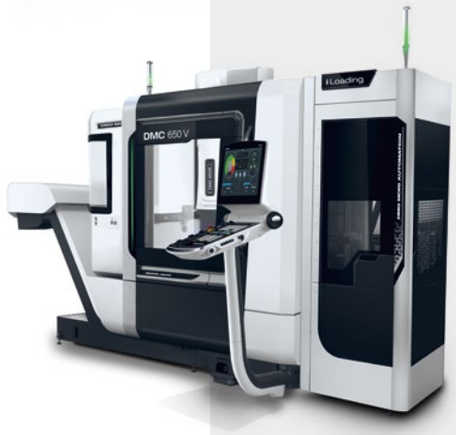
Future-proof automation ex-works

Junger views the fact that the factories now having the lead again in the development of perfect automation is an important strategic policy decision. The production sites provide the best conditions to perfectly match and test machines and automation solutions before delivery. That applies equally to hardware and software, for example, in the area of integrated control systems. According to Junger, "The all-in-one solution can only make its desired contribution to productivity in the end if all components interlock perfectly."

Differentiation through in-house developments

In addition to high system competence, Alfred Geißler views, above all, the high proportion of in-house developments as a basis for success. At the same time, a wide variety of opportunity is provided by the range between the top-end LPP linear pallet systems on the one hand and the pallet and workpiece handling systems of the PH series, iLoading and RS series on the other hand. In addition, thanks to the Robo2Go, DMG MORI has a mobile workpiece handling system in the range that can be used flexibly on many universal lathes. The advanced module can be programmed via a CELOS APP.

«



iLoading on DMC 650 V:
11 lbs max. workpiece weight; workpiece dimensions max. 3.1×3.1×3.1 in; realisable cycle time of 8 seconds per component

iLoading

ROBOT INTEGRATED IN THE MACHINE FOR LARGE QUANTITIES

HIGHLIGHTS

+ Automation for **large quantities and small workpieces up to 11 lbs**
+ Up to **8 sec. cycle time**
+ Up to **4 fixtures** in the machine – simultaneous workpiece load/unload through integrated robot automation
+ **Only 53 ft² of floor space** (without workpiece store)
+ **Easy operation** without special knowledge of robots
+ **Highly flexible and easy conversion** for different components
+ **Individual workpiece feed**

AUTOMATION AT A GLANCE

+ **Intelligent combination** of machine tool and automation solution
+ **Automation solutions for all DMG MORI machines**
+ Factories supply **machines and automation from one source**
+ **Perfect coordination** of hardware and software
+ Scope of services from **standard automation** via **customized automation systems to turnkey solutions**

WORLD PREMIERE 2017

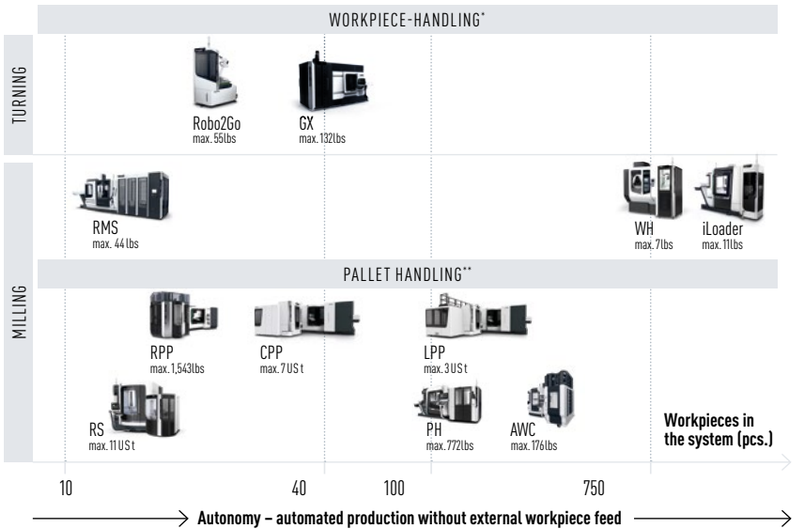
1,032 ft-lbs powerMASTER SPINDLE

Portfolio overview

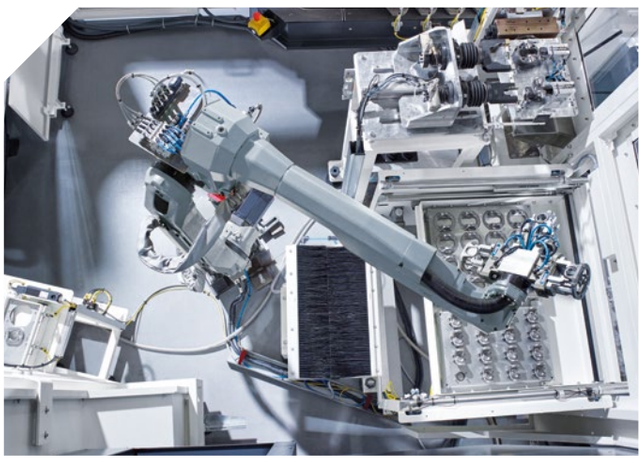
STANDARD AUTOMATION

HIGHLIGHTS

+ **Workpiece and pallet handling**
+ **Easy to adapt to your workpiece**
+ Adapted optimally and already **tested in the factory**
+ **Standardized,** function-orientated **modules**
+ **Integrated user interface**



* **Robo2Go:** CTX, NLX, CTX TC, NZX; **GX – Gantry X-class**: CLX, CTX, NLX, CTX TC, NT/NTX, NZX (-S), NRX; **RMS – Robot, Modular System**: NVX, NHX; **WH – Workpiece handling:** MILLTAP; **iLoading:** DMC V
** **RPP – Round Pallet Pool:** NHX; **CPP – Carrier Pallet Pool:** NHX, duoBLOCK; **LPP – Linear Pallet Pool:** NHX, DMC H *linear*, duoBLOCK; **RS – Rotary Storage:** DMC H *linear*, monoBLOCK, duoBLOCK, Portal; **PH – Pallet Handling:** CMX V, DMC V, CMX U, DMU, monoBLOCK, DMU eVo, HSC, ULTRASONIC, LASERTEC; **AWC – Auto Work Changer:** NMV; Presentation without product-specific solutions SR (Wasino), APC (TAIYO KOKI) and IMTR (NTX 1000)



Portfolio overview

CELL AUTOMATION AND CUSTOMIZED SOLUTIONS

HIGHLIGHTS

+ **Variable** number of machines and types
+ **Turnkey solutions**
+ **Integration** of process-related peripheral equipment
+ **Tailor-made solutions** optimized for your workpiece
+ Our **comprehensive solutions** from planning and simulation to delivery of the finished production line

NHX 6300 2nd Generation

powerMASTER spindle with up to 1,032 ft-lbs

HIGHLIGHTS

+ Significantly increased machine rigidity, ideal for **heavy-duty machining:**
  – **181,89 cubic inches / titanium** (porcupine mill ø 3.1 in)
  – **12 mm depth of cut in cast iron** (EN-GJS-450, ø 6 in mill, 4 in cutting width)
+ **powerMASTER** spindle up to **1,042 ft-lbs*** or up to 16,000 rpm
+ **SmartSCALE measuring system** by MAGNESCALE, with **0.005 µm resolution** in all linear axes as standard
+ **CELOS with MAPPS on FANUC**

* Option

CPP – CARRIER PALLET POOL

+ Up to **29 pallet positions**
+ **Max. 4 machines and 2 set-up stations**
+ **39.3 × 39.3 IN max. pallet size** (only for CPP 6)

CUSTOMER FIRST 2.0 – OUR 4 SERVICE PROMISES WITH EVEN MORE COMMITMENTS!

1

World-class spindle service

NEW

2

More service experts, faster support

NEW

3

DMG MORI Full-Service, 100 % guaranteed

4

Immediate support thanks to Netservice 4.0

NEW

ENHANCED SERVICE INITIATIVE WITH EVEN MORE COMMITMENT!

Dr. Maurice Eschweiler
Executive Board
Industrial Services
DMG MORI AG

Even in the face of Industry 4.0 and digital services of the future, it's important to keep an eye on day-to-day operations. That is, at least, what Dr. Maurice Eschweiler of the Executive Board of Industrial Services of DMG MORI Aktiengesellschaft suggests. In our interview, he explains how he generally views the issue of striking a balance between the status quo and the digital future, and which services DMG MORI wants to use right now to impress and inspire its customers.

Dr. Eschweiler, DMG MORI has just expanded its service campaign with Customer First 2.0. What does this involve?
Before we start, I'd just like to make something clear: "Customer First 2.0" has nothing to do with the digit inflation in industrial revolutions. We want to stress the fact that we have launched the second stage of our 4 service promises and are thus even more committed to our customers than ever before.

How can customers recognise this evolution?
A clear sign is our planned recruitment of more than 100 service specialists by the end of the year. At the same time, we are raising our maintenance intervals from 2,000 to 4,000 operating hours. This will help to noticeably improve our availability and response times.

But, overall we have already made improvements in this area. This applies to original spare parts and spindle services a Price guarantee.

And what about digital services?
In the future, digital services will become incredibly important. That's why, we are working hard on developing digital service concepts. Many projects are already in the prototype stage – others, like the new DMG MORI NetService 4.0, are already being implemented.

However: Our customers are mainly small and medium-sized businesses, which are now aiming to maximise the productivity of the machine tools they use. Therefore, digitization could possibly play a role there. Our spindle services are currently far more important to our day-to-day business …

What makes the spindle service from DMG MORI so special?
We are making considerable investments in our stock availability. For example, we now have more than 1,000 spindles in stock. This enables us to achieve spindle availability of more than 96 %. In addition, we also have an advanced performance promise for replacement spindles and spindle repairs.

Anyway, apart from that, only the manufacturer has the expertise to ensure the "heart of the machine", the spindle, functions properly in the long run. This cannot be stressed enough. «

GX 06 with CLX 450
4 × 13 lbs with double gripper,
workpiece dimensions max. ø7.8 × 5.9 in,
10 pallet positions of 154 lbs each

TRADITIONAL COMPANY WITH HIGH STRATEGIC VALUE

As a traditional DMG MORI company, FAMOT Pleszew SP. Z O.O. is of major importance to the Group - both for its strategic alignment and for the DMG MORI portfolio.

On the one hand, the 550 employees at the site design and build the CLX, CMX V and CMX U universal machines. On the other, it is the largest supplier of machine frames, subassemblies and components. DMG MORI is currently investing 40 million euros to expand the production area by 226,042 ft² as well as in the modernisation and digitalization of FAMOT. "We want to virtually double the size of the factory by 2020," explains Managing Director Dr. Michael Budt.

Selling around 1,500 universal machines in the CLX/CMX range per year, FAMOT continues to contribute to the Group's success. According to Dr. Michael Budt, the reasons for this are the motivation and expertise of the staff along with the technical performance of the CLX, CMX V and CMX U ranges. These have been totally redesigned by about 50 engineers, draughtsman and designers

FAMOT PLESZEW SP. Z O.O. – SINCE 1877

+ Home of the **CLX, CMX V and CMX U ranges**
+ Production of **>3,500 machines and machine frames per year**
+ **Around 1,800 machine frames per year** for DECKEL MAHO Pfronten, DECKEL MAHO Seebach and other DMG MORI factories
+ **40 million euro investment** in 2017/2018 for expansion and modernisation with a view to the digital factory
+ **Integrated automation solutions from a single source**

at the Polish site in close collaboration with their colleagues in Japan. FAMOT is therefore the only factory in the Group to design, build and sell lathes and milling machines throughout the world.

As a supplier within the DMG MORI Group, FAMOT also builds more than 1,800 machine frames and hundreds of sets of components per year for the various sister plants. The mechanical production facility, with its approximately 45 high-tech machine tools, most of which are Group products, is therefore the heart of the factory and operates around »

WORLD PREMIERE 2017

FOOTPRINT ONLY 80 ft²

CLX 550

THE COMPLETION OF THE CLX RANGE

HIGHLIGHTS

+ **Heavy-duty machining** thanks to main spindle with 464 ft-lbs and 44 hp (max. 3,250 rpm)
+ **6-sided complete machining** of complex workpieces thanks to **counter spindle* and 4.7 in Y-axis***
+ **Impressive stability,** optimal for heavy-duty machining at the limit of the performance range
+ **Linear guideways** for maximum precision and long-term accuracy

Technical Data		CLX 350	CLX 450	CLX 550
Max. turning diameter ø	in	125	157	188
Max. turning length	in	228	236	488
Bar capacity	in	20 (25)*	31	31 (40)*
Spindle speed	rpm	5,000	4,000	3,250
Power/torque (40% DC)	hp/ft-lbs	22	34	44

* Option

3D CONTROL TECHNOLOGY

SIEMENS 840D
on 19" DMG MORI SLIM*line* Panel

NEW/FANUC i-series
on 15" DMG MORI SLIM*line* Panel

You will find more information on the CLX 550 at:
clx.dmgmori.com

PH 150 with CMX 600 V:
Max. load capacity 551 lbs (772 lbs optional), pallet size: 8-off 12.5 × 12.5 in (4-off 19.6 × 19.6 in or 10-off 9.8 × 9.8 in optional)

With the PH 150 pallet handling system, we can offer every CMX V and CMX U with an integrated automation solution from DMG MORI.

Dr. Michael Budt
CSO and FAMOT Managing Director

Dr. Michael Budt (right), as CSO responsible for FAMOT and the Russian factory Ulyanovsk MT, and Zbigniew Nadstawski, CTO of FAMOT and Ulyanovsk MT.

the clock over 21 shifts. Machine frames and components are processed on the DMC 340 U and DMC 270 U from DMG MORI's large machine range. In addition to this there are a grinding shop, which includes a TAIYO KOKI from DMG MORI, an ultramodern inspection department, and an in-house spindle production facility. A Kardex mini-load store distributes 140,000 parts a day to the production and assembly stations. A recently installed induction hardening machine – for processing components of the CTX 5th Generation – completes FAMOT's comprehensive manufacturing plant.

FAMOT relies on innovative and networked manufacturing processes from the production engineering stage to the final measurement report. "A robot scans and checks the components, virtual machines simulate the processing, and all relevant data are transferred to manufacturing, the tool shop and the measuring room," says Zbigniew Nadstawski, FAMOT Managing Director, describing the process. The MACHDATA software developed by FAMOT enables all parameters of the entire mechanical machining process to be consistently monitored and evaluated.

Automation solutions ex-works

One area of focus at DMG MORI is the automation of machine tools and the planning of customized solutions. "For this area, we have our own assembly hall for the production and proving out of customer parts and for carrying out test machining," says Dr. Michael Budt. The CLX 450 with the GX 06, a new gantry loader for the CLX range, has already been presented at EMO. The automation solution in the new VERTICO design manages tool weights up to 13 lbs; the tool changing process can be individually planned by FAMOT's engineering department for all CLX lathes. FAMOT automates the CMX V and CMX U ranges with the proven PH 150 pallet handling system.

Fully integrated automation solutions are just the first step in the production portfolio. The machine specification is also being expanded, as Dr. Michael Budt explains: "In future, all CLX turning centers will have a Y-axis as well as a counter spindle." The 3D control portfolio in particular is being expanded. CMX U machines are already available with the successful DMG MORI SLIM*line* Multi-Touch Panel and Operate 4.7 on SIEMENS or with HEIDENHAIN, and the CMX V models are available today with MAPPS IV on FANUC. From the autumn of 2017, DMG MORI will additionally be offering CLX lathes with the FANUC i-series. Thanks to this wide choice of 3D controllers and the modular building block system along with the numerous options and technology cycles, the machines will also be suitable for sophisticated technological requirements.

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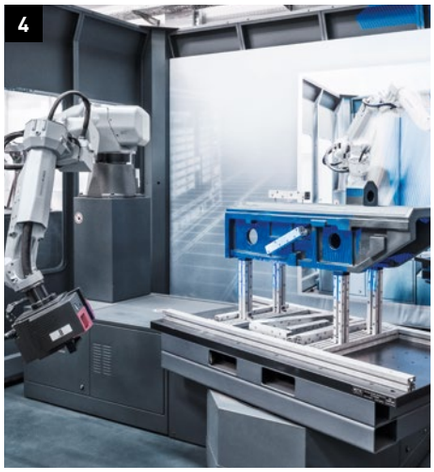
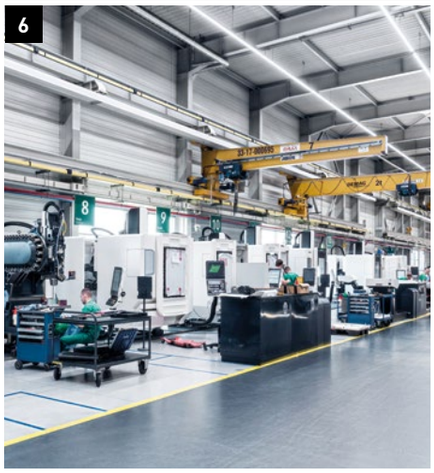


MORE THAN 3,500 MACHINES AND MACHINE FRAMES PER YEAR AT MAXIMUM PRODUCTIVITY WITH 21 SHIFTS PER WEEK

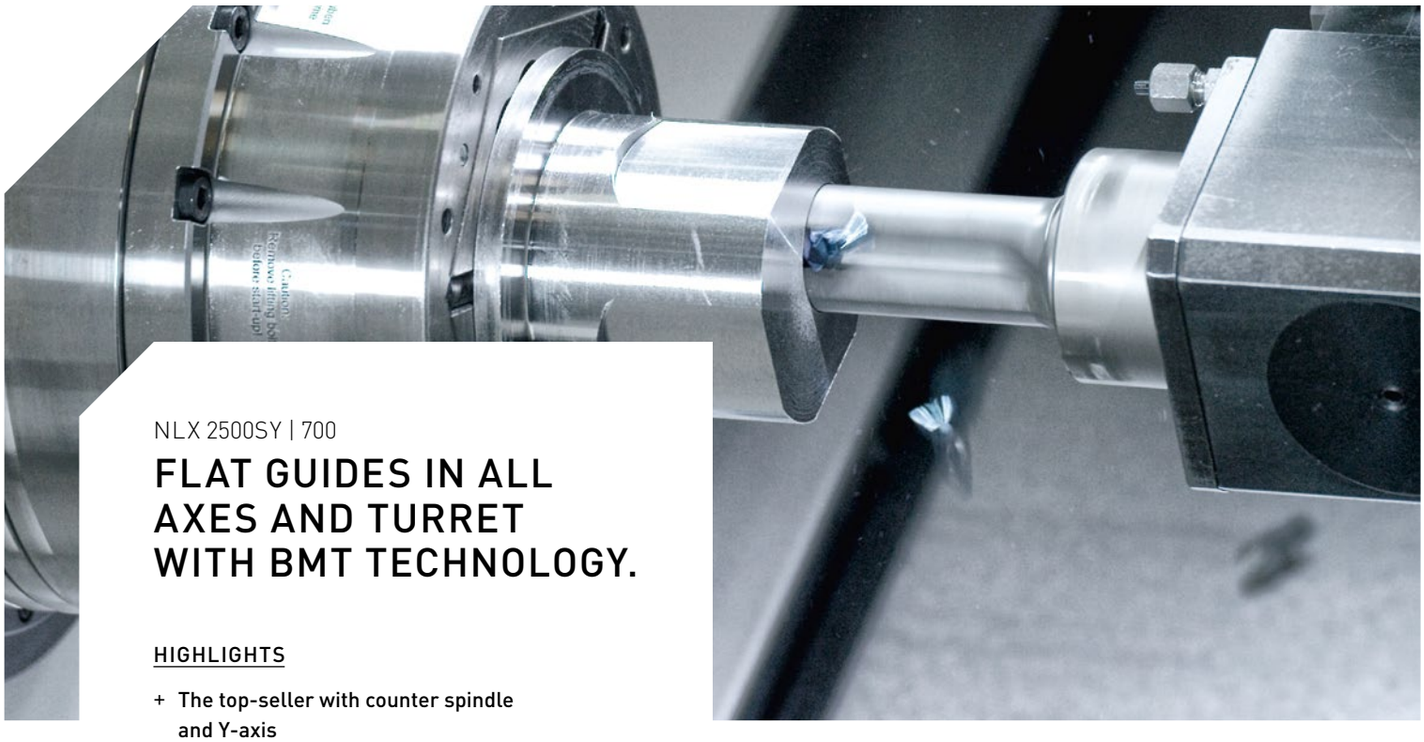


1. + 2. With around 45 machine tools – 90 % of which are DMG MORI machines – FAMOT has the largest mechanical production facility within the group.

3. FAMOT has its own grinding shop with five machines, including a TAIYO KOKI from DMG MORI.

4. + 5. Digitalization is very important at FAMOT: A robot scans and checks the components, virtual machines simulate the processing of parts, and all relevant data are transferred to manufacturing, the tool shop and the inspection department.

6. + 7. DMG MORI is currently investing more than 40 million euros in the Polish location. A new, large castings store and a new logistics hall are already complete. As well as the expansion of the assembly area, the extension of the group's in-house spindle assembly facility has also been planned.



NLX 2500SY | 700

FLAT GUIDES IN ALL AXES AND TURRET WITH BMT TECHNOLOGY.

HIGHLIGHTS

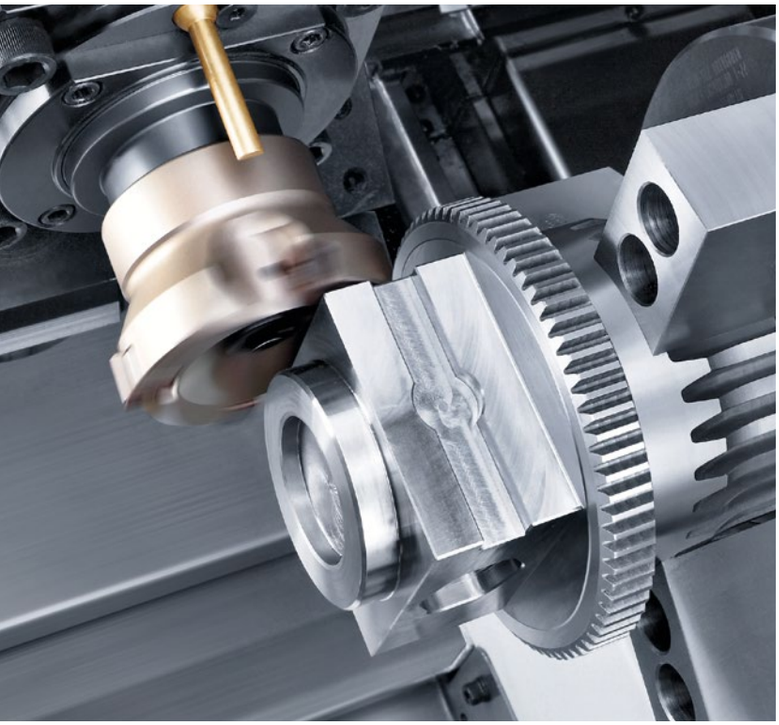
+ **The top-seller with counter spindle and Y-axis**
+ Turning diameter up to 14.4 in.
+ Turning length up to 27.7 in.
+ **BMT® turret with 10,000 rpm:** Improved machining capacity and milling accuracy
+ **Flat guides on all axes:** Optimum damping characteristics and dynamic rigidity
+ **3.9 in. Y-axis:** Eccentric machining

Boxways and BMT turret with 10,000 rpm for highest cutting performance

UNIVERSAL TURNING IN THE HIGH-PERFORMANCE CLASS WITH BOXWAYS AND BMT TURRET

NLX 2500SY | 700
The most successful model with a counter spindle and Y-axis.

Find out more about NLX 2500SY | 700 at:
nlx.dmgmori.com



NLX 2500SY | 700 – 6-sided machining with main and counter spindle, as well as a turret with 3.9 in. of Y-axis travel.

NLX 1500 with GX 05

FLEXIBLE GANTRY LOADER FOR INCREASED PRODUCTIVITY

HIGHLIGHTS

+ Compact, space saving with built-in loader
+ Combinable with various kinds of automatic peripheral equipment (washing, measuring, marking etc.) and loader hands available by flexible design
+ Easy programming and setup due to integration into the machine control
+ Loader status monitoring can be delivered by DMG MORI Messenger
+ Optional up to 100 kg handling weight available

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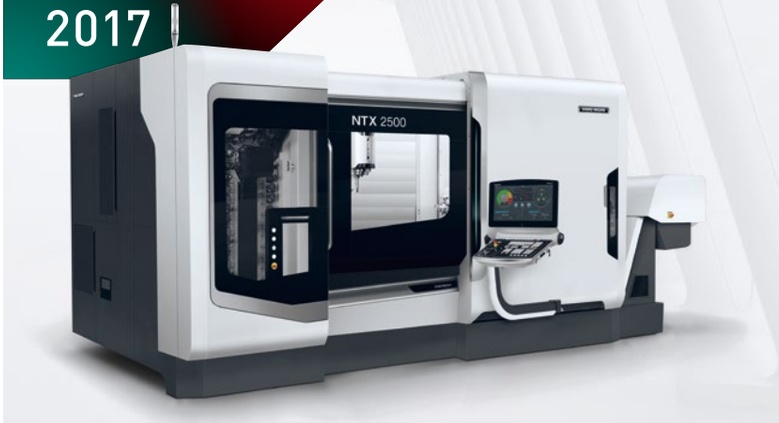
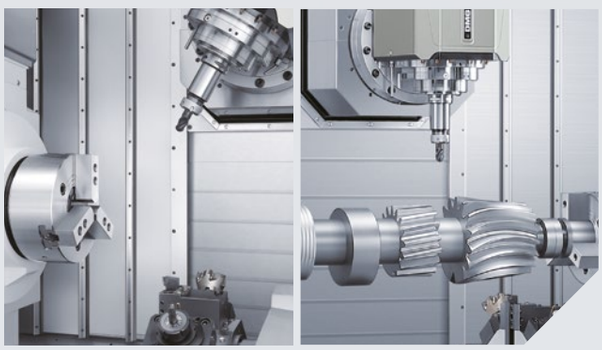


NTX 2500

6-SIDED COMPLETE MACHINING WITH THE 89 ft-lbs compactMASTER TURN & MILL SPINDLE

HIGHLIGHTS

+ **Main spindle** (10" chuck) with 4,000 rpm and max 441 ft-lbs, optionally also available with 8" and 12" chuck
+ **Large working area** thanks to the compactMASTER Turn & Mill spindle with a length of 13.7 in and 89 ft-lbs torque
+ **Multitasking:** Direct Drive B-axis for 5-axis simultaneous machining of complex workpieces
+ **High flexibility** thanks to X-axis traverse up to -4.9 in below the spindle centerline
+ **CELOS with MAPPS on FANUC and CELOS with SIEMENS available**



4-axis milling of complex workpieces up to ø26.3 in 60.6 in in length with the compactMASTER Turn & Mill spindle and second tool carrier (lower turret) included with 3.1 in Y-axis travel.

Find out more about NTX 2500 at:
ntx.dmgmori.com

GLOBAL SUPPLIER FOR ADDITIVE MANUFACTURING

Unique process chain offer for additive complete manufacturing

With a worldwide unique offer of three universal process chains for additive manufacturing and machining, DMG MORI currently underlines its global commitment in the field of ADDITIVE MANUFACTURING of metal parts. The three pillars of success build on two process variants of powder bed and powder nozzle. "Both technologies complement each other excellently and they enable us to offer a suitable solution for each application to interested parties in the field of metal processing", explains Patrick Diederich, Managing Director of SAUER GmbH.

Focus on the powder bed

Particular focus is currently on the process of Selective Laser Melting (SLM). This is no surprise: in the world of additive manufacturing of metal components, the process has a market share of 80 percent. Furthermore, the powder bed method as it is described by DMG MORI is a sensationally successful industrial manufacturing process, particularly for lightweight aircraft components or high temperature applications in turbine technology for aerospace and power generation.

LASERTEC 30 *SLM*

Component size: 11.8 × 11.8 × 11.8 in

SELECTIVE LASER MELTING *SLM*

LASER DEPOSITION WELDING
3D/3D hybrid

LASERTEC 4300 *3D hybrid*

Component size: ø25.9×59 in
Max. workpiece weight: 1,984 lbs

LASERTEC 65 *3D hybrid*

Component size: ø19.6×15.7 in
Max. workpiece weight: 1,323 lbs

ADDITIVE MANUFACTURING AT A GLANCE

+ **Unique: 3 process chains** for ADDITIVE MANUFACTURING and subtractive finishing by metal cutting from a single source
+ 20 years' experience in laser technology and SLM technology
+ **End-to-end competence** in the field of additive metal machining
+ **Powder bed *SLM* and powder nozzle *3D/3D hybrid* laser metal deposition (LMD)** under one roof for all materials and geometries
+ **5-axis complete machining and turning of up to 6 sides in a single setup**
+ **5 Additive Manufacturing Excellence Centers worldwide:** Bielefeld, Pfronten, Chicago, Tokyo, Shanghai
+ **Comprehensive consultation for material selection and parameter definition** as a basis for high process reliability

COMBINED ADDITIVELY AND CONVENTIONALLY

With the LASERTEC 30 *SLM* into industrial production

As is generally known, with a majority stake in REALIZER GmbH, DMG MORI expanded its portfolio in additive manufacturing to gain a crucial foothold. The first result of the cooperation is the LASERTEC 30 *SLM*. Small and where applicable highly filigree components with a high degree of complexity can be produced by the SLM procedure. "With our new LASERTEC 30 *SLM*, we are bringing the powder bed method from prototype construction to the industrial environment for the first time. The machine thus takes on a key role for the further establishment of the technology", says Florian Feucht, Head of Sales and Application at REALIZER GmbH. »

LASERTEC *3D hybrid* – added value for large components and complete machining

With the combination of laser deposition welding and metal cutting on a single machine, DMG MORI has already been revolutionizing the additive manufacturing of metal components for four years. The integrated concept is used in the 5-axis LASERTEC 65 *3D hybrid* as well as the LASERTEC 4300 *3D hybrid*. It combines laser deposition welding and 6-sided turn-milling.

Perfect additive and metal cutting combination

What is revolutionary about the machine concept of the LASERTEC *3D hybrid* series is the combination of additive deposition and finishing by metal cutting – and consequently finished part production in a single setup.

Both technologies can be used alternately. This enables completely new degrees of freedom with regard to component design, as Patrick Diederich points out. In particular for complex geometries, the combination enables early machining of certain workpiece areas, before they can no longer be accessed on the complete component. "Added to this is the option to produce innovative components from two or more materials by using different powder", Mr. Diederich emphasizes.

LASERTEC 65 *3D* – Productive machining of different materials

A crucial advantage, which applies to the LASERTEC 65 *3D* as well, focuses on the LMD procedure with 45 percent less footprint and 40 percent larger work area. Patrick Diederich also refers to different track widths, higher laser power up to 4 kW as well as the option to also process reactive materials like aluminum or titanium.

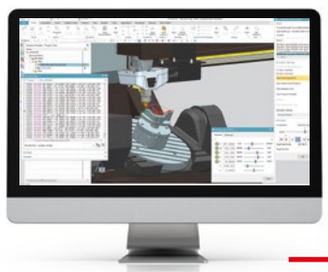
Technology leader with industrial maturity and global presence

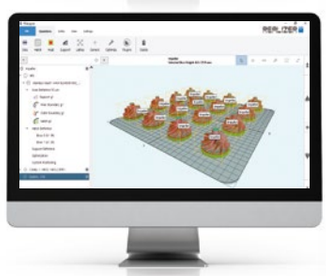
Next on the development agenda is the further extension of the machine portfolio to enable the additive design and manufacture (ADM) of larger components. Furthermore, DMG MORI emphasizes its global claim to leadership in additive manufacturing with comprehensive training and further education offers in the Technology Excellence Centers in Pfronten, Chicago, Shanghai and Tokyo. The aim is clear – bringing the fascinating possibilities of additive manufacturing even closer to the markets.

«

ADDITIVE PROCESS CHAINS FOR EVERY REQUIREMENT

Universal solutions from CAD and CAM up to combined machining to finished part quality





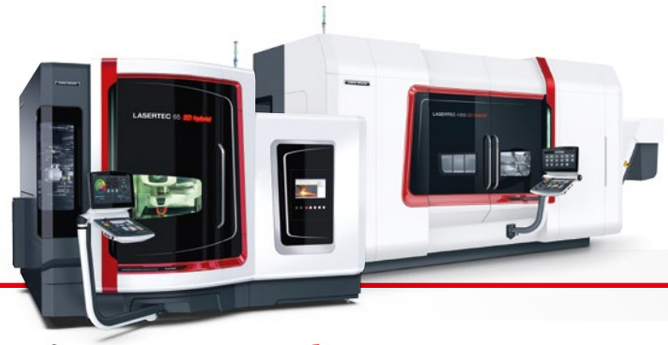
CAD / CAM

SIEMENS NX ADDITIVE / HYBRID

R DESIGNER / R OPERATOR

ALL IN ONE

3D hybrid



3D

NEW

ADM BY POWDER NOZZLE
LASERTEC 65 *3D*
Component size max.
ø 25.5 in, height 22 in

SLM

NEW

ADM BY POWDER BED
LASERTEC 30 *SLM*
Component size max.
11.8 × 11.8 × 11.8 in

Fast material change in less than 2 hours instead of 2 days with the innovative powder handling system. Simply clean the process chamber and connections and slide in new powder module.

ADM WITH POWDER NOZZLE IN COMBINATION WITH:

MILLING – LASERTEC 65 *3D hybrid*

Component size max. ø 19.6 in, height 15.7 in

TURN & MILL – LASERTEC 4300 *3D hybrid*

Component size max. ø 25.9 in, length 59 in

FINISHED PART

METAL CUTTING / FINISHING

FINISHED PART

METAL CUTTING / FINISHING

TECHNOLOGY COMPARISON

THE TWO MOST PROGRESSIVE ADDITIVE TECHNOLOGIES: POWDER BED / POWDER NOZZLE

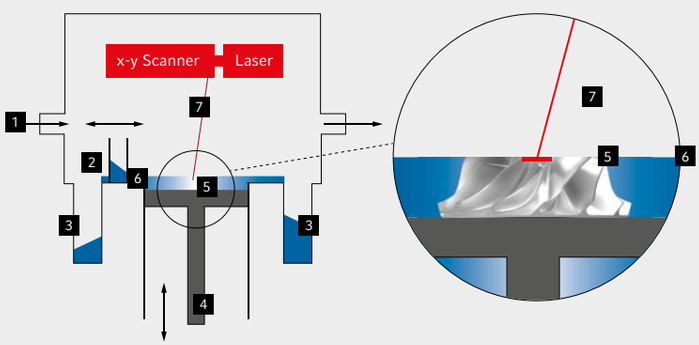
As one of the very few manufacturers of selective laser melting and laser deposition welding systems for additive manufacturing, (in principle, there are no more than two German suppliers), DMG MORI provides its customers with a full range of options. The common denominator is the raw material in powder form. However, while the powder for laser melting is applied over the whole area and then built up layer by layer via a laser beam, in deposition welding it is fed via an inert gas stream and melted to the desired geometry in a controlled way with laser power. DMG MORI differentiates the two procedures by calling them "powder bed" and "powder nozzle" respectively.

«

Powder bed and powder nozzle complement each other superbly in the DMG MORI portfolio.

Fred Carter
Lead Engineer Advanced Solutions Inc.
fcarter@dmgmori-usa.com

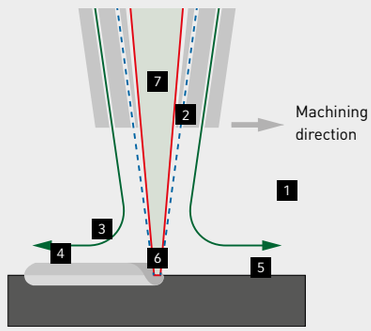
FUNCTIONAL PRINCIPLE POWDER BED *SLM*



1. Inert gas (Argon) **2.** Recoater **3.** Powder container
4. Build platform **5.** SLM component
6. Powder bed **7.** Laser beam

	SELECTIVE LASER MELTING *SLM*
Process	Melting in a powder bed
Application	Prototyping, production
System	Closed process chamber
Buildup rate	On average 0.2 lbs/h (steel, 0.61 in³/h, 600 W one-laser system)
Layer thickness	Approx. 0.0008 – 0.004 in
Post processing	Required
Perspective	Production systems for smaller parts

FUNCTIONAL PRINCIPLE POWDER NOZZLE *3D / 3D hybrid*



1. Inert gas **2.** Powder **3.** Applied material
4. Bonding zone **5.** Workpiece **6.** Molten pool
7. Laser beam

LASER DEPOSITION WELDING *3D / 3D hybrid*
Welding with a powder nozzle
Repair, coating, prototyping, production
Open work area
On average 1.7 lbs/h (steel, 5.5 in³/h, LASERTEC 65 *3D*)
(system-dependent) approx. 0.03 – 0.06 in
Required
Larger components

POWDER BED

SELECTIVE LASER MELTING *SLM*

+ **Highly filigree structures**
  with layer thickness between 0.0008 – 0.004 in
+ **Production of multiple workpieces at once**

POWDER NOZZLE

LASER DEPOSITION WELDING *3D / 3D hybrid*

+ **Production of large workpieces**
  with layer thickness up to 0.06 in
+ **Multiple materials and machining**
  of existing workpieces

1. FUNCTIONAL PARTS
Automotive, 4.9 × 4.9 × 4.9 mm, stainless steel

2. TURBINE BLADE
Aerospace, 1.5 × 0.7 × 2.3 in, titanium

3. DENTAL CROWNS / BRIDGES
Dental, ø 2.7 × 0.9 in CoCr

4. TOOL BODY
Precision tools, ø 1.5 × 1.5 in, tool steel

5. TURBINE HOUSING
Aerospace, ø 7.4 × 3.1 in, Inconel / copper

6. DRILL BIT
Aerospace, ø 5.9 × 6.2 in, stainless steel, Inconel, tungsten carbide

7. CUTTER
Aerospace, 7.8 × 4.7 × 3.1 in, base HRC 44, cutting edge HSS (HRC 63)

8. PIPE WITH INTERNAL COOLING
Plant engineering, ø 3.1 × 15.3 in, stainless steel

ELIGIBILITY CERTIFICATE FOR ADDITIVE MANUFACTURING

Across the generations, Franz and Alexander Mack (left) head up the company – supported by Managing Director Damir Lendler.

As a machining service provider, Dornstadt-based CNC-Technik Mack GmbH & Co. KG enjoys a shining reputation for quality and reliability with its customers. In particular, with a great deal of curiosity, courage and consistency, the Swabians have repeatedly expanded their capabilities with new technologies and processes and have achieved impressive success while combining tradition and modernity. The latest example is the entry into selective laser melting – initially for the dental process chain and now, increasingly, also in general metal processing.

Particularly in the field of precision machining of highly complex geometries, CNC-Technik Mack GmbH & Co. KG is among the best that the service market has to offer. Further pillars of the company's success are its readiness to innovate and invest and a good feel for new business areas.

Entry into dental engineering in 2008 is a prime example of this, as Alexander Mack, who manages the company together with his father, recalls: "About 10 years ago, there was a trend here towards increasingly industrialising manual and skilled operations. We therefore asked ourselves the question why we should leave the required machining to others when we should be better at doing it ourselves with our own experience in the core business ..."

Economic machining of ceramics and other hard and brittle materials

The Mack Group had already become involved with DMG MORI's ULTRASONIC technology in 2001. "This process made it possible for us to economically machine the most demanding materials such as ceramics and other hard and brittle materials. This opened the door to the dental sector for us", explains Alexander Mack.

ROBOT GRIPPER

Machine: LASERTEC 30 *SLM*
Dimensions: 3.9 in × 1.3 in
Material: 1.4404

+ **Material and process development** as key elements for industrial use
+ **Additive processes** as an important complement to conventional machining en route to geometrical component optimization
+ **Investment in powder bed processes** to provide a future-oriented service
+ **Three REALIZER SLM machines** extend additive service capability – in particular for general metal processing

Web-based process chain
In the years that followed, the company also developed a continuous CAD/CAM process chain. After entering the geometrical data in the order portal, the machining parameters and machining strategies are determined immediately. From here, the simulated NC programs are passed to the 10 ULTRASONIC machines.

Additive Manufacturing completes the MACK service spectrum
However, the description of the process chain is no longer quite accurate since the Mack group became involved in additive manufacturing in 2016. "Additive Manufacturing marks a quantum leap, particularly with regard to the individuality and complexity of geometrical requirements," enthuses company founder Franz Mack. This applies to the dental sector just as much as to "normal" metal machining.

Unrestricted design and production thanks to SLM
With the use of selective laser melting, basically all earlier design and manufacturing restrictions no longer apply. As a result, compared with traditional methods, designers are able to create material-efficient and therefore cost-effective products, and have them economically manufactured by us, with total freedom of design, as Alexander Mack amplifies.

WEB-BASED FOR PRECISION DENTAL PARTS

Integrated SLM process chain with HSC technology and ULTRASONIC
No matter how great the design freedom may be – with high demands on surface quality or precise functional parts, all additive methods reach their limit. With a view to in-house service capability, Alexander Mack has no doubt that the sequential combination of additive manufacturing and »

With the integrated process chain comprising additive metal processing and machining from DMG MORI, all design restrictions immediately cease to apply …

Alexander Mack
Mack CNC-Technik GmbH & Co. KG

machining has a great future, whether carried out with ULTRASONIC, HSC or general milling techniques depending on the material and the requirements. In addition, there is no doubt that his company, with its high level of expertise in technologies, methods and digital processes, would like to participate in this future to a considerable extent. The latest investments are indicative of this: the Mack Group has recently ordered 3 new SLM machines from DMG MORI's REALIZER range.

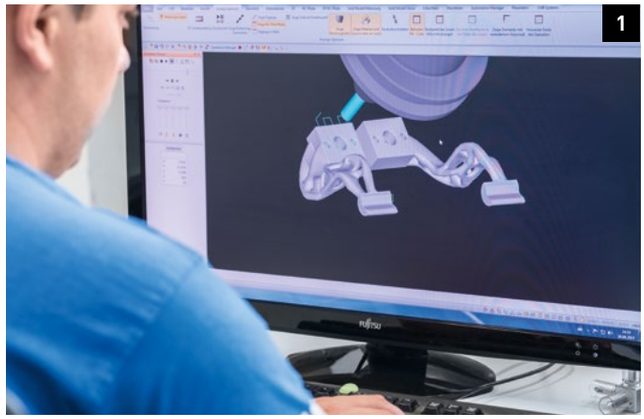
«

MACK CNC TECHNICAL FACTS:

+ More than 60 high-tech milling machines for every task
+ ULTRASONIC and ADDITIVE MANUFACTURING as future-oriented complementary technologies
+ Integrated process chain comprising additive techniques and machining as a key to the industrial maturity of SLM in practice

MACK GRUPPE

CNC-Technik Mack GmbH & Co. KG
Dieselstraße 25
D-89160 Dornstadt
www.mackgruppe.com



1. Along with an earlier system from Concept Laser, Mack has now invested in a total of three SLM machines from DMG MORI and in doing so has enormously expanded its additive service capability.
2. With the new LASERTEC 30 *SLM* machines from DMG MORI's REALIZER range, the company is accelerating the use of additive manufacturing even for "normal" metal processing.
3.+ 4. Example of industrial deposition: Basic structure of a lightweight robot gripper produced in a powder bed before final HSC machining.

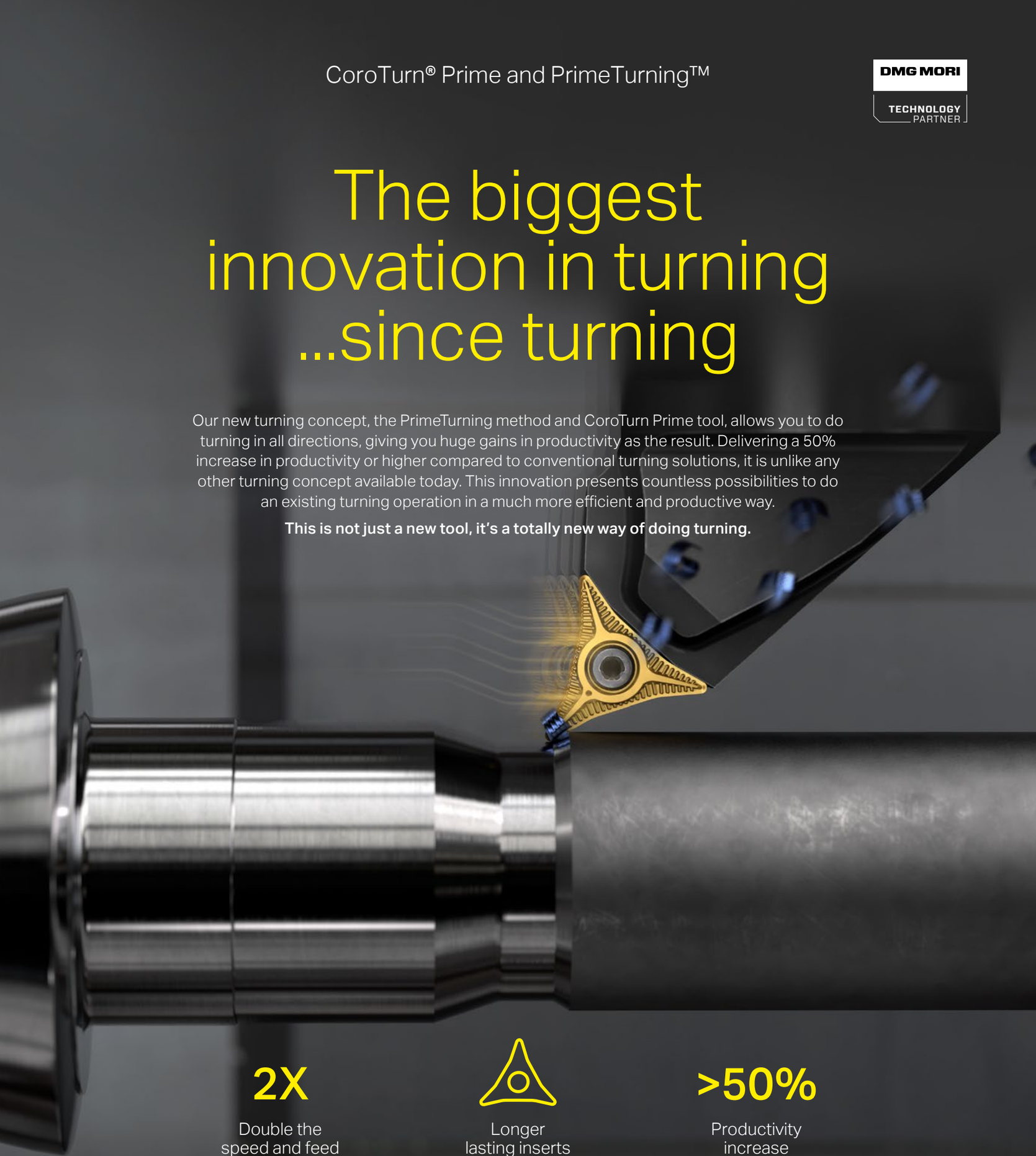
CoroTurn® Prime and PrimeTurning™

DMG MORI
TECHNOLOGY PARTNER

The biggest innovation in turning ...since turning

Our new turning concept, the PrimeTurning method and CoroTurn Prime tool, allows you to do turning in all directions, giving you huge gains in productivity as the result. Delivering a 50% increase in productivity or higher compared to conventional turning solutions, it is unlike any other turning concept available today. This innovation presents countless possibilities to do an existing turning operation in a much more efficient and productive way.

This is not just a new tool, it's a totally new way of doing turning.



2X
Double the speed and feed

Longer lasting inserts

>50%
Productivity increase

Seeing is believing, visit our website to see PrimeTurning in action:
www.sandvik.coromant.com/primeturning

SANDVIK Coromant

AEROSPACE EXCELLENCE NEWS

- Over **20 years of technological experience** for all applications and materials
- **20 years of mill-turn technology** Best in Class for Casings and Rotating Parts: New: Technology integration grinding and ULTRASONIC
- **NEW: DMU 200 Gantry and DMU 340 Gantry** with up to 0.5 g acceleration
- **torqueMASTER** spindles **up to 737 ft-lbs** for the machining of titanium components
- **Aerospace speedMASTER 30,000**, with 105 hP for up to 488 in³ metal removal rate for aluminum
- **Additive Manufacturing:** Laser deposition welding and selective laser melting in a powder bed

BLISK

Machine: DMU monoBLOCK series
Dimensions: ø 17.7 × 4.7 in
Material: Ti6Al4V

PUSHING THE GREEN BUTTON

20 YEARS OF EXPERIENCE
in all workpiece areas

> 100
Aerospace Specialists

CONSULTING
Right through to turnkey Implementation

TECHNOLOGY INTEGRATION
Mill-Turn, Additive Manufacturing, PowerDrill, ULTRASONIC, specific Process requirements

Average annual growth rates of over seven percent make aerospace one of the global growth industries. However, this sustained increase is only one side of coin for airlines. They must be profitable if they wish to remain competitive. They can achieve this among other things with more modern aircraft, which of course leads to a noticeable rise in demand for manufacturers. Traditionally America and Europe have a large share of the manufacture of aerospace products, but Asia is meanwhile gaining ground, with a 37 percent market share. As a supplier of technology for aircraft manufacturers, DMG MORI has observed this development through its order intake.

Optimum machine concepts for every application

Michael Kirbach, Head of the DMG MORI Aerospace Technology Excellence Center, sees lightweight construction in particular as a key factor for positive development: "The structural parts of aircraft contribute greatly to the total mass, so there is an increasing tendency to use aluminum and titanium for such parts."

»

Exclusive Technology Cycle

Grinding – Milling

+ Grinding cycles for internal, external and face grinding plus truing cycles
+ Machine-mounted sensors for start up and truing

More info at:
techcycles.dmgmori.com

TREND

Turn-mill machining with automatic component transfer to the counter-spindle to boost productivity and quality

DMG MORI SOLUTION

Turn & Mill complete machining centers with axial clamping for automatic transfer from main to counter-spindle

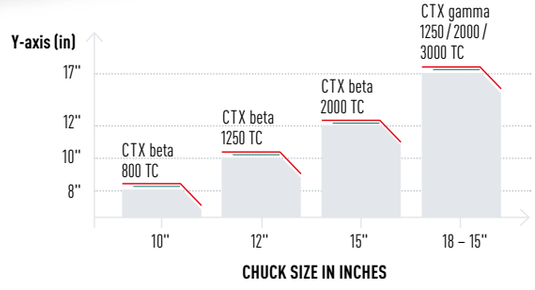
+ **6-Sided complete machining** of engine rings and discs up to ø 27.5 in
+ **Highly productive machining of titanium and nickel alloys**
  – Turning: Main spindle up to 2,950 ft-lbs and counter spindle up to 1,622 ft-lbs
  – Milling: Turn & Mill compactMASTER spindle with up to 162 ft-lbs or 20,000 rpm
+ **In-process measurement** with exclusive DMG MORI Measuring Cycles

SPECIAL BLADE MACHINING:

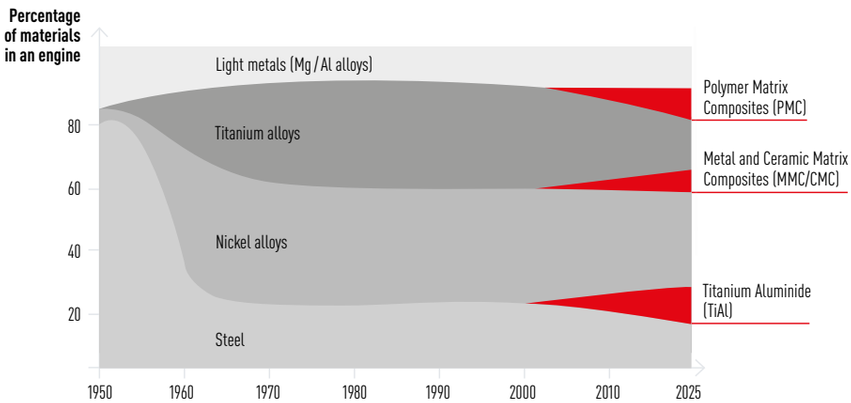
+ **Highly dynamic blade machining** thanks to exclusive DMG MORI Technology Cycles:
  – 5-axis simultaneous machining
  – ATC – Application Tuning Cycle (Turning)
+ **6-sided complete machining** of chuck components, or NEW direct from bar

ENGINE (demo component)

Machine: CTX gamma 1250 TC
Dimensions: ø 9.8 × 4.9 in
Material: TiAl6V4



NEW, LIGHTER AND MORE HEAT-RESISTANT MATERIALS IN THE ENGINE – THE RIGHT SOLUTION FOR EVERY MATERIAL



Source: Based on ACCIS – Bristol University // own estimate

NEW

POLYMER MATRIX COMPOSITES:

+ ULTRASONIC Integration, e.g. on a DMF 260 or the new Gantry series: Improvement of process and quality without delamination or fiber splitting

METAL AND CERAMIC MATRIX COMPOSITES:

+ ULTRASONIC Integration in all DMG MORI 5-axis machines: Cost-effective machinability of MMC / CMC using grinding for compressor blades or shrouds

TITANIUM ALUMINIDE:

+ ULTRASONIC Integration, e.g. on a DMU 65 monoBLOCK: Process improvement and longer tool service life in the machining of low-pressure turbine blades

BEST IN CLASS

NICKEL AND TITANIUM ALLOYS:

+ powerMASTER spindle with up to 737 ft-lbs and max. 9,000 rpm or torque spindles up to 71 hp and 317 ft-lbs
+ Mill-turn technology, as well as high-pressure cooling: > 20 years of mill-turn technology, New: Technology integration grinding

PRECISION

LIGHT METALS AND STEEL ALLOYS

+ speedMASTER spindles with up to 30,000 rpm or 147 ft-lbs
+ Measuring systems from MAGNESCALE with up to 0.01 µm resolution: 18 month warranty with no hourly limit

FAN DISC

Machine: DMC 125 FD duoBLOCK
Dimensions: ø 37.4 × 15.7 in
Material: Ti6Al4V

"The decisive aspect is always the early involvement of users in pending future projects," claims Michael Kirbach as he stresses this aspect of customer orientation.

Unique diversity for additive manufacturing from a single source

He mentions the future field of the additive manufacturing of metal materials as an example. As one of only a few suppliers, DMG MORI offers not just one but two alternative processes here – selective laser melting in a powder bed and laser deposition welding using a powder nozzle. The offer of integrated process chains comprizing additive manufacturing and metal cutting from a single source is indeed unique.

"Additive manufacturing demands a profound knowledge of the respective processes in order to produce highly complex aerospace components with maximum process reliability and reproducibility and on an industrial scale. Close cooperation between us as the provider and the users at a very early stage is vital here", explains Michael Kirbach.

The performance promise mentioned applies equally to the entire DMG MORI portfolio and to all areas of technology: from turning and milling to the integration of technologies and on through to include ULTRASONIC, LASERTEC and ADDITIVE MANUFACTURING. Plus the extensive automation offer from the production cell to the large production system.

Lightweight construction is the dominating topic

The development of production technology in this sector is characterized in particular by the aspiration for lightweight construction and the use of innovative materials. The result is an increased use of CRP and titanium for structural parts in addition to aluminum. Where the construction of engines is concerned, on the other hand, titanium predominates together with ever more heat-resistant nickel alloys. This is reflected in the corresponding diversity of the tasks with which DMG MORI is confronted. Chip removal during the machining of aluminum from the solid, for example, is a critical topic. The machining of titanium components, on the other hand, demands machines designed especially for heavy-duty metal removal.

Competence partner for all component sizes and materials

"It is exactly in the question of the material where our customers benefit from our enormous range," stresses Michael Kirbach and »

DMC 80 FD duoBLOCK
with its pallet changer is ideal for maximum efficiency in mill-turn complete machining.

TREND

+ **Digitization and additive manufacturing** are revolutionizing aircraft and engine manufacture
+ **Heavy duty machining:** High-strength materials with low density for advanced geometries

DMG MORI SOLUTION

High-performance 5-axis simultaneous machining centers from the duoBLOCK series

+ Proven duoBLOCK concept provides **maximum rigidity and performance** for the machining of titanium

TORQUE LINK

Machine: DMC 160 U duoBLOCK
Dimensions: 3.9 × 26.5 × 8.2 in
Material: Ti-10V2Fe3Al

PYLON RIB

Machine: DMC 80 U duoBLOCK
Dimensions: 23.6 × 19.6 × 1.7 in
Material: Ti-6Al4V

Sophisticated components made of titanium: Landing gear parts or frames are milled from the solid on duoBLOCK machining centres.

names the horizontal centers in the DMC H *linear* series and gantry machines as an example for aluminum and CFP components. Added to these are the duoBLOCK machines for high-performance milling of titanium and the mill-turn or turn-mill machines for 5-axis complete machining of engine components – right through to the new technologies as either stand-alone machines or integrated processes.

Gantry series expanded

Michael Kirbach also points out that the Aerospace speedMASTER 30,000 for large structural components can also be used on the travelling column machines of the DMF series or on the gantry series, which has just been extended. The new DMU 200 Gantry now combines the machining of large parts with maximum dynamics with workpiece weights up to 22,046 lbs and 0.5 g acceleration. The DMU 600 Gantry *linear* has a working volume of 236.2 × 177.1 × 78.7 in, making it ideal for large integral components. The new DMU 340 Gantry has a working volume of 133.8 × 110.2 × 49.2 in between two sister machines and can be expanded to up to 236.2 in in the X-axis and 59.05 in in the Z-axis, adds Michael Kirbach.

«

powerMASTER 1000 TITANIUM MACHINING WITH A 737 ft-lbs TORQUE

Aerospace speedMASTER 30,000

Michael Kirbach also mentions the Aerospace speedMASTER 30,000 spindle, which was developed especially for small, complex structural components made of aluminium, for example. With its 105 hp and 37 ft-lbs it enables a metal removal rate of 34 in^3. Particularly when used on the DMC H *linear* series, this is the ideal solution for the machining of structural components up to 737 ft-lbs, promises Kirbach – and it does this with 5 axes. The high volume of chips is channelled out of the work area reliably thanks to optimum chip flow and the high-performance chip conveyor.

WORLD PREMIERE 2017

424 ft³ WORKING VOLUME

DMU 340 Gantry

THE NEW STANDARD IN THE GANTRY SECTOR: POWERFUL, DYNAMIC, COMPACT AND CAN BE USED UNIVERSALLY

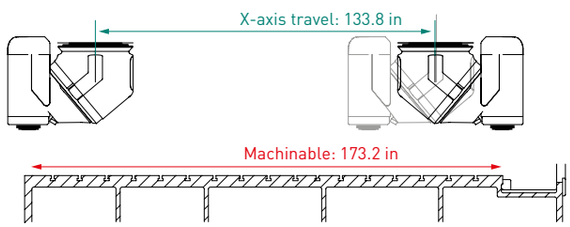
HIGHLIGHTS

+ **Stable construction:** One-piece, thermo-symmetrical machine bed made of EN-GJS-600 for maximum rigidity and precision
+ **Dynamic:** Linear drives in the X and Y-axes with up to 0.5 g acceleration (optional), with integrated, direct drive C-axis for maximum dynamics in 5-axis simultaneous machining
+ **Modular:** Can be expanded to 236.2 in in the X-axis and 59.05 in in the Z-axis

Technical Data		DMU 340 Gantry
Travel X/Y/Z	in	133,9 / 110.2 / 49.2
Rapid traverse X/Y/Z	ipm	2,756 / 2,756 / 2,362 *
Acceleration X/Y/Z	g	0.41 / 0.41 / 0.41
Workpiece weight	lbs	22,050

* with linear drive

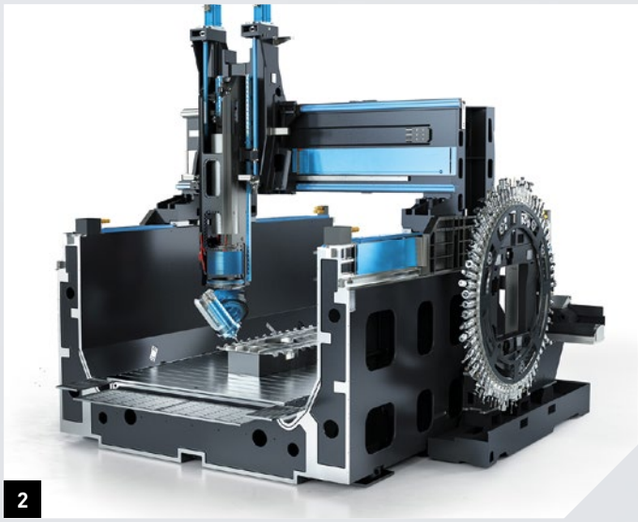
You will find more information on the DMU 340 Gantry at: **gantry.dmgmori.com**



46 % LARGER WORK AREA THANKS TO B / C-AXIS IN THE MILLING HEAD

+ C-axis with ± 300 °
+ 50 ° swivel in the B-axis
+ Direct drives in B- and C-axis

1



2

1. 50 ° B-axis: Normal working volume: 133.8 × 110.2 × 49.2 in
With B-axis rotation: 173.2 × 124.4 × 49.2 in

2. Extensive cooling for maximum component accuracy and surface quality, linear drive (optional) with up to 0.5 g acceleration

AUTOMOTIVE

GLOBAL SUPPLIER
COMPREHENSIVE COMPETENCE PARTNERSHIP

WORLD PREMIERE 2017

150 % MORE TORQUE

135 ft²
footprint

CTV 250

CTV OF THE 3rd GENERATION WITH THE 62 ft-lbs torqueDRIVE TURRET

HIGHLIGHTS

+ **New torqueDRIVE turret** with 150 % more torque up to 62 ft-lbs
+ **Powered tools** with optional 12,000 rpm
+ Main spindle up to 331 ft-lbs torque for optimum cutting performance
+ 25 % higher **machine rigidity**
+ **Optimized chip flow** in the work area
+ **1 concept for 4 machines:** CTV 160, CTV 250, CTV 315 and CTV 250 DF

TCO
Life-cycle costs

CPK
Process capability

FLEXIBLE MANUFACTURING CELLS
for all requirements of the automotive industry

UNIT COSTS

TURNKEY
1 contact partner (supplier) for all technologies

Advanced driver assistance systems, vehicle sharing economy and electric mobility are the dominant topics in the automotive boardrooms. The day-to-day business in the production plants however is characterized by digital changes. What is important here is to cushion the trend towards individualization and consequently changing batch sizes with equally flexible and economical structures. With the support of its automotive Technology Excellence Center, DMG MORI intends to participate in the digital transformation of automotive production to a considerable extent, and significantly increase its sales in this field from the current 1,500 machines annually. »

AUTOMOTIVE EXCELLENCE NEWS

+ More than 1,500 DMG MORI machines annually for the automotive industry
+ **Everything from a single source:** Turning, Milling, ULTRASONIC, LASERTEC Shape, Additive Manufacturing and Automation
+ **NEW: CTV of the 3rd Generation** with 62 ft-lbs torqueDRIVE turret
+ **NEW: CTX beta 1250 CS,** unique machine concept for crankshaft production
+ **NEW: MULTISPRINT,** multi-spindle automatic lathes for SWISSTYPE machining up to 7.08 in turning length
+ **NEW: DMU 200 Gantry and DMU 340 Gantry with** up to 0.5 g acceleration

Technical data		CTV 250
Chuck diameter, max.	in	62 – 98
Max. rotational speed	rpm	5,000
Capacity (40 / 100 % DC)	hp	40 / 33
Axis stroke X/Y*/Z	in	364 / ±35 / 137
Rapid traverses X/Y*/Z	ft/min	60 / 40 / 40
Driven tools*	rpm	12 × 6,000 (12,000)

* Option

More information about CTV 250 can be found here: **ctv.dmgmori.com**


1


2

1. Fast loading and unloading time of 5 sec. with 2-track automation (integrated accumulating conveyor or prismatic conveyor belt)

2. Large work area for workpieces up to ø13.7 and 7.8 in length

Unique assortment for the automotive process chain

"Apart from sheet metal and plastic parts, without exception, every mechanical component of a car can be economically produced to the required quality using machines and technologies from DMG MORI." With just one sentence, Harry Junger manages to elucidate the comprehensive expertise of DMG MORI in the automotive process chain. At the same time, the Managing Director of GILDEMEISTER Drehmaschinen GmbH supports his statement by referring to the multitude of metal machining and additive processing – from the production of single parts to the serial production of components for the drive train. As an example, he points to the full spectrum of horizontal and vertical turning technology, complete with automation. For producing filigree surfaces using additive manufacturing based on powder bed or powder nozzle technology, Junger cites 20 years of LASERTEC expertise as a demonstration of competence. Furthermore, thanks to ULTRASONIC technology, DMG MORI is able to automatically machine ceramic brake discs for example, or lightweight materials, productively, safely and to high quality. In addition, DMG MORI offers comprehensive digitization with the CELOS ecosystem and the new IIoT-platform ADAMOS. «

CRANKSHAFT

Dimensions: ø5.9×22.04 in
Material: GG20

CAMSHAFT

Dimensions: ø1,5×18,5 in
Material: GG20

CTX beta 1250 CS

Unique machine concept for crankshaft production

+ **Three tool carriers** for shortest cycle times, with turning and milling on one machine
+ **20 % reduction in production time for the entire process,** 50 % faster production of main bearing and bearing pin
+ **Patented turning unit with 42 tool pockets** and integrated steady rest ø1.3 – 3.1 in
+ **Shaft chuck** for complete machining

Technical data		CTX beta 1250 CS
Max. machinable workpiece length	in	275
Max. turning diameter	in	295
Main spindle (40 % DC)	hp/rpm	64/4,000
Two milling units (40 % DC)	ft-lbs/rpm	2,765/120

NZX-S-series

Compact turning centers for series production of shafts

+ **Space-saving design** for production involving short travels as well as optimized spindle power and feed
+ **Thermo-symmetrical design** with reference to the spindle centerline for highest machining accuracy
+ **Optimum accessibility** to workpieces and tools
+ **Vertical design** for optimum chip flow

INTEGRAL TURNING COMPETENCE FOR THE AUTOMOTIVE INDUSTRY

CV JOINT INNER RACE

Dimensions: ø 0.7 in
Material: 20MnCr5

STATOR SHAFT

Dimensions: ø 3.9 × 2.7 in
Material: Steel

CONNECTOR

Dimensions: ø 2.3 × 3.9 in
Material: alloyed tempered steel

CTV 250 DF

Vertical turn-milling center for machining constant velocity joints

+ **High dynamics** with turn-milling swing arm (DF) as direct drive with 90 rpm, swivel range +105 / -45 °
+ **DF swing arm** for up to two milling spindles 6,000 rpm, 19 hp and 33 ft-lbs (one milling spindle as standard)
+ **Additional Capto C5 tool holder** for multi-tool with up to four cutters
+ **Mirrored double version** for increased productivity and faster ROI

WASINO G100

Ultra-high precision lathes for the automotive industry with < 0.5 µm roundness

+ **Complete thermal decoupling** of the work area with stainless steel covers
+ **Temperature response accuracy** < 3 µm (cold start)
+ **< 1 sec. chip-to-chip time** with linear tool carrier without indexing time
+ **Ideal for hard turning,** e.g. finishing in sequential production processes

NRX

Highly productive twin-spindle turning center for series production

+ **Max. Turning diameter ø 7.08 / 5.9 in** (turning specification / milling specification), chuck size max. ø 7.8 in
+ **Maximum productivity** due to the world's fastest workpiece loading at 5.6 sec.
+ **Parallel loading of one spindle** while the second spindle is in operation. Two 8-station (optional 10*) turrets for optimum metal removal

* MC version: standard

EUROPEAN COMPETENCE CENTER FOR AUTOMATIC LATHES

Unique! Upward compatible from the SPRINT to MULTI-SPRINT – using the same technology and cutting tools on both machines.

Mario Stroppa
Managing Director at GILDEMEISTER Italiana S.p.A.

With more than 5,000 installed multi-spindle automatic lathes, GILDEMEISTER Italiana is the competence center for automatic turning. Since the factory in the Italian Brembate di Sopra was completely modernized, thus strengthening the product area sustainably, the company has now developed a completely new multi-spindle concept with the MULTISPRINT series. "The MULTISPRINT redefines automatic turning and is the perfect machine to significantly increase productivity for manufacturing long turned parts", says Managing Director Mario Stroppa.

Furthermore, DMG MORI combines the SWISSTYPE*kit* known from the SPRINT series with all benefits of a multi-spindle automatic lathe. Using a Y-axis at each spindle as standard, highly complex workpieces can be completely machined with standard tools. «

SPRINT 32 | 8

HIGHLY PRODUCTIVE AUTOMATIC TURNING

HIGHLIGHTS

+ **Workpieces up to ø1.2 × 9.4 in** with less than **138 ft² footprint**
+ **SWISSTYPE*kit*** for short and long turning operations on a single machine**, < 30 min. setup time**
+ **Up to 30 tools** on 2 independent linear holders, max. 10 driven tools

WORLD PREMIERE 2017

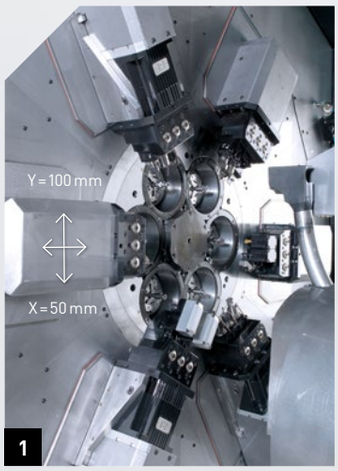
236 ft²
INCL. LOADER & HIGH-PRESSURE COOLING SYSTEM

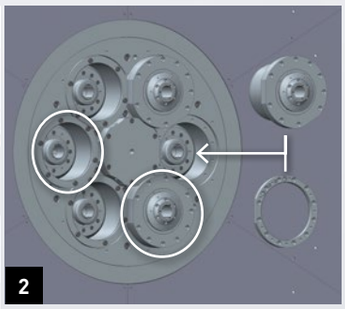
MULTISPRINT

REVOLUTION IN AUTOMATIC TURNING – MULTI-SPINDLE AUTOMATIC LATHES FOR SWISSTYPE MACHINING

HIGHLIGHTS

+ Use of **driven tools at all spindle positions**
+ **Y-axis at all spindle positions** as standard
+ SWISSTYPE*kit* for short and **long part turning up to 7.08 in in length,** < 2 h setup time
+ **Chuck and bar machining:** bar diameter up to ø1.4 in, chuck components up to ø1.9 in
+ **Double-rear and off-center machining**
+ State-of-the-art control technology: **FANUC Series 30i**





1. Unique: **Y-axis with 3.9 in stroke** at all 6 spindle positions as standard

2. SWISSTYPE*kit* incl. driven guide bush for **turning up to 7.08 in**

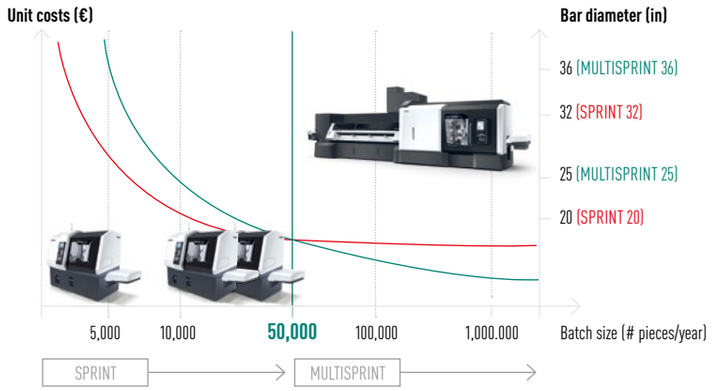
SPRINT AND MULTISPRINT: ALWAYS THE RIGHT MACHINE FOR SWISSTYPE MACHINING

Spline shaft

Spline shaft
Sector: Automotive
Dimensions: ø0.8 × 5.07 in
Material: Steel (45S20)
Machining time: SPRINT 32|8: 62.5 sec.
MULTISPRINT 36: 14.1 sec.

EXAMPLE SPLINE SHAFT

+ **Production launch:** 1 × SPRINT 32|8
+ **Medium batch size** up to 50,000 pieces per annum: 2 × SPRINT 32|8
+ **Series production** over 50,000 pieces per annum: Change to 1 × MULTISPRINT 36
+ **30 % less space occupied** by a MULTISPRINT 36 compared to a 2 × SPRINT 32|8; (236 ft² vs. 341 ft²/ incl. bar loader, chip conveyor, etc.)



DMU 200 Gantry

LARGE, DYNAMIC, FAST AND PRECISE

Think tank for complete solutions
The 80 employees of Fritzmeier Technologie GmbH develop, design and produce tools, prototypes, cubing models and test gauges for the automotive industry. The company finds its customers both within and outside the Fritzmeier Group, to which the company belongs. Within the association, the technology team is mainly a think tank for individual complete technical solutions.

DMU 200 Gantry:
In top form for large components
The DMU 200 Gantry has recently been ordered from DMG MORI especially for machining large components. What is particularly interesting is that directors Peter Berger and Robert Huber have in effect ordered the gantry machine at the "drawing board stage".

However, the extraordinary decision was, of course, not made completely out of the blue. After all, 10 of its 25 machines in metal parts production carry the DMG MORI logo – including a DMU 200 P and two lathes. This is indicative of a positive experience and a trusting business relationship – particularly with regard to the innovative demands which the company, founded in 1997, makes on its manufacturing equipment.

DMG MORI AS TOP SUPPLIER IN THE MACHINE TOOL SECTOR

"Innovative technologies have always ensured our competitiveness," explains Robert Huber, who points out that they were already using high-speed centres with linear direct drive in 2001 in order to speed up the finishing process. Robert Huber has been head of Fritzmeier Technologie GmbH since January. He is therefore following in the footsteps of Peter Berger. Berger has been with the company for more than 40 years and, as an "old hand", also understands the importance of modern manufacturing technology: "With our products, precision is the first commandment – whether in tool making or in the machining of cubing models and test gauges. This cannot be achieved with the good old methods."

Dynamics, speed and precision in the 5-axis machining of large parts
This explains the circumstances for the latest investment in the machining of large parts. "As part of our open house event in Seebach, we showed a few customers the machine status at the time – the bed and the gantry," recalls Markus Rehm, Managing Director of DECKEL MAHO Seebach. And Peter Berger adds: "The machine concept impressed us immediately. The workpiece lies on the rigid table while the spindle moves around the component." The rapid traverse speeds of 1,969 in/min also impressed us as a basis for dynamic 5-axis simultaneous machining with spindle speeds up to 30,000 rpm. The overall positive picture was completed by equipment options for the milling head in 45° and 90° design.

FRITZMEIER TECHNOLOGIE: THE THINK TANK FOR INDIVIDUAL COMPLETE TECHNICAL SOLUTIONS OPTS FOR THE NEW DMU 200 GANTRY FROM DMG MORI FOR THE MACHINING OF LARGE PARTS

Customer-oriented and tailor-made

Purchasing during the final design stage of the DMU 200 Gantry had one advantage: it enabled the Fritzmeier Technologie application engineers to input their know-how together with their expectations to further the machine development. For Markus Rehm, a clear win-win situation. "We were able to make decisive improvements to the machine compared with the original design, particularly in detailed matters." One example is that the maximum machine loading was increased to 22,046 lbs – with table dimensions of 90.5 × 86.6 in – as a result of Fritzmeier feedback. Also, it was possible to further improve accessibility and the design of the work area thanks to the innovative collaboration, according to Rehm.

toolSTAR magazine and technology integration as further highlights

With the new DMU 200 Gantry, DMG MORI has rounded off its product portfolio for the machining of large parts. The machine, with its large work area, is designed particularly for applications in automotive, aerospace and »

Top: Robert Huber (left) has this year succeeded Peter Berger, who was Managing Director of Fritzmeier Technologie GmbH for many years.

Bottom: For Fritzmeier, perfect machining is essential in tool making and in the machining of cubing models and test gauges.

Top: Fritzmeier Technologie has been working for many years with CNC machines from DMG MORI.

Bottom: Every component is fully tested before delivery or assembly.

the energy sector. "Model making, structural parts and even the machining of aluminum plates are examples of uses for the DMU 200 Gantry," explains Markus Rehm. The in-house toolSTAR magazine with up to 120 tool pockets ensures high flexibility and reduces the setup time for complex machining operations. "Furthermore, the modular building blocks even allow ULTRASONIC and LASERTEC technology to be incorporated."

Fritzmeier Technologie will take delivery of its DMU 200 Gantry at the beginning of 2018 and use it alongside the DMU 200 P. "Both machines will be accessible via a common platform," says Robert Huber, discussing the floor plans. In the end, it always comes down to the space requirement. "Measured against the footprint, the DMU 200 Gantry offers a very large work area so that the model fits ideally into our range of machines."

Young talent encouraged and machines updated

As in many areas, Fritzmeier Technologie is also underlining its desire to achieve a modern production facility with the DMU 200 Gantry. "Of course, this also includes well-trained specialists," says Roland Huber. With currently twelve trainees – who also learn on DMG MORI machines in the apprentice workshop – the young talent for the future is being secured. Training is very practical as it is integrated to a major extent into normal everyday production.

«

FRITZMEIER FACTS

+ Original equipment manufacturer for the production of off-road vehicles and commercial vehicles
+ World market leader of cabs for construction machines and industrial trucks
+ Range of products and services: Cabs and metal system parts, plastic assemblies, fixtures, tools and special machines made-to-measure, fertilizer management systems

Fritzmeier Technologie GmbH
Forststraße 2
D-85653 Großhelfendorf
www.fritzmeier.de

WORLD PREMIERE 2017

22,046 lbs
TABLE LOAD

DMU 200 Gantry

5-AXIS MACHINING WITH UP TO 30,000 rpm AND OPTIONAL TECHNOLOGY INTEGRATION

HIGHLIGHTS

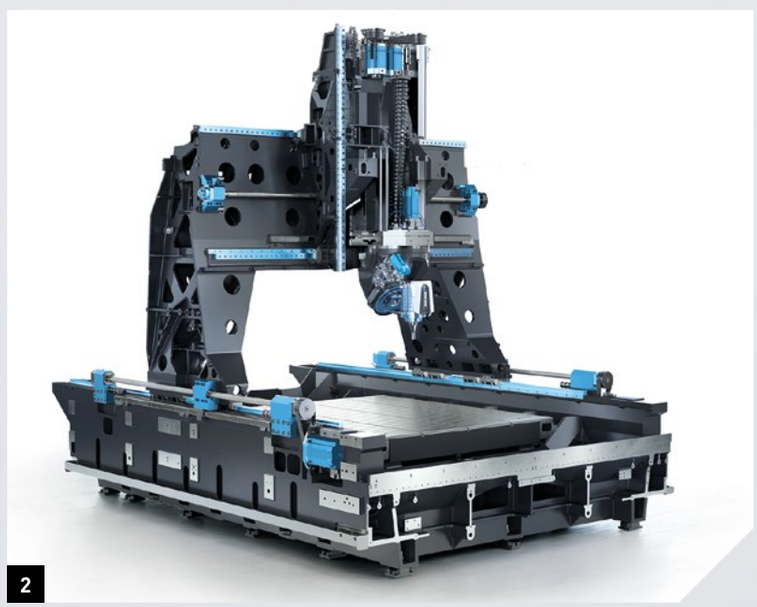
+ **Dynamics:** 0.5 g acceleration and 1,969 in/min rapid traverse (X/Y/Z)
+ **Large work area:** Travels of 78.7×78.7×47.2 in (X/Y/Z) optional 157.4 in travel in X
+ **High stability:** Cast iron machine bed
+ **High table loading:** Workpieces up to 22,046 lbs
+ **High flexibility:** 45° or 90° milling head for 5-axis machining at up to 30,000 rpm
+ **Technology integration:** Optional integration of ULTRASONIC for CRP/GRP machining or LASERTEC Shape for surface texturing

Technical Data		DMU 200 Gantry
Travels X/Y/Z	in	78.74 (157.48)/78.74/47.24
Rapid traverse X/Y/Z	ipm	1968.5
Acceleration X/Y/Z	g	0.51
Max. workpiece weight	lbs	22,000

You will find more information on the DMU 200 Gantry at:
gantry.dmgmori.com

1

1. 45° or 90° milling head for 5-axis machining at up to 30,000 rpm



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2. Low-gantry design with integral cooling concept: 0.5 g acceleration for highly dynamic machining of large components up to 22,046 lbs in a footprint of less than 258 square feet

DOUBLE OUTPUT

... THANKS TO A FLEXIBLE MANUFACTURING SYSTEM FROM DMG MORI – INCLUDING HSC

Development, design, production and prototyping as core elements of in-house MOLD MAKING expertise. In addition, the Plastics Technology Division provides surface finishing, assembly and packing right through to on-time delivery. The range of services offered by Werkzeugbau Karl Krumpholz GmbH & Co. KG with its two sites in Franconia is as comprehensive as it is impressive. This is also reflected in the machine shop of the mold making facility in Kronach. The great importance placed on automation here is evidence of the forward-looking approach of the company. Particularly impressive is a flexibly automated DMG MORI manufacturing system for the production of electrodes.

If as few personnel as possible are in attendance when the machines are heavily loaded, this automatically means economical production!

Kay Löffler
Technical Manager
Werkzeugbau Karl Krumpholz GmbH & Co. KG

Customized automation in electrode production

Krumpholz-Formenbau had the FMS made-to-measure by DMG MORI at the turn of the year 2016 – 2017. At its heart is the high-speed HSC 105 *linear* machining center from the factory in Seebach. In combination with two erosion machines from OPS-Ingersoll, a large warehouse as a trans-shipment center for blanks and finished parts, and a Kuka robot for internal handling, the system produces electrodes up to 51.1 × 5.9 × 19.6 in and weighing up to 220 lbs.

DMU 60 eVo *linear* with PH 150|8 pallet handling

The DMG MORI electrode production system is not the moldmaker's first automated system. DMG MORI in Kronach installed a DMU 60 eVo *linear* with PH 150|8 pallet handling back in 2013. Krumpholz produces a wide range of functional parts for in-house tools on the machine. Kay Löffler, Technical Manager at Krumpholz, says: "With the help of the pallet handler, this system also works 24 hours a day, seven days a week." There is therefore no question for Löffler that the automation system is cost effective.

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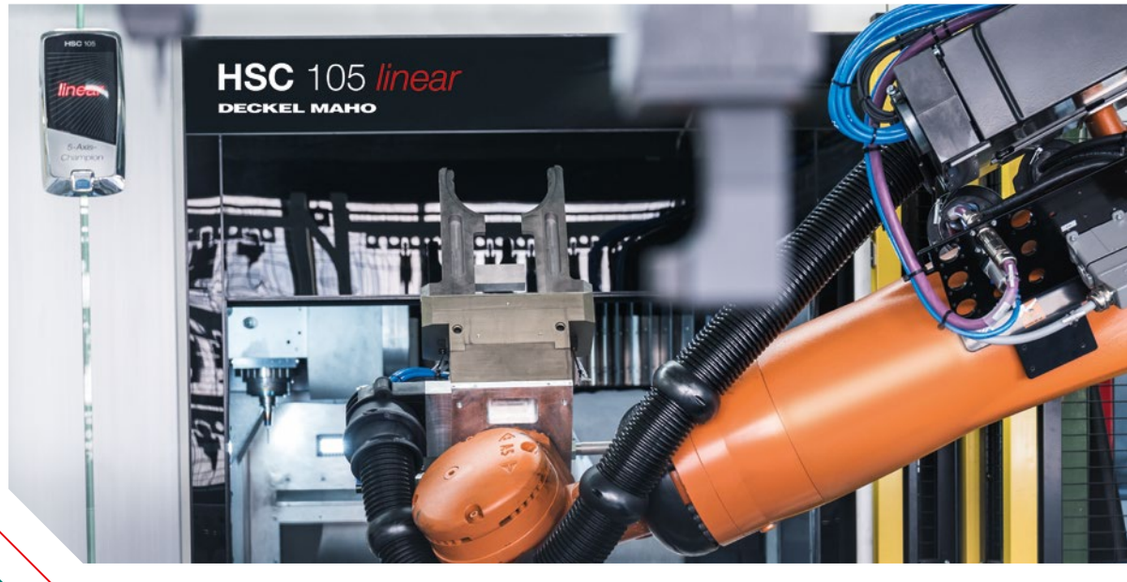

Automation made by DMG MORI: For electrode production at Krumpholz, an HSC 105 *linear* and two erosion machines as well as a blank and finished parts store are connected via Kuka robots for 24/7 operation.

"If as few personnel as possible are in attendance when the machines are heavily loaded, this automatically means economical production!" Continuous operation is necessary thanks to an excellent order situation.

DMU 210 P from DMG MORI for large mold making

95 % of the tools are intended for the automotive and commercial vehicle sector. Krumpholz also produces serial parts – for example single frames for Audi or whole bumper systems for trucks – in its in-house plastics technology facility. With a particular eye on the large molds necessary for this, Kay Löffler turned his attention to a further DMG MORI installation. The machine range was therefore supplemented by a DMU 210 P in 2014.

Magazine with space for 400 electrodes

But back to the latest investment in automation. As mentioned earlier, DMG MORI has connected one of its HSC 105 *linear* high-speed centers and two erosion machines from Ingersoll via a 6-axis Kuka robot for electrode production. A blank and finished component store with 400 locations has also been incorporated. The HSC machine and the erosion machines are served flexibly and under program control from this store.

HSC as an unbeatable investment

"The HSC spindle with speeds up to 40,000 rpm and the linear drives with 3,543 in/min rapid traverse allow extremely precise machining with high surface qualities", remarks Kay Löffler, assessing the performance of the HSC 105 *linear*. High-speed milling is therefore an unbeatable facility for graphite machining.

CONTINUITY FROM CAM TO CAQ

Added to this are the advantages of automation. "With the same number of personnel, we produce twice as many parts compared to stand-alone production", says Löffler.

Meanwhile, the personnel have been redeployed in another area, reports Christopher Zwosta, Production Planning, and Tino Schnapp, CAM Manager: "The large store and the high output ensure that the automation system continuously requires replenishment. For this reason, in the meantime we have strengthened the whole of the production engineering department."

«

KRUMPHOLZ FACTS

+ Founded in 1955
+ 150 employees at two sites
+ Expert partner to the automotive industry for mold making and plastics technology
+ Molds up to 118.1 × 98.4 in and 55 US t weight
+ Plastic parts for interior, exterior and power train
+ Reference: MAN bumper system TGL/TGM Euro 6

KRUMPHOLZ.
FORMENBAU | KUNSTSTOFFTECHNIK

Werkzeugbau Karl Krumpholz GmbH & Co. KG
Im Ziegelwinkel 10/12
D-96317 Kronach
www.krumpholz-fb.de

1. The spindle of the HSC 105 *linear* with speeds up to 40,000 rpm and linear drives for 3,543 in /min rapid traverse enable very precise graphite machining with excellent surface finishes.

2. The machine range was supplemented in 2014 by a DMU 210 P for machining large molds for plastic component production.

DMU 50
WITH PALLET
HANDLING
PH 150|8

DMU 50 3rd GENERATION

MORE THAN 350 MACHINES SOLD IN THE FIRST 8 MONTHS

HIGHLIGHTS

+ **78 % larger work area** with < 721 ft² footprint
+ **40 % higher rapid traverse speeds,** 1,654 in/min as standard
+ **28 % greater swivel range,** swiveling rotary table for 5-axis simultaneous machining with -35 °/+110 ° as standard
+ **speedMASTER spindles** up to 20,000 rpm incl. 18 month warranty with unlimited hours
+ **Pallet handling: e.g. PH 150|8** – Inexpensive introduction to automation – Integral pallet magazine with 8 pallet storage locations (optional: up to 30 locations) – Pallet set-up position with intuitive touchscreen control panel

PH 150 – 8-pallet pool;
load capacity 551 lbs incl. pallet (optional 772 lbs)

Technical Data		DMU 50 3rd Generation
Travels X/Y/Z	in	255/204/187
Clamping surface	in × in	ø 255 × 196
Table swivel/rotation (B|C)	Degree	-35 °/ +110 ° | 360 °
Max. workpiece weight	pound	661

You will find more on the
DMU 50 3rd Generation at:
dmu.dmgmori.com

MEDICAL EXCELLENCE NEWS

+ **Machining of the complete material mix:** From high-strength plastic to stainless steel and titanium through to CoCr with ULTRASONIC
+ **SPRINT 20|8:** 35 % shorter machining time for bone screws made of titanium
+ **speedMASTER spindles** up to 30,000 rpm or HSC spindles up to 60,000 rpm
+ **Workpiece optimized automation,** e.g. the NTX 1000 with 6-axis robot, or the WH 3 workpiece handling system for the MILLTAP 700
+ **Exclusive DMG MORI Technology Cycles,** e.g. ATC for the best surface finish

WITH TECHNOLOGY EXCELLENCE TO TOP QUALITY

As a partner of virtually all large manufacturers of medical equipment, DMG MORI plays a decisive role in ensuring implants and instruments are machined efficiently and above all that they meet the high demands on quality. This includes the complete material mix, from high-strength plastic to stainless steel and titanium and on through to cobalt chrome and now biodegradable magnesium alloys. CNC solutions for 6-sided turn-milling, 5-axis simultaneous milling, ULTRASONIC technology and high-speed cutting are just as much a part of the portfolio as ADDITIVE MANUFACTURING and digital solutions for future-orientated processes in the medical technology sector.

Integral automated processes boost efficiency

DMG MORI is a long-term partner of manufacturers of medical components and is well acquainted with the special challenges in mechanical production. "The technological possibilities are not in fact the limiting factor here. Instead it is the high demands on the certification of medical products that determine the process in medical technology", explains Marcus Krüger, Head of the DMG MORI Medical Excellence Center.

Innovative solutions for the medical technology of the future

Thanks to its extensive product program and process competence, DMG MORI is optimally prepared for every question. The experts of the machine tool manufacturer in the DMG MORI Medical Excellence Center at DECKEL MAHO Seebach realize innovative turnkey solutions for cost-effective production, as the engineers on site are involved in customer projects in the very early stages. "This results in continuous mutual learning, from which both we and our customers benefit", says Marcus Krüger enthusiastically.

Space-saving machine tools for every application

The high-performance and productive CNC machine tools from DMG MORI are and remain an indispensable basis for cost-effective automation solutions. »

6-SIDED
complete machining

RA
< 0.15 µm

72 h
flexible and automated
production from a batch size of 1

60,000 rpm
max. spindle speed

from
METAL FOAM
to titanium

Exclusive
Technology Cycle
MPC 2.0

+ Vibration and torque monitoring of the process
+ Fast machine shutdown in the event of a crash

More info at:
techcycles.dmgmori.com

In the DMG MORI Medical Excellence Center at DECKEL MAHO Seebach, DMG MORI realizes optimum manufacturing solutions for medical technology applications thanks to early involvement in customer projects.

Marcus Krüger
Head of the Medical Excellence Center
marcus.krueger@dmgmori.com

MATERIAL TRENDS

+ **NEW: Biodegradable magnesium alloys** – MILLTAP 700 with integrated fire extinguisher system and 2-stage flame detection
+ **High-strength plastic, stainless steel and titanium** – speedMASTER spindles up to 30,000 rpm or HSC spindles up to 60,000 rpm
+ **CoCr** and hard-brittle materials **such as zirconium oxide** – ULTRASONIC machining

BONE SCREW

Dimensions: ø 0.3 × 3.3 in
Material: Titanium (Ti6Al4V)

BONE PLATE

Dimensions: ø 2.3 × 0.7 × 0.1 in
Material: Titanium

35 % shorter machining times for bone screws made of titanium: combination of SWISSTYPE*kit* and patented Direct Drive thread whirling with CBN

SPRINT 20|5 SWISSTYPE*kit*

for turning of short and long high-precision implants on one machine

MILLTAP 700

Highly productive compact machining center for the economical series production of implants and bone plates

Here, too, users prefer the most compact footprint possible. That is why this market is dominated by models such as the compact MILLTAP 700 machining center, the SPRINT automatic lathes and the DMU 50 for 5-axis milling plus the smaller DMU eVo as well as the 2nd Generation NTX 1000 for 6-sided complete machining.

Precision milling with 5 axes and up to 60,000 rpm

Two things that the entire component range in the medical technology sector have in common are the high demands on quality and the need for shorter machining times. "That is why complete machining is a commonplace topic in this sector", says Marcus Krüger. In particular, complex components such as knee implants made of cobalt chrome can be produced efficiently in 5-axis operation on the DMU 40 eVo. "Spindles such as the speedMASTER with up to 30,000 rpm or special HSC spindles with speeds of up to 60,000 rpm ensure excellent surface qualities and require at most only minimum time and effort for post processing," Marcus Krüger goes on to tell us.

TURN & MILL IN A SINGLE SETUP

6-sided complete machining

Marcus Krüger takes the 2nd Generation NTX 1000 for 6-sided complete machining of diverse components such as hip and knee prostheses as an example to illustrate this point for turning. "This turn-mill center achieves in a footprint of just 107.6 ft² what normally requires two machines in many cases", promises Krüger.

The basis for this outstanding performance of the NTX 1000 is among other things the simultaneous machining with milling spindle and lower turret. The sturdy machine construction guarantees high-precision machining, while the tool magazine with its 76 stations contributes to a high degree of flexibility in production. Several automation solutions, including an integrated 6-axis robot for loading chuck components, rounds off the configuration options.

«

KNEE PROSTHESIS

Dimensions: 2.4×2.7×2.6 in
Material: CoCr

HIP JOINT SOCKET

Dimensions: ø2.3 in
Material: Titanium

Top products in the medical technology sector

DMU 40 eVo *linear*

Dynamic 5-axis simultaneous machining of implants and joints made from difficult-to-machine materials

NTX 1000

DDM technology on the B-axis for 5-axis simultaneous machining of complex workpieces

+ Knee prostheses
+ Hip prostheses
+ Spinal implants
+ Bone plates
+ Surgical instruments

MANUFACTURING EXPERTISE MEETS MEDICAL ENGINEERING

CHARMANT INC. has been around since 1956. In the beginning, the company manufactured components for spectacle frames and later complete frames. Since then, the company has expanded its business both in direct sales and production, and in the meantime has become a leading manufacturer on the Japanese market. Today, CHARMANT operates in a hundred countries throughout the world and is highly competitive thanks to impressive technological developments.

Two examples of these are the competent processing of Excellence titanium alloy and the use of precision laser welding. The numerous innovations in products and processes led in 2012 to CHARMANT expanding its expertise in the growth market of medical engineering. Chairman of the Board, Kazuo Iwahori, recalls: "An ophthalmologist working in a university hospital in Kanto was complaining about the quality of stainless steel instruments from abroad and asked us whether we could make these from titanium." Shortly afterwards, a brain surgeon, who had seen ophthalmological products developed by CHARMANT,

1

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1. From left to right: Yuki Kataoka, Engineer, Kazuo Iwahori, Managing Director, and Terukazu Mizuguchi, Engineer, in front of the HSC 20 *linear* high-speed machining centre. The ULTRASONIC 20 *linear* can be seen in the background. **2.** 5-axis laser cutting with the LASERTEC 20 FineCutting is carried out in a temperature-controlled room due to the precision requirements.

All Charmant medical instruments are patent pending. Many of them have even won a design prize.

recognized the technological potential and asked the company to produce micro scissors for neurosurgical operations. Impressed by the micro scissors, Takanori Fukushima, also a brain surgeon and known in Japan as the "Hand of God", placed an order on CHARMANT to produce a series of surgical instruments. This is clearly better than word-of-mouth marketing.

ADVANCED TECHNOLOGIES LEAD TO SUCCESS

At the time of launching the development and manufacture of medical engineering products, CHARMANT was the first company in Japan to install a DMG MORI LASERTEC 20 FineCutting. Yuki Kataoka of the Technical Development Department is responsible for the machine and is enthusiastic about the possibilities of 5-axis laser precision cutting. He cites some examples: "Among other things, the LASERTEC 20 FineCutting produces tweezers by splitting a wire of 0.19 in diameter. It also manufactures extremely thin tubes with high precision."

Compared with the previously used wire erosion method, we hear that CHARMANT has increased efficiency by nearly 100 %. This machine was later joined by a further HSC 20 *linear* for high-speed and high-performance milling, and an ULTRASONIC 20 *linear* for the ULTRASONIC machining of special materials. The HSC 20 *linear* is used in the machining of medical engineering products, while complex prototypes made of glass or ceramic are processed on the ULTRASONIC 20 *linear*. Both are tasks which CHARMANT could not previously accomplish.

"We will soon be purchasing an additional HSC 20 *linear* with pallet changer for up to 99 workpieces," says Kazuo Iwahori, explaining his plans for the near future, in which manufacturing is to be further improved and product and service capabilities successively expanded.

«

CHARMANT FACTS

+ From newcomer to technology partner for the surgical sector
+ Micro scissors for neurosurgical operations as the introductory product
+ LASERTEC 20 FineCutting, ULTRASONIC 20 *linear* and
+ HSC 20 *linear* as a basis for market success
+ HSC 20 *linear* with pallet changer for up to 99 workpieces planned

CHARMANT

Charmant Inc.
6-1 Kawasari Cho Sabae City
Fukui Pref. 916-0088
www.charmant.co.jp

SUPPORTING YOUNG PEOPLE AT WORLD CLASS LEVEL

DMG MORI was most recently the main sponsor of the WorldSkills Competition in Leipzig, Germany

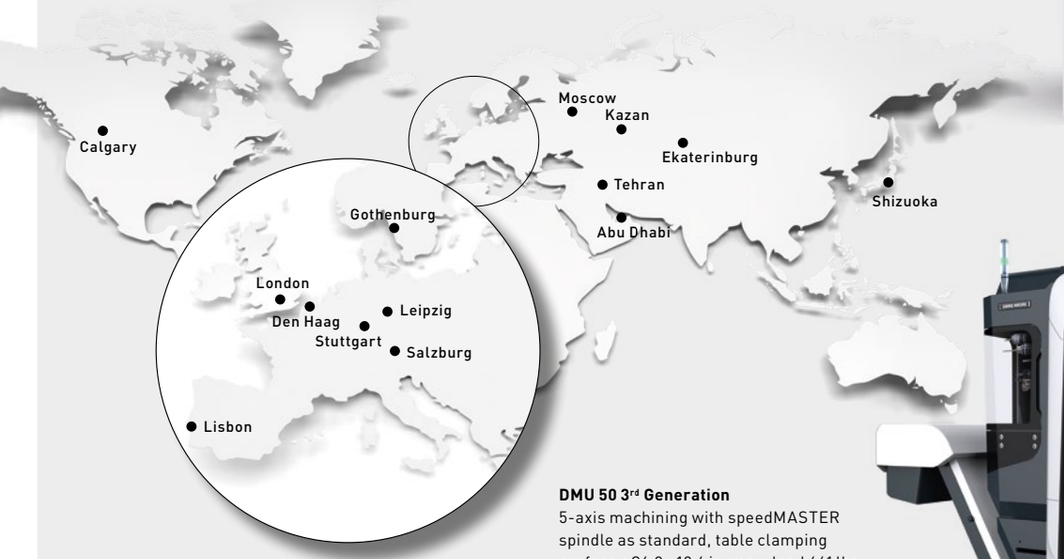
It is no less than the 44th time that WorldSkills International is attracting skilled junior employees from 62 countries to the world championship of professions. More than 1,200 participants will compete against each other from 15th to 18th October 2017 in Abu Dhabi (UAE) in 51 disciplines. As Global Industry Partner and long-standing sponsor, DMG MORI is supporting the world championships in the metal cutting professions with 17 milling machines and 12 lathes.

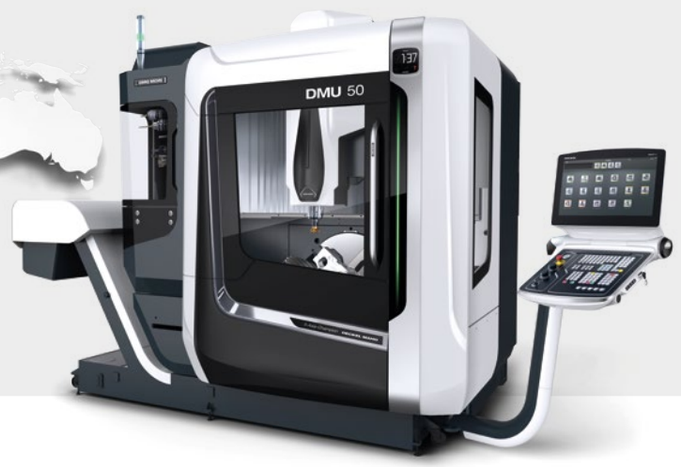
Young professionals will take center stage on metal cutting machines in four disciplines during the WorldSkills 2017 in the United Arab Emirates. The competition includes CNC Milling, CNC Turning, the Manufacturing Team Challenge and Plastic Die Engineering. DMG MORI is making the required CNC technology available to the competitors in the form of 17 3rd Generation DMU 50 milling machines and 12 CTX alpha 500 lathes. All DMG MORI machines are equipped with the intuitive operating system CELOS and the state-of-the-art SIEMENS control Sinumerik 840D Operate 4.7. This way, DMG MORI ensures an equally innovative and reliable CNC standard in all four disciplines at Industry 4.0 level.

For Jörg Harings, Head of Application Training at DMG MORI Academy and responsible for the involvement in the WorldSkills, this subject is of great importance: "We aim to

Jörg Harings
Head of Application Training
joerg.harings@dmgmori.com

SPONSOR OF THE WORLDSKILLS COMPETITIONS SINCE 2007





DMU 50 3rd Generation
5-axis machining with speedMASTER spindle as standard, table clamping surface ø 24.8 × 19.6 in, max. load 661 lbs

DMG MORI IS PROVIDING 29 TURNING AND MILLING MACHINES FOR THE WORLDSKILLS

ALL MACHINES WITH CELOS AND SIEMENS CONTROL!

CTX alpha 500
< 62 ft² footprint, 3.1 in Y-axis for complex workpieces up to ø7.8 × 20.6 in

introduce young talent to state-of-the-art CNC technology early and to promote the training of skilled workers on an international basis." DMG MORI has been closely connected to the world championships of professions as sponsor of the global WorldSkills Competitions since 2007. "The fact that we now act as so-called Global Industry Partner of WorldSkills International for the first time emphasizes the long-term significance of promoting new recruits for DMG MORI and our customers", says Jörg Harings. The next WorldSkills Competition will take place in Kazan in Russia in 2019. DMG MORI is probably going to be heavily involved there as well.

As at past WorldSkills, DMG MORI has a special offer for its customers this year as well. Interested companies will be able to purchase the 3rd Generation DMU 50 and CTX alpha 500 machines used during the WorldSkills after the competition **with short delivery times for a special price.**

«

DMQP

DMG MORI QUALIFIED PRODUCTS

PERFECTLY MATCHED PERIPHERALS AND ACCESSORIES FROM A SINGLE SOURCE

Mr. Charles McManus
Your contact for DMQP in the USA
cmcmanus@dmgmori-usa.com

CUSTOMER BENEFITS

+ Everything from a single source – machine, peripherals and service
+ Perfect coordination – connectivity of all DMQP products tested and guaranteed
+ DMQP partners must meet the highest innovation, competence and quality requirements
+ All DMQP products at market price
+ Complete handling (warranty, service etc.) by DMG MORI
+ Same warranty conditions as for a new DMG MORI machine

SUPPLIER BENEFITS

+ This year already > 15,000 sales worth > $117 million USD
+ Certification as DMQP partner and worldwide market access by DMG MORI
+ Use of the DMQP label by certified suppliers
+ Exhibition of DMQP products in selected DMG MORI showrooms and at trade fairs
+ Regular product training of all DMG MORI sales staff

For some time, DMG MORI as a comprehensive solutions provider has been offering high-tech peripheral equipment and innovative accessories from selected suppliers in combination with its technologically leading machine tools. DMG MORI is now extending these activities and is offering innovative complete solutions from a single source under the label DMG MORI Qualified Products (DMQP).

Certified DMQP partners must meet the highest standards for innovative expertise, technology know-how and quality. Coordinated interfaces, guaranteed availability, consistent prices and defined warranty conditions ensure further increases in productivity for DMG MORI customers by providing complete solutions.

Customer benefits with DMQP

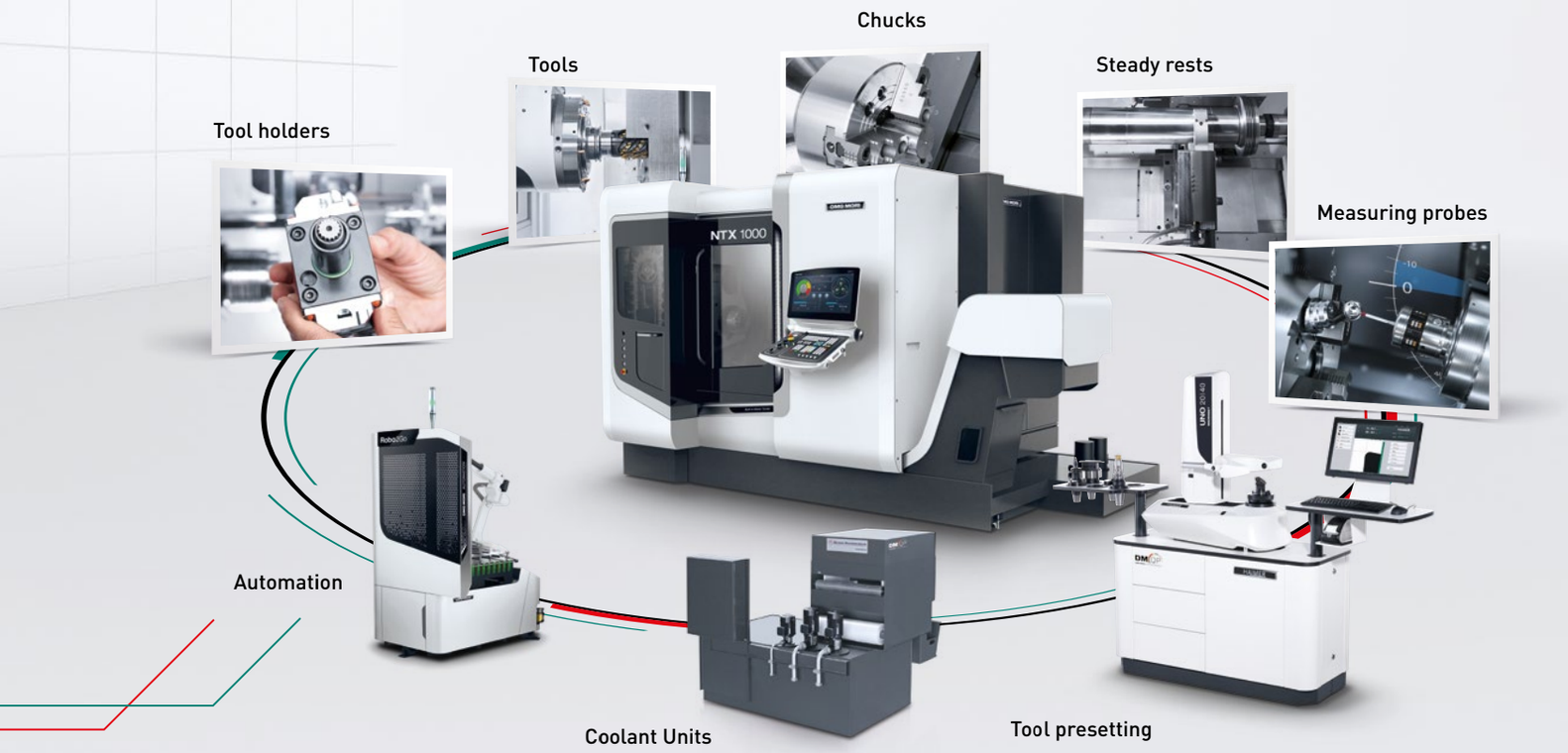
The concept of DMG MORI Qualified Products is not new for DMG MORI, as high-quality peripherals and accessories have been sold together with new machines for some time. The machine tool manufacturer is now emphasizing the importance of this subject by specifying concrete requirements for these products and taking over responsibility for the entire handling and coordination to support the customer, from installation to service.

DMG MORI attaches great value to innovation, quality, reliability and connectivity to its machines. For this purpose, the latest technologies are tested and thoroughly checked together with certified suppliers and DMG MORI experts. Only products offering high added value are approved as DMG MORI Qualified Products.

MORE THAN 15,000 DMQP ALREADY SOLD IN 2017

This also includes clearly coordinated interfaces to the machine, defined warranty conditions and market prices.

DMG MORI QUALIFIED PRODUCTS – EXAMPLES



The combination of DMG MORI machine tools and a wide range of different peripherals and accessories increases productivity through integrated production solutions. For example, bar loaders provide support in the area of automated machining, and tool systems with long service life offer more machining flexibility. The customer response has been exceptionally positive. In the first half of the year, more than 15,000 DMQPs with a value of over $117 million USD have already been sold.

«

INTERESTED?
THEN GET IN TOUCH!

Germany, EMEA: dmqp@dmgmori.com
China, India: dmqp@dmgmori.com
Japan, Asia: dmqp@dmgmori.co.jp
USA, America: dmqp@dmgmori-usa.com

Peripherals and Accessories in 4 DMQP Categories

1 MACHINING

+ Coolant Unit
+ Oil mist separator
+ Steady rest
+ Tool holder
+ Tools
+ Rotary table
+ Workholding/chucks
+ Air filters
+ Software (CAD/CAM, training software etc.)

2 HANDLING

+ Bar loader
+ Automation (robots, workpiece and pallet handling)
+ Chip conveyor
+ Gripper systems

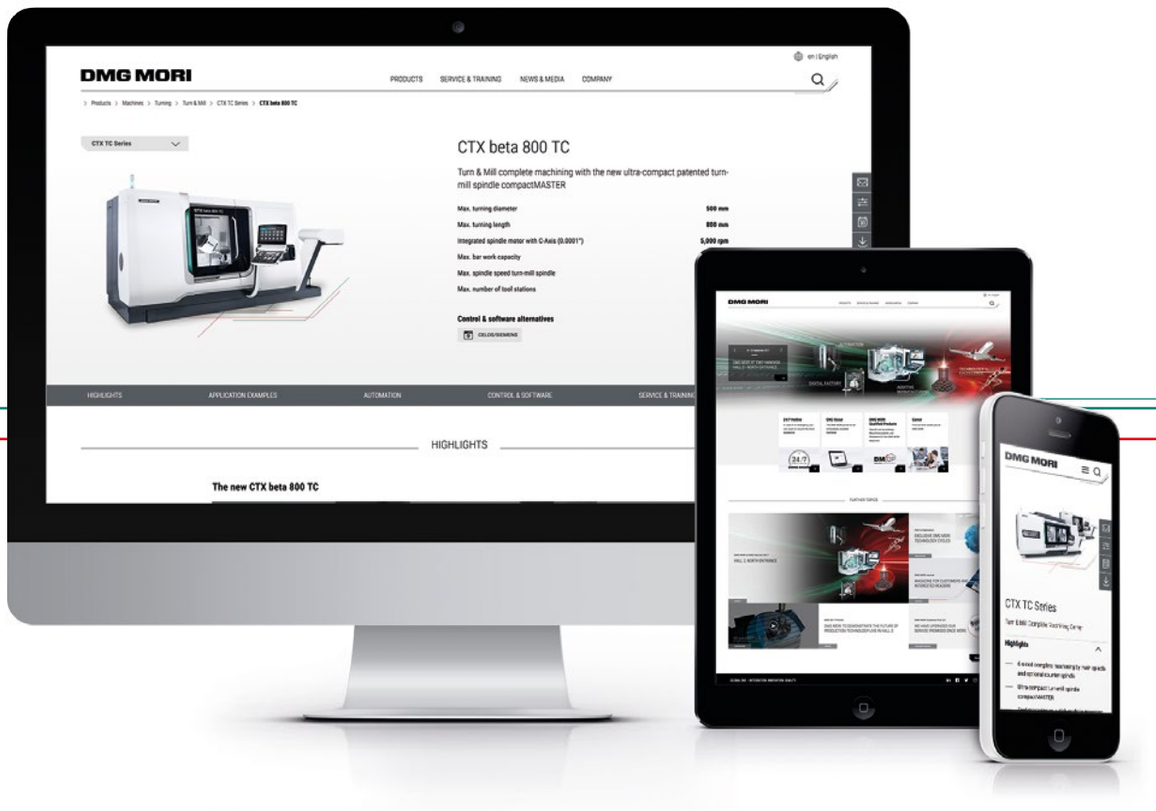
3 MEASURING

+ Measuring probe
+ Tool/workpiece measuring systems
+ Tool presetters
+ CMM

4 MONITORING

+ Transformers
+ Signal lamps
+ Camera
+ Load Monitoring System

VISIT US:
DMGMORI.COM



30.01 – 03.02.2018

DMG MORI
OPEN HOUSE 2018
PFRONTEN

SAVE THE DATE

01/30 – 02/03/2018

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