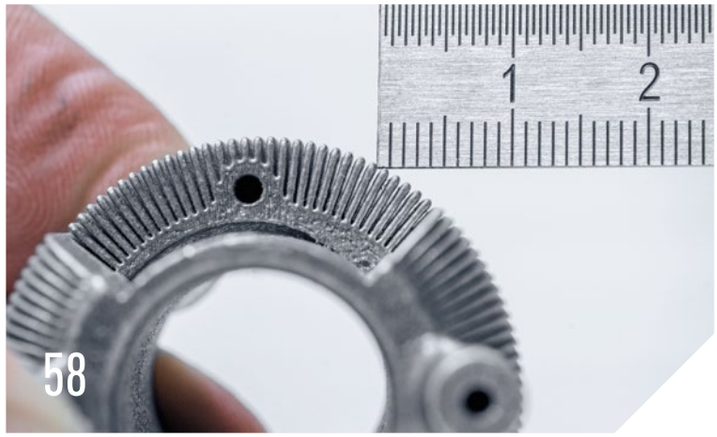
THE DMG MORI MAGAZINE FOR CUSTOMERS AND INTERESTED PARTIES 01–2020.

DMG MORI

TECHNOLOGY EXCELLENCE

CONTENT

Baltic Metalltechnik: 45 machines from DMG MORI
for precision machining down to tens of microns, including
a DMC 340 U for large parts up to 3 m.



Page 28 // Drexler Automotive GmbH:
The know-how for series production (image above)
Page 58 // Modellbau Clauß:
Filigree geometries thanks to additive manufacturing
on a LASERTEC 30 *SLM* 2nd Generation. (image below)

06 **DIGITIZATION**
DMG MORI Digitization // DMG MORI Connectivity

14 **AUTOMATION**
KRAL GmbH // WORLD PREMIERE: PH CELL,
3D-Zerspantechnik GmbH // WORLD PREMIERE:
DMU / DMC 65 H monoBLOCK // NHX series //
Baltic Metalltechnik GmbH

28 **AUTOMOTIVE**
Drexler Automotive GmbH

34 **DIE & MOLD**
SPINTO Hungaria Kft. //
WORLD PREMIERE: LASERTEC 200|400 Shape

40 **MEDICAL**
Smithstown Light Engineering //
Sandvik Coromant

44 **ENGINEERING & TECHNOLOGY**
AMOB S. A. // FUCHS Kühlschmierstoff for
titanium machining // Nakahara Seisakusho Co., Ltd.

52 **SEMICONDUCTOR**
Berliner Glas KGaA Herbert Kubatz GmbH & Co.

56 **ADDITIVE MANUFACTURING**
AeroEdge Co., Ltd. // Modellbau Clauß GmbH & Co. KG //
NEW: LASERTEC 30 DUAL *SLM* // Additive Consulting //
OPTOMET

20 WORLD PREMIERE

DMG MORI exhibits 5 world premieres and
innovations at the Open House in Pfronten,
including the new DMU / DMC 65 H monoBLOCK.

STABLE FOUNDATIONS AND HIGH SPEED

For a decade, the machine tool industry was growing worldwide. However, a decline in the global economy, geopolitical trade conflicts and structural change in the automotive industry are now adversely affecting the sector. We spoke to Dr.-Ing. Masahiko Mori, President of DMG MORI CO. LTD., and Christian Thönes, CEO of DMG MORI AG, about the status quo and the digital future.

To what extent is the economic situation weighing down on business sentiment at the beginning of the year?

Dr. Mori: First of all we are very proud of what we have achieved as a "Global One Company" together with our customers, partners and suppliers over the past years. Strategic discipline, targeted innovations and the development of efficient structures have placed DMG MORI more than ever at the forefront of the international machine tool industry.

And to your question: Of course, there is more pleasure in sailing with the wind behind you. But a lull does not diminish a skipper's love of his sport. On the contrary, he makes use of the calm sea to clear the decks. The next wind is just around the corner ...

What does this mean for DMG MORI?

Thönes: It means we keep our goals in sight. We have a unique footprint! DMG MORI is active in 42 industries and has more than 100,000 customers worldwide! With 154 sales and service locations worldwide, we are always close to our customers. DMG MORI is able take advantage of a stable foundation and all-round strengths. This is how we continue to develop – with dynamism and excellence.

»

What will you be focusing on?
Dr. Mori: DMG MORI has always aimed at setting new standards in performance and efficiency and making our customers stronger with groundbreaking solutions. Our renowned high-tech machines serve as the platform from which success for all is derived – with a main focus on quality and service.

The machine as a platform?
Thönes: The perspective has changed. What were once considered stand-alone machines are now essential components of digital value-creation systems and their functionality is being evaluated accordingly on a more holistic level. Our role in the customer / supplier relationship is also changing from that of a traditional product and service provider to an excellence and solution partner for future-oriented technology, automation solutions and digitization.

In this respect we have done an excellent job in all areas as a "Global One Company" – and will continue to do so by keeping our budget and teams stable.

What will be the main focus for 2020?
Dr. Mori: In the technical field we are pushing ahead with our extensive offer for the forward-looking market of additive manufacturing. With our powder nozzle and powder bed solutions we offer the two predominant processes worldwide. An extensive range of powders as well as intelligent software tools for calculating the respective process parameters are also part of the portfolio, which is being continuously expanded.

Thönes: When it comes to digitization, we are currently focusing on rolling out universal connectivity and the *my* DMG MORI customer portal.

What special role does my DMG MORI play?
Thönes: The *my* DMG MORI customer portal is the new interactive platform for maximum customer proximity and digitized service processes. Nowadays customers no longer want to speak to a hotline, describe their problem and then be connected or wait for an expert to call back. Those times are over – with an upgrade to our WERKBLiQ platform even machines from other manufacturers are covered.

That leaves the question of automation ...
Dr. Mori: DMG MORI currently offers its customers 150 different machine models in 42 product lines. We are now also in a position

> *DMG MORI aims at setting new standards in performance and efficiency, thus making customers ever stronger with groundbreaking solutions.*

Dr.-Ing. Masahiko Mori
President
DMG MORI COMPANY LIMITED

DMG MORI develops further to become an excellence and solutions partner for future-oriented technology, automation and digitization solutions.

Christian Thönes
Chairman of the Executive Board
DMG MORI AKTIENGESELLSCHAFT

to automate almost all of our machines thanks to our 52 automation solutions for workpiece and pallet handling. The latest highlights include cell control technology with tool management, the new PH Cell solutions plus the linear pallet storage systems in the LPP series.

DMG MORI announced three new investments during EMO. How do the alliances fit into the portfolio you just mentioned?
Thönes: The common denominator of our digital activities is the shopfloor. TULIP's no-code platform provides a digital toolbox that can be used even from modest beginnings to achieve a bottom-up, modular, digital transformation of an entire production system without any programming knowledge required on the part of the employees.

TOP PERFORMANCE, EFFICIENCY AND SUSTAINABILITY

And we want to give our customers access to the future technology of artificial intelligence with up2parts – for example with automatic calculation of quotations for production orders.

DMG MORI Digital GmbH is currently supporting our global sales and service organization with customer-oriented 360° services for consulting, implementation and qualification.

One last question: With what expectations are you starting off in the new decade?
Dr. Mori: Although times are currently challenging, they also open up opportunities for the future. More and more designers are taking an "additive" approach, a fact that will stimulate the market for 3D printing. The trend towards automation will continue globally and dynamically. And digitization is only just getting into its stride. Service providers who think ahead and act accordingly will join us in becoming winners.

The DMG MORI Economic Stimulus Program also sends an important signal. With this we support our customers in all current issues related to liquidity, financing, training, full service and machine retrofit.

«

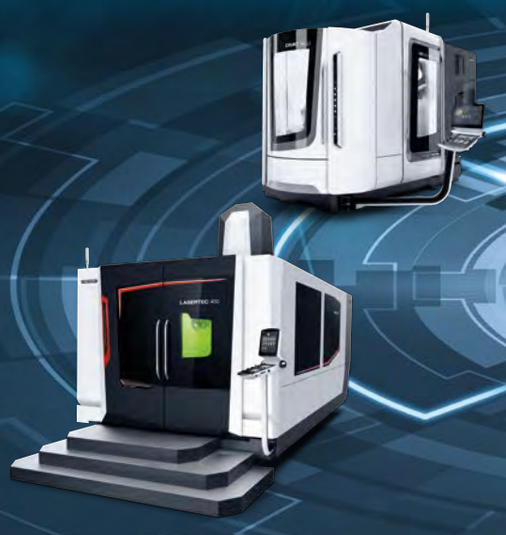
The role of DMG MORI is changing from that of a traditional product and service provider to an excellence and solution partner.

MORE FLEXIBLE ENTRY
INTO INTEGRATED DIGITIZATION

1. **TULIP:** Digitalize manufacturing with employee-centric APPs and without the need for programming skills
2. **Digital Manufacturing Package:** DMG MORI Connectivity, CELOS, Messenger, NET*service* & *my* DMG MORI
3. ***my* DMG MORI & WERKBLiQ:** End-to-end service and maintenance optimization for DMG MORI and third-party machines

CELOS Update
from every version

DMG MORI Connectivity
Free of charge as standard in every DMG MORI machine

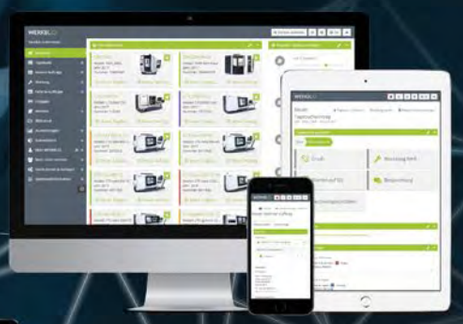


① **TULIP**
Digitization made easy: employee-centric and without the need for programming skills

② Digital Manufacturing Package
Simpler and faster start to digitization

NETservice

Messenger



Third-party machines

DMG MORI machines

umati
OPC UA
MQTT.ORG
MTConnect

③ *my* DMG MORI & WERKBLiQ
End-to-end service and maintenance optimization

* *my* DMG MORI is currently available in member states of the European Union, Switzerland, Norway and India.

"We're still going full speed ahead!" With this promise, Christian Thönes, Chairman of the Executive Board of DMG MORI AKTIENGESELLSCHAFT, sent out a conspicuously impressive signal at EMO in September 2019. And DMG MORI has been true to its word! The German-Japanese world market leader and global innovator traditionally presents the first full-speed results of the new year at its Open House in Pfronten. Once again in focus: forward-looking Digitization concepts and advanced shopfloor technologies for integrated manufacturing and production.

Like no other company, for years DMG MORI has successfully managed to digitally enhance the traditional business of machine tools and services. In this context, the APP-based operating and control system CELOS – first presented to the global trade public at EMO 2013 – is considered to be a revolutionary product in the industry.

> 20,000 HIGH-TECH MACHINES WITH CELOS IN USE WORLDWIDE

Almost six years have passed since its world premiere, during which time many pioneering innovations have been successfully implemented. Today, CELOS is used in the control systems of more than 20,000 DMG MORI machines worldwide.

In addition to this are the success stories of DMG MORI Planning & Control and those of the WERKBLiQ maintenance and repair platform. Moreover, as a founding member of ADAMOS, DMG MORI set the course early on for networked value creation in the context of platform economy. "Overall, we have established a brilliant position for ourselves digitally and globally," says Christian Thönes, Chairman of the Executive Board of DMG MORI AKTIENGESELLSCHAFT in a positive assessment.

»

CELOS INTEGRATED MANUFACTURING

LEADING THE DIGITAL SHOPFLOOR

The world premiere of CELOS about six years ago was celebrated as a sensation in professional circles. For the first time in the machine tool industry, it had become possible to use various APPs directly on the screen of the machine control system, in the same way as on a smartphone. Since then, DMG MORI has installed over 20,000 high-tech machines with CELOS as a trailblazing control and operating system.

Compared with the original version, CELOS has increasingly freed itself from the machine platform. "But without sacrificing any of its user-friendliness," underscores Tommy Kuhn, Managing Director of DMG MORI Software Solutions GmbH. According to him "CELOS today represents an open platform for digital services, with added value extending far beyond the immediate machine environment".

This is standard with effect from the latest 2019 version. For all those who want to take full advantage of current added value possibilities, DMG MORI offers the Digital Manufacturing Package as an entry point together with a comprehensive guarantee that existing data can be used. Naturally, this also applies to all existing CELOS machines since 2013.

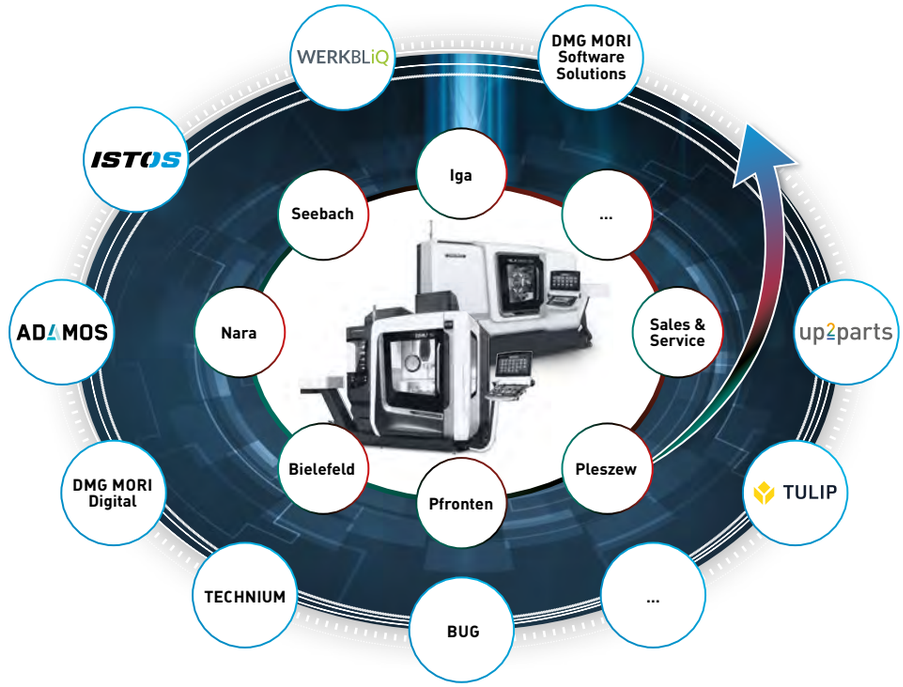
The package also includes the new DMG MORI Messenger (including monitoring connectivity of third-party machines on the shopfloor) and the CELOS APPLICATION CONNECTOR for free interaction with a company's internal IT and web-based software systems (such as the no-code platform from TULIP). The new job import functionality of JOB MANAGER ultimately enables deeper integration, which allows job orders to be imported directly from the ERP or MES system into CELOS.

«

You can find a reference video about CELOS Update at: **dmgmori.com/liebetrau**

Our decentralized fields of expertise enable us to offer integrated solutions in real and digital form. We innovate from the outside in and test all solutions inside out.

Christian Thönes
Chairman of the Executive Board
DMG MORI AKTIENGESELLSCHAFT



Dynamic structure: Digital devices steer the factories as well as the sales and service companies towards digitization.

Live at Liebetrau: 10 % more output thanks to integrated CELOS Workflow and DMG MORI Connectivity to internal IT systems, the internet and *my* DMG MORI.

WITH CELOS UPDATE TO UPGRADE INTEGRATED MANUFACTURING

+ **APPLICATION CONNECTOR:** Direct access to the intranet and internet as well as to the internal NC and manufacturing data management
+ **JOB IMPORT:** Continuous order workflow from PRODUCTION PLANNING to JOB MONITOR and JOB ASSISTANT
+ ***my* DMG MORI:** Unique performance and transparency in service management with the new DMG MORI customer portal

Since the CELOS update to 14 DMG MORI machines, they are even better integrated into our manufacturing processes – resulting in 10 % more output!

Katrin Lippold and Tony Liebetrau
Manufacturing management
Liebetrau GmbH & Co. KG

Open and cross-system connectivity from the machine to the IIoT platform.

DMG MORI CONNECTIVITY

CONNECTIVITY AS STANDARD

HIGHLIGHTS

+ Networking of DMG MORI machines and selected third-party products
+ Support of established protocols (OPC-UA, umati, MQTT and MTconnect)
+ Open interaction with networks and IoT platforms such as ADAMOS, MindSphere or FIELD system
+ Perfect networking to monitoring and remote services
+ Networking with LAN, WIFI, 3G/4G/5G and Bluetooth

The latest EMO highlights are now also making a successful contribution to this:

+ **DMG MORI Connectivity** now not only ensures the secure **networking of DMG MORI machines,** but also that of **selected third-party products.**
+ Moreover, CELOS customers are now able to carry out a **PLC-independent CELOS update** to the current version. This applies to every existing CELOS version of the past six years.
+ The new **DMG MORI MESSENGER** now offers an interface for third-party monitoring software and can be used for all machines and devices in production that are networked with **DMG MORI Connectivity.**
+ The new ***my*DMG MORI customer portal optimizes our service processes** and sets **new benchmarks for digital, transparent communication.**
+ Users can easily upgrade from "*my* DMG MORI" to **WERKBLiQ, the integrated maintenance and servicing platform,** and thus also connect with third-party products and make use of further premium functions.

LEADING PROVIDERS AND LEADING USERS OF INDUSTRIAL DIGITIZATION

Christian Thönes identifies the perfectly orchestrated interplay between the mechatronic core business and the digital products as a stable foundation for the successful transformation from a product and service provider to a holistic partner for digital value creation. "We are both a leading provider for our customers and a key user of our own digital solutions for integrated manufacturing in all business areas!

"This is our strength and we are getting stronger," emphasizes Christian Thönes: "We exhaustively test everything in our own production plants and thus ensure the high quality and scalability of our solutions – from the market launch of a CELOS APP to the implementation ofa digital factory." Thönes is convinced: "A structure like this is unique within the machine tool industry. It can't be copied, let alone imitated!"

This applies more than ever since DMG MORI acquired a strategic stake in three other start-ups last year. DMG MORI Digital GmbH acts as the new spearhead of the group in the industrial digitization market; TULIP provides an employee-centric platform that can be used without any programming knowledge, while up2parts brings the world of artificial intelligence to machine manufacturers for the first time.

»

DMG MORI DIGITAL GMBH

DMG MORI DIGITAL – COMPREHENSIVE 360° SERVICE FOR CUSTOMER-ORIENTED SOLUTIONS

"With DMG MORI Digital GmbH we are creating a central contact point for our customers for all queries and services relating to their digitization," says Christian Thönes, Chairman of the Executive Board of DMG MORI AKTIENGESELLSCHAFT.

CONSULTING AND INTEGRATED IMPLEMENTATION

At the same time, the new partnership decisively demonstrates DMG MORI's claim to be a pioneer of integrated industrial digitization. The comprehensive performance and service promise is therefore largely manufacturer-independent:

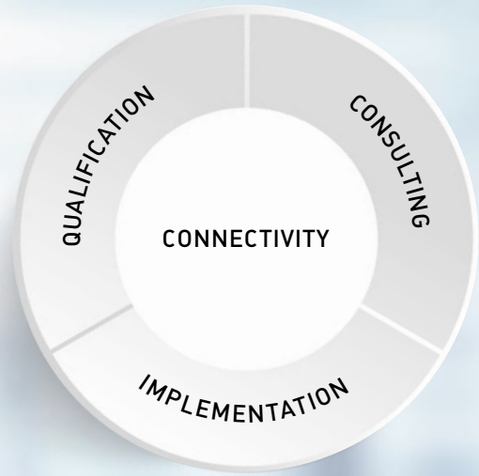
+ **Ensuring the connectivity** of DMG MORI machines and third-party products
+ **Overall implementation and integration** of digital products and services
+ **Vertical and horizontal networking** in global value-creation networks
+ **Comprehensive consulting and qualification** for digital products and software services

Moreover, our partners expect important stimuli from the market as the basis for customer-oriented new and further development and expansion of joint expertise for IT and IoT in mechanical engineering and industry.

"We offer DMG MORI customers a comprehensive 360° service for all aspects of their Digitization projects," sums up Dr. Peter Blaeser, Managing Director of DMG MORI Digital GmbH. Here he makes explicit reference to their consulting offer, which provides customers with comprehensive and integrated advice within the framework of their digitization strategy and projects.

"Many small and medium-sized companies are hesitant when it comes to starting their digitization process due to a shortage of human resources and in the light of the many completely new technologies," explains Dr. Damir Hrnjadovic, Project Manager at DMG MORI. He goes on to emphasize: "As a technology and innovation leader, we consider it our responsibility to support our customers during the initial phase, to set the right course together and to define the roadmap for individual digitization!"

«



We offer DMG MORI customers a comprehensive 360° service and realize the integrated implementation of their digitization projects from a single source!

Dr. Peter Blaeser
Managing Director
DMG MORI Digital GmbH

L. to r.: Alexander Mack, Franz Mack and Damir Lendler during the introduction of Tulip in Dornstadt.

TULIP is the ideal entry into digitization. The first TULIP apps can be implemented in cooperation with a company's own employees within a few days and with low investment costs.

Dr. Damir Hrnjadovic
Project-Manager
DMG MORI

The TULIP APPs have enabled us to achieve a unique depth of transparency within our dental process chain within a very short time by allowing us to visualize the position and status of each individual workpiece in real time.

Alexander Mack
Managing Director
CNC-Technik Mack GmbH & Co. KG, Dornstadt

DMG MORI powered by TULIP

"It's people and not technology that determine the success of digitization!" With this clear statement, Dr. Damir Hrnjadovic, the project manager responsible for this area at DMG MORI in Bielefeld, started the discussion about the cooperation with TULIP from Boston, USA, which was announced at EMO. "This will enable us to make it much easier for small and medium-sized companies in particular to get started in digital manufacturing," he states convincingly.

The secret of success: Rather than forcing employees on the shopfloor into a strict set of guidelines from the "top down," TULIP provides them with creative and simple digital tools via a no-code platform. They are able to use it to write their own personal digitization script – without the need for any IT or programming skills.

Every individual part of a process can be described and visualized on the TULIP platform using existing or self-created APPs just like a modular script. And where necessary, certain scenarios can be linked with key data from digital sensors, measuring devices and machines via "drag & drop".

Gradually, an interactive "roadmap" is created that supports employees in their work and prompts them to carry out measurements or tests at check points important to results. Visualization takes place via a separate screen at the workstation or directly (via APPLICATION CONNECTOR from CELOS) on the control screen.

"This is far more effective than any paper-based, top-down instructions," Dr. Hrnjadovic is convinced. And he is sure that the employee-centric, no-code approach increases the productivity of every employee, ultimately leading to sustainable increases in both efficiency and quality throughout the entire manufacturing process and during manual assembly, especially since it is possible to optimize workflows in combination with other technologies such as machine learning and computer vision systems in a further expansion stage.

PROGRAM SHOPFLOOR APPS INDEPENDENTLY

"The continuous transparency will enable us to tap the enormous potential for the future viability of the company," emphasizes Dr. Hrnjadovic. He refers to spindle production at DECKEL MAHO Pfronten as an example. Here, after only a few weeks, productivity was increased by 20 % and the error rate was reduced by 10 %.

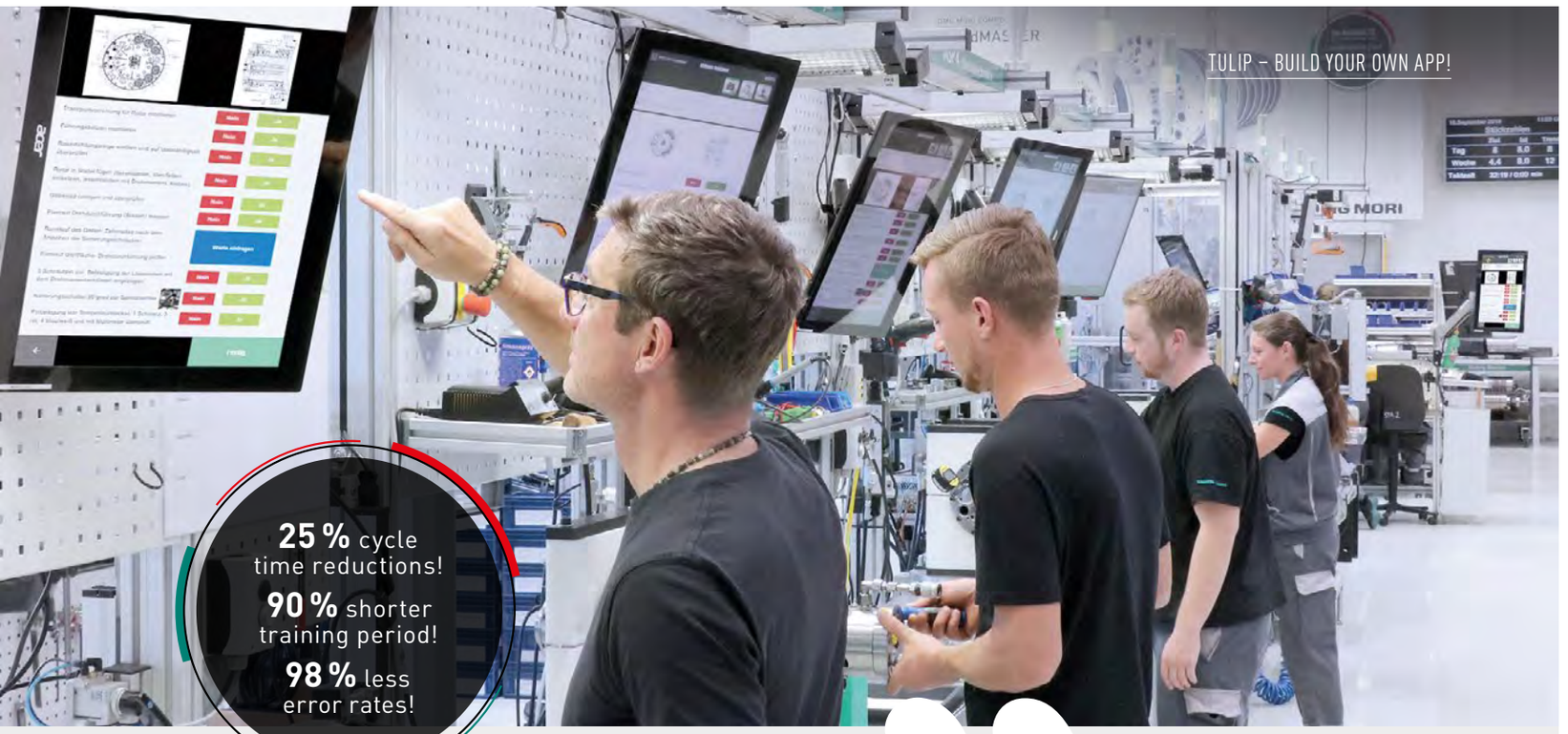
«

MACK CNC TECHNIK FACTS

+ Over 150 high-tech CNC machines for every task
+ ULTRASONIC and ADDITIVE MANUFACTURING as pioneering complementary technologies

MACK

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



25 % cycle time reductions!
90 % shorter training period!
98 % less error rates!

TULIP

BUILD YOUR OWN APP!

THE SIMPLEST WAY TO DIGITIZE YOUR SHOPFLOOR PROCESSES

EMPLOYEE-CENTRIC

+ Enables employees to digitize processes themselves
+ Bottom-up approach for digital solutions

NO CODE

+ Create your own APPs without any programming experience
+ Supports employees in performing complex tasks

APP TEMPLATES

+ Powerful best-in-class tools
+ Faster innovations with customizable app templates

With TULIP we have increased spindle manufacturing productivity by 20 %. The investments paid for themselves in less than a year.

Reinhard Musch
Managing Director
DECKEL MAHO Pfronten GmbH, DMG MORI

BOTTOM UP TO A PERFECT SHOPFLOOR PROCESS

Personal
Individual process management with "individual" TULIP APPs

Progressive
Easy integration of external data sources via drag & drop

Visual
Images, graphics and videos support process control

EXAMPLE REFERENCES

DMG MORI · JABIL · MACK · Schneider Electric · Dentsply Sirona · KAMPF · Ernst Schumacher GmbH

FIT FOR THE FUTURE

THANKS TO TOOL AND PALLET HANDLING FROM DMG MORI

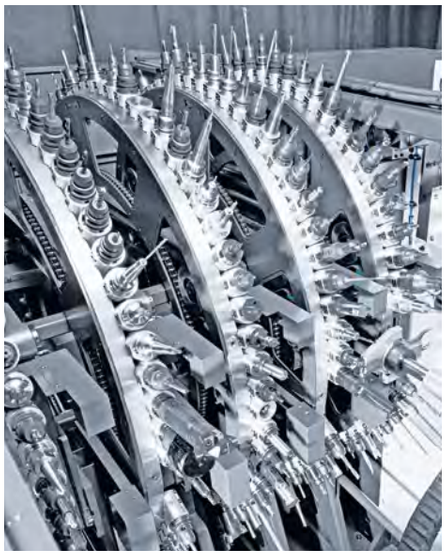
We boost the efficiency of our processes and ensure growth with automation concepts and digital solutions from DMG MORI.

***Simon Flatz** (left)*
Head of Mechanical Production
KRAL in Lustenau
***Harald Nenning** (right)*
responsible for systems and automation
KRAL in Lustenau

Founded as a family-owned business in 1950, KRAL GmbH from Lustenau in Austria specializes in the development and production of screw pumps and flow measurement technology. Its portfolio, which ranges from engineering to commissioning and on through to service, is aimed primarily at customers that operate globally in the marine, power generation, oil & gas, mechanical engineering and chemicals sectors. Around 250 employees ensure trouble-free and cost-efficient processes as well as quality-oriented production. That is why KRAL relies on automated and digitized production solutions, as is reflected in its latest acquisitions from DMG MORI – a CTX gamma 2000 TC with gantry loader that was installed at the beginning of 2019, for example, and two DMC 60 H *linear* machines with a storage system for 100 pallets.

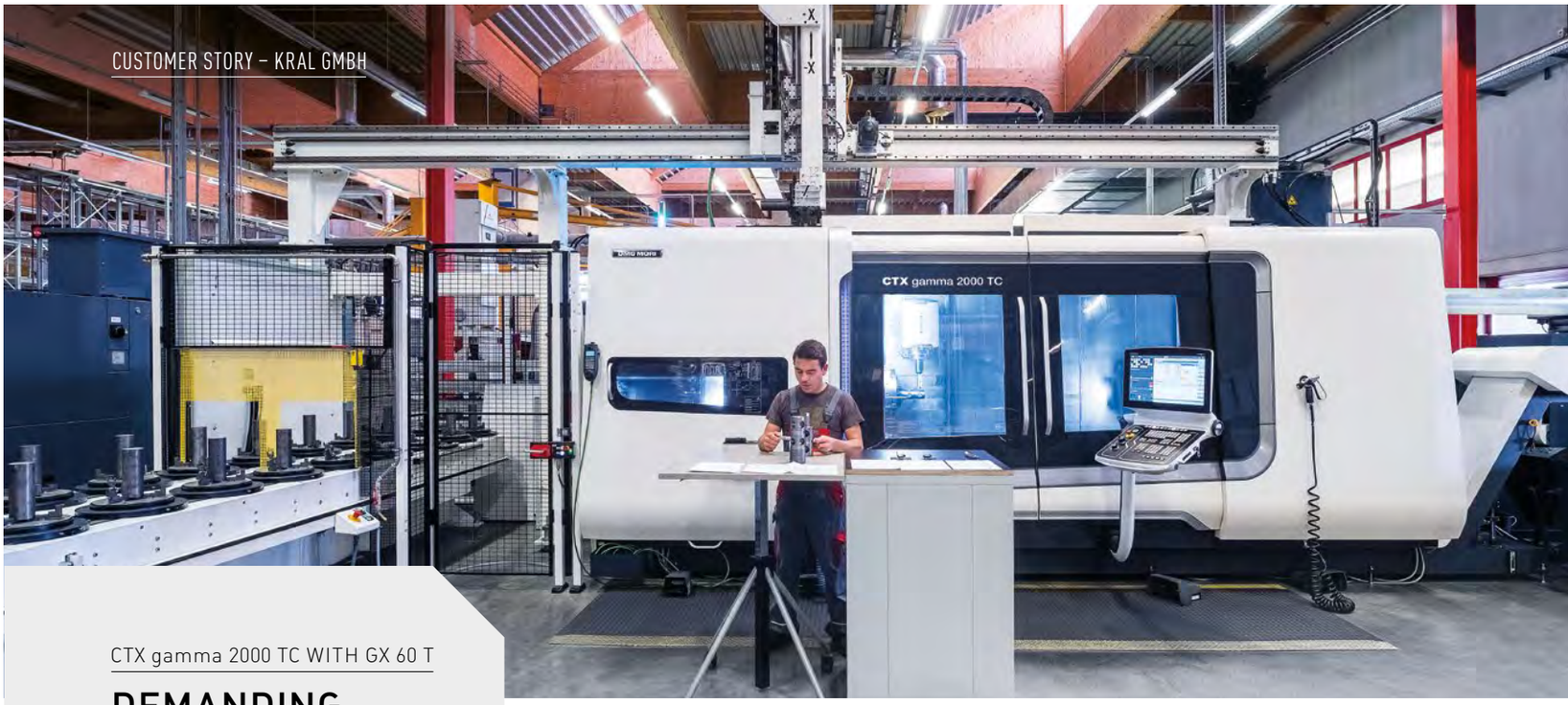
303 TOOLS AND 100 PALLETS FOR AUTONOMOUS PRODUCTION

"A large part of our work involves individually designed solutions for our customers", explains Harald Nenning, responsible for systems and automation at KRAL. You have to respond quickly and think innovatively if you want to meet the demands. Customer-orientation has a long tradition at KRAL. The result has always been the delivery of powerful, low-maintenance screw pumps and robust, high-precision flowmeters. »



5-wheel magazine for 303 tools; with minimum call-up times thanks to the short travels of just 300 mm per wheel.

Two DMC 60 H *linear* machines are connected to the 100-position pallet storage system. Together with the 303-pocket tool magazine, this ensures autonomous production overnight and at weekends.



Thanks to a 20-station gantry loader, the CTX gamma 2000 TC produces autonomously over a large linear footprint.

CTX gamma 2000 TC WITH GX 60 T

DEMANDING TURN-MILLING UP TO LENGTHS OF 2,050 mm

HIGHLIGHTS

+ Maximum precision and thermal stability
+ Direct MAGNESCALE linear encoders in all axes
+ Turn-milling spindle compactMASTER with 12,000 rpm and 220 Nm (high-speed version with 20,000 rpm)
+ 420 mm Y-axis stroke for more flexibility
+ Loading and unloading of workpieces up to ø 450 × 500 mm and 60 kg
+ Workpiece management completely integrated in the machine control

DMG MORI machines have been meeting all demands on quality and productivity for 15 years

The high quality required of its own products also defines the demands in production. Simon Flatz, Head of Mechanical Production, tells us: "If we are to remain fit for the future, we have to take a progressive approach. So we can achieve a high level of precision on one hand and offer competitive prices on the other." That is the reason the company has been using machine tool technology from DMG MORI for over 15 years. "The robust design of the machining centers and turn-mill machines promises a long service life and maximum long-term accuracy.

CTX gamma 2000 TC – Complete machining of highly complex turn-mill parts with workpiece lengths up to 2,050 mm

A key feature of production at KRAL is its wide range of components. So the CTX gamma 2000 TC was exactly the right answer to this requirement for Harald Nenning: "Our development of large screw pumps means we will be able to make good use of the 2,050 turning length." The 12,000 rpm and Y-stroke of 420 mm provided by the compactMASTER turn-mill spindle are key equipment features for the complete machining of highly complex turned-milled parts. KRAL also benefits from the multi-threading cycle 2.0 in this connection: "We use the DMG MORI technology cycles to reduce the programming of our demanding geometries by up to 60 percent", explains Simon Flatz.

MULTI-THREAD CUTTING CYCLE 2.0 FOR UP TO 60 % FASTER PROGRAMMING

Unmanned production of small batches

Batch sizes at KRAL rarely exceed 30 work-pieces. Many variants of the individual components are far more the order of the day. This meant that the automation of the

The spindles for the screw pumps are produced on the CTX gamma TC, among others. (Photo: KRAL GmbH)

DMC 60 H *linear*

HIGH-PRECISION, FAST HORIZONTAL MACHINING CENTER

HIGHLIGHTS

+ Rapid traverse up to 100 m/min and maximum 1 g acceleration
+ Chip-to-chip time down to 2.5 s in compliance with VDI 2852
+ Powerful 15,000 rpm speedMASTER spindle as standard with 35 kW and 130 Nm
+ Fast innovative wheel magazine with up to 303 tools
+ Pallet size: 500 × 500 mm
+ Workpiece dimensions up to maximum ø 800 × 1,030 mm and pallet load up to 600 kg
+ 4-axis and 5-axis machine versions available

CTX gamma 2000 TC had to be extremely flexible, so DMG MORI installed a gantry loader with 20 stations. "We produce components weighing up to 35 kg autonomously with the machine, so we can take advantage of a third unmanned shift", says Simon Flatz.

Two DMC 60 H *linear* machines – up to 100 pallets in unmanned production

DMG MORI installed an even larger automation at KRAL in the form of two DMC 60 H *linear* machines and a pallet high rack from FASTEMS, which can be loaded with up to 100 pallets via two set-up stations. "This allows optimum utilization of the two horizontal machining centers, leaving our programmers and operators time to prepare new orders", is how Harald Nenning describes the advantage of the solution. The company also reaps the benefit of producing overnight and at the weekends. "The 303 tool stations drastically reduce set-up times as well", adds Harald Nenning. "And the minimal tool call-up times of the magazine of just a few seconds is a real advantage, especially when the tools are used for only a short time."

The reliability of the machine tools plays a key role in autonomous production. This, according to Simon Flatz, is exactly where the two DMC 60 H *linear* machines come into their own: "Horizontal machining is the ideal solution for our components, which often have very deep holes." The required precision is achieved with the high degree of stability and perfect vibration suppression. In view of the limited space available for production, the compact design of the horizontal machining centers is also a great advantage.

Young people in particular find modern production solutions such as those from DMG MORI really exciting

"As the possibility of expanding of our production area is limited, future growth will be influenced increasingly by other factors", points out Harald Nenning with regard to the continuous further development of manufacturing competence. That is why such high priority is given to the training and further education of skilled workers at KRAL. Boasting 32 apprentices, the company is one of the major training companies in Vorarlberg. "Young people in particular find modern production solutions such as those from DMG MORI really exciting", claims Simon Flatz enthusiastically.

Partnership with DMG MORI for increased

Modern production is the second building block for growth. "We boost the efficiency of our processes and ensure growth with automation concepts and digital solutions from DMG MORI", says Harald Nenning. "Our machines will request the necessary material automatically in future, for example. The supply of materials is effected via a driverless transport system." The partnership with DMG MORI is a logical step, because the machine tool producer also pursues and promotes such a philosophy.

«

KRAL FACTS

+ Founded in Lustenau in 1950
+ Approximately 250 employees
+ Development and production of screw pumps and flow measurement technology

KRAL

KRAL GmbH
Bildgasse 40
6890 Lustenau, Austria
www.kral.at

NEW: PH CELL WITH DMU 65 monoBLOCK

WORLD PREMIERE 2020

Unique!
Direct loading from the front possible

Compact!
Up to 40 pallets in a footprint of 10.7 m²

PH CELL

MODULAR PALLET HANDLING SYSTEM FOR UP TO 40 PALLETS

PALLET CHANGE DEVICE
+ Up to 300 kg transfer weight (workpiece incl. pallet)

HIGHLIGHTS

+ **Unrivalled ergonomics and accessibility** to the work area thanks to loading from the side
+ **Modular design** to suit individual customer requirements
+ **Subsequent expandability** of the second rack module
+ **Simple adjustability** of shelf heights
+ **Separate set-up station** for ergonomic preparation of the pallets during production
+ **Short commissioning time** thanks to defined interface and modular principle
+ **Attractively priced** automation in the **DMG MORI VERTICO design**

+ **Available for » from*:**
  – DMU 65/75 monoBLOCK » 04/2020
  – DMU 50 3rd Generation » 05/2020
  – DMU 40/60/80 eVo » 05/2020
  – DMU 85/95 monoBLOCK » 07/2020
  – CMX 50/70 U » 07/2020
  – DMU 80/90 P duoBLOCK » 07/2020
  – CMX 600/800/1100 V » 07/2020
  – DMC 650/850 V » 07/2020
  – DMU 65 H monoBLOCK » 10/2020

*Depending on the delivery time of the machine

SEPARATE SET-UP STATION
+ Ergonomic setting-up
+ Rotatable option

Versatile!
Rack modules can be combined for different pallet sizes

Retrofittable!
Connection possible to existing machines that already have an integrated automation interface
+ subsequent expansion with a second rack module

With rack modules for pallets of different sizes, the PH CELL feeding a powerful DMU 80 P duoBLOCK is the optimal solution for our diverse range of parts.

Andreas Eichler and Frank Jansen
Founder and CEO
3D-Zerspanungstechnik GmbH

NUMBER OF PALLETS (per rack)

Pallets	Workpiece height	
Size	**500 mm**	**300 mm**
500 × 500 mm	# 9	# 12
400 × 400 mm	# 12	# 16
320 × 320 mm	# 15	# 20

Flexible!
Unrestricted crane loading from above

Both the PH CELL and the machine are optimally accessible.

3D-ZERPANUNGSTECHNIK FACTS

+ Founded in 2002
+ 17 employees
+ Production of tools for rubber molding, plastic injection molding and die casting in the automotive, electronics and aerospace sectors

WERKZEUG- UND FORMENBAU

3D-Zerspanungstechnik GmbH
Christenfeld 24d
41379 Brüggen-Bracht
Germany
www.3d-zerspanungstechnik.de

WORLD PREMIERE 2020

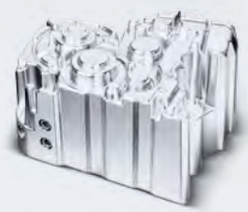
DMU / DMC 65 H monoBLOCK
THE FIRST UNIVERSAL 5-AXIS HORIZONTAL MACHINING CENTER

MECHANICAL ENGINEERING / CONTRACT MANUFACTURERS

+ **Simple automation** and wheel magazine with up to 543 tools
+ **One-piece inherently rigid machine bed** with 3-point support for maximum rigidity (also available with HSK-A100)

AEROSPACE

+ **Optimum chip flow** due to horizontal machining
+ **5-axis swivelling rotary** table as standard
+ **speedMASTER spindles** up to 30,000 rpm



DIE & MOLD

+ **Direct drive in the C-axis** with up to 80 rpm
+ **Wheel magazine for tools** up to 550 mm, ideal for machining deep holes
+ **Thermo-symmetrical design** for maximum long-term accuracy down to 5 µm

AUTOMOTIVE

+ **HSK-A100** interface for tools up to ø 280 mm
+ **Wheel magazine** for 3.5 seconds chip-to-chip time
+ **Linear drives** with up to 100 m/min rapid traverse to reduce idle times

Thanks to the wheel magazine with its 273 pockets, the possibility of setting up during production and the rotary pallet storage RPS 9, we are able to utilize the machine to the full extent over 3 shifts, while at the same time maintaining production flexibility.

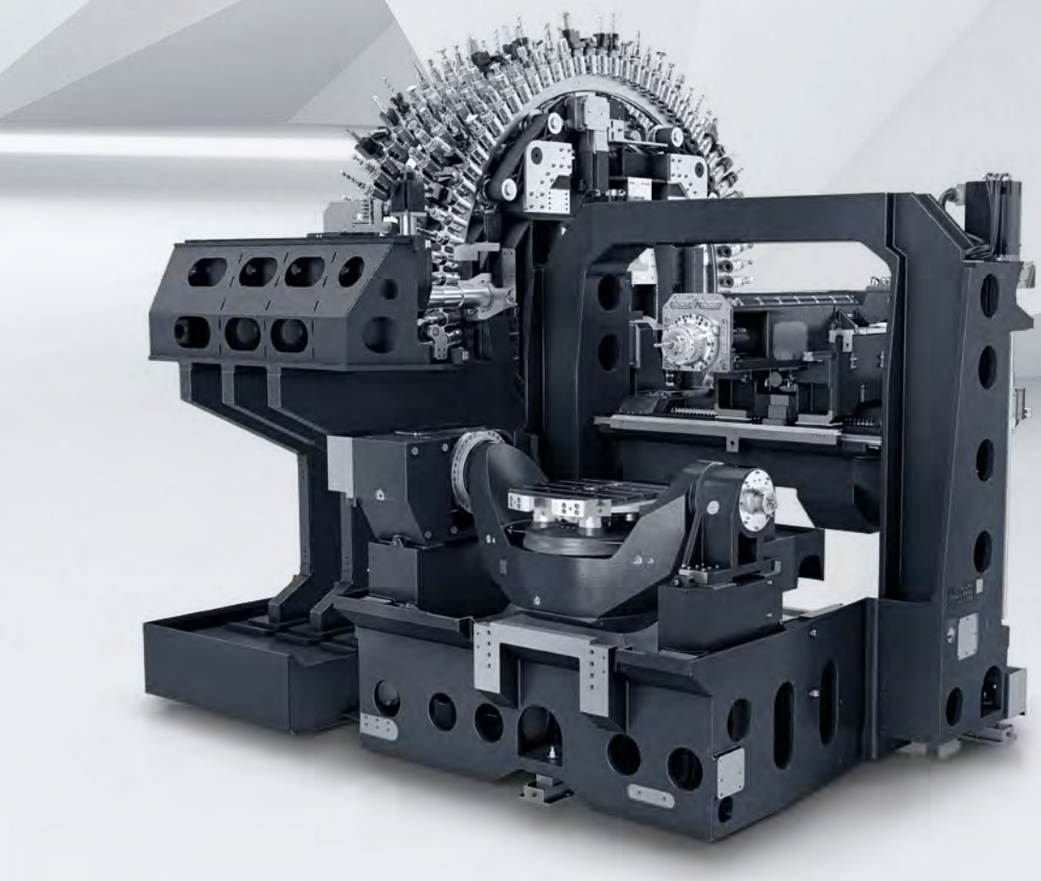
Helmut Kärtner
Head of Production
Müller Präzision GmbH

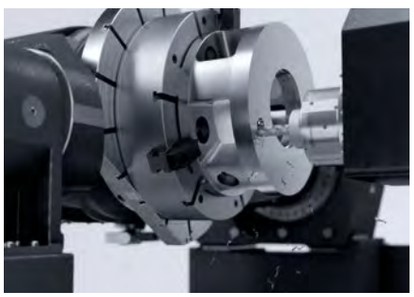
MÜLLER PRÄZISION FACTS

+ Since 1974 in Cham
+ Series production in turning, milling, grinding and hardening

MÜLLER PRÄZISION

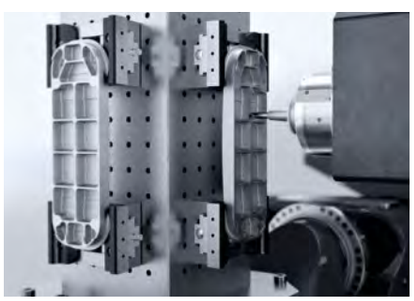
Müller Präzision GmbH
Frühlingstraße 16
93413 Cham, Germany
www.mueller-praezision.de





HORIZONTAL MACHINING

Maximum process reliability in automated production thanks to optimal chip flow for efficient heat removal.



MAXIMUM FLEXIBILITY

Swivelling rotary table with thrust bearings for consistent accuracy when machining a variety of components weighing up to 600 kg.

LUDWIG GUTTER & SOHN FACTS

+ Established 1864 in Weißenhorn
+ Aluminum die-casting foundry with finishing processes and tool making

Gutter&Sohn

Ludwig Gutter & Sohn GmbH & Co. KG
Obere Mühlstraße 12
89264 Weißenhorn, Germany
www.gutterundsohn.de

The high degree of rigidity of the monoBLOCK base and the optional twin-drive table for parts weighing up to 600 kg were features of the DMC 65 H monoBLOCK that immediately won us over.

Horst Thoma
Managing Director
Ludwig Gutter & Sohn GmbH & Co. KG

NHX SERIES
THE NEW STANDARD FOR HORIZONTAL MACHINING CENTERS

NHX 5000
+ 500 × 500 mm pallet size
+ 500 kg pallet weight (700 kg as an option)
+ ø 800 × 1,000 mm workpiece dimensions

NHX 4000
+ 400 × 400 mm pallet size
+ 400 kg pallet weight
+ ø 630 × 900 mm workpiece dimensions

HIGHLIGHTS

+ **speedMASTER spindles** up to 20,000 rpm or 250 Nm
+ **powerMASTER spindles** up to 16,000 rpm or 1,413 Nm
+ **toolSTAR magazine** with 60 tool pockets or **wheel magazine** with up to 303 tool pockets for **retooling during production and idle times** (only SIEMENS)
+ **CELOS with MAPPS on FANUC or CELOS with SIEMENS** (for NHX 4000 / 5000 / 5500 / 6300)

NHX SERIES

AUTOMATION SOLUTIONS

RPS – ROTARY PALLET STORAGE

+ **Rotary pallet storage** with 5, 14 or 21 additional pallets, up to 23 pallets in total
+ **500 × 500 mm** max. pallet size, **700 kg** max. pallet weight
+ **ø 800 × 1,000 mm** max. workpiece dimensions

CELOS with SIEMENS CELOS with MAPPS

PATENTED WHEEL MAGAZINE

(AVAILABLE FOR NHX 4000 / 5000 WITH SIEMENS)

+ **Most compact magazine on the market** (41 % width reduction for 123 tool pockets)
+ **Set-up during production and idle times** (with 2 wheels, 123 tools)
+ **Up to 303 tool pockets** (123, 183, 243, 303)
+ **3 sec. chip-to-chip time, max. 5.6 sec. tool change time**

Outer wheel with 63 available tool pockets, inner wheels with 60 available tool pockets.

		NHX 4000	NHX 5000	NHX 5500	NHX 6300	NHX 8000	NHX 10000
Pallet size (Option)	mm	400 × 400	500 × 500	500 × 500	630 × 630	800 × 800	1,000 × 1,000
	kg	400	500 (700)	1,000	1,500	2,200 (3,000)	3,000 (5,000)
Max. workpiece dimensions	mm	ø 630 × 900	ø 800 × 1,000	ø 800 × 1,100	ø 1,050 × 1,300	ø 1,450 × 1,450	ø 2,000 × 1,600
SPINDLES		**speedMASTER (#40 / HSK-A63)**		**powerMASTER (#50 / HSK-A100)**			
Spindle	rpm	20,000		12,000			
	Nm	221		807			
Spindle option	rpm	15,000		High speed: 16,000 | High power: 8,000			
	Nm	250		High speed: 528 | High power: 1,413			

CPP & LPP

+ **500 × 500 mm** max. pallet size, **700 kg** max. pallet weight
+ **ø 800 × 1,000 mm** max. workpiece dimensions
+ **DMG MORI cell controller MCC-LPS IV**
+ **Central tool management system MCC-TMS**

CPP – Compact Pallet Pool

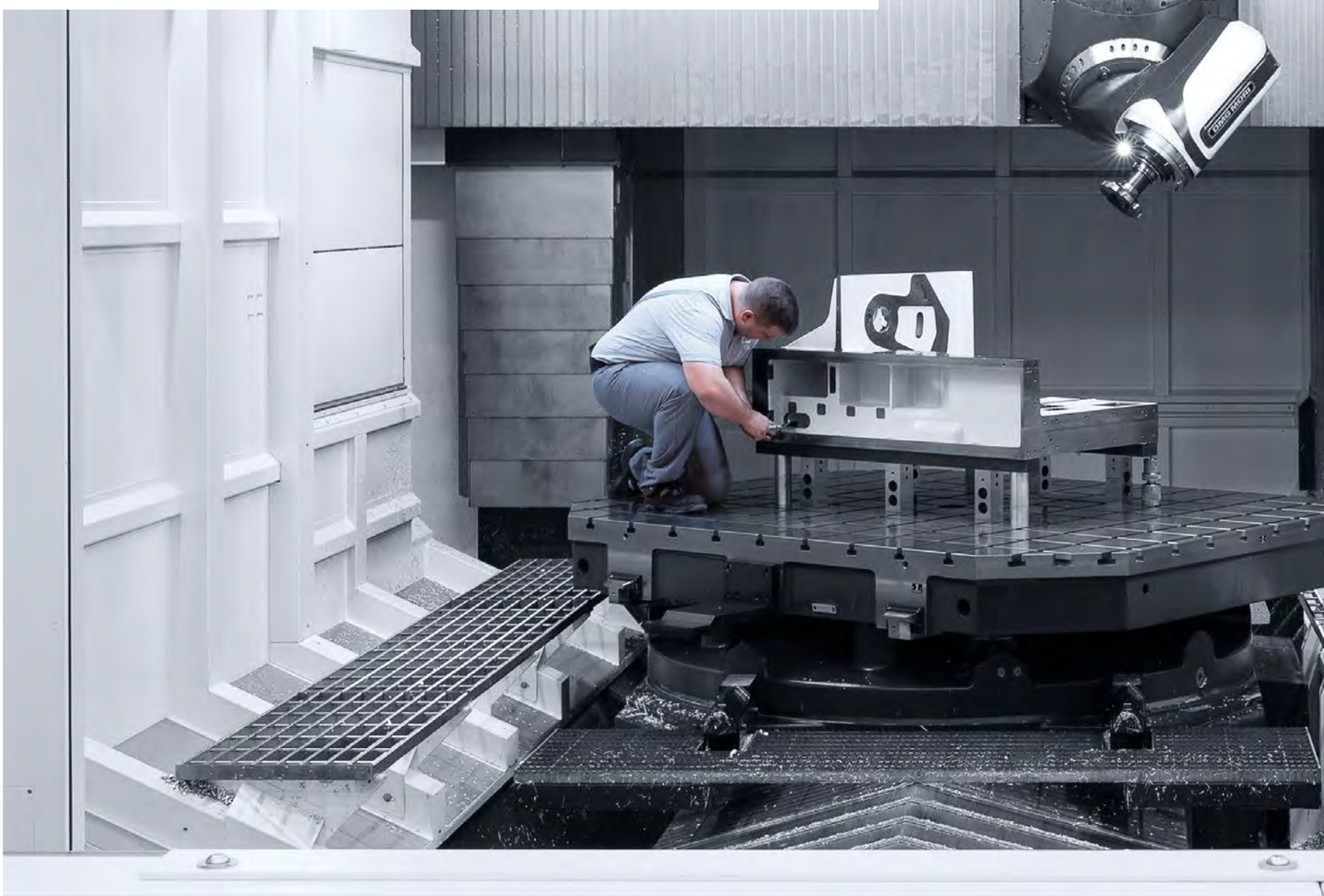
+ Up to 29 pallets
+ Max. 4 machines with 2 set-up stations

LPP – Linear Pallet Pool

+ Up to 99 palettes on 2 levels
+ Max. 8 machines with 5 set-up stations

XXL MACHINING

TO WITHIN TENS OF MICRONS



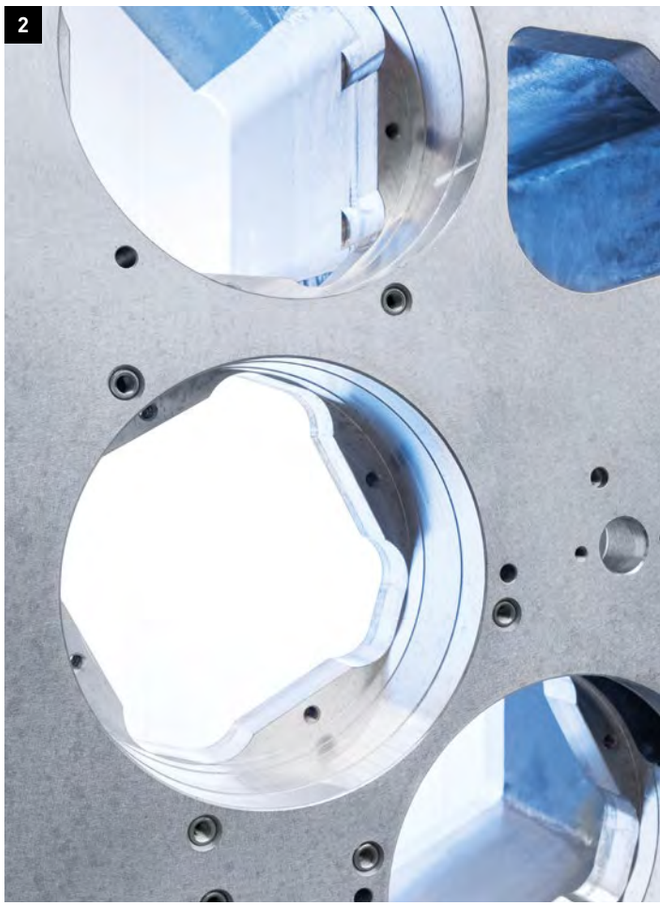
Founded in 1946, Baltic Metalltechnik GmbH, a subsidiary of the Hauni Group, specialises in modern manufacturing technologies. At the Hamburg factory, 248 employees are responsible for the production of complex mechanical components and assemblies. Machining of the high-precision components is carried out on versatile machine tools on the company's shopfloor, which include around 45 models from DMG MORI. Since January 2019, Baltic Metalltechnik has been using a DMC 340 U for machining its large part in addition to several 5-axis machining centers and CTX beta TC turn-mill centers.

Hauni Group's machines produce up to 20,000 cigarettes per minute. "The quality of every one of these is inspected by an optical process and where necessary recycled", adds Thorsten Deumlich, Head of Large Part Machining. All individual elements of the sophisticated machines must interact perfectly if such high speeds are to be achieved. "This calls for many years of experience in both the development and design as well as

45 DMG MORI MACHINES IN PRECISION MACHINING

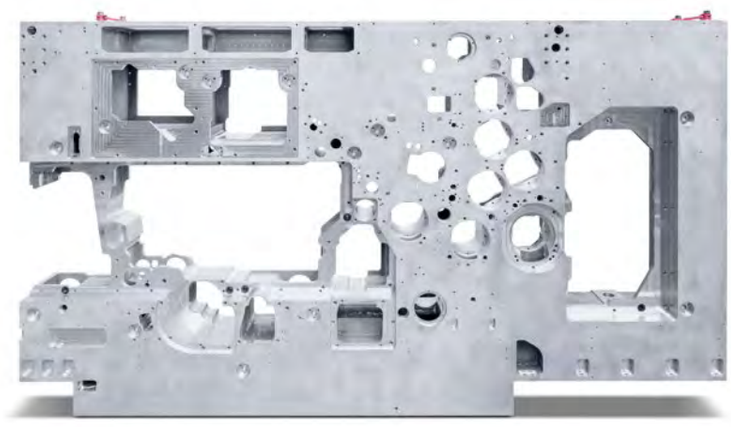
in machining." This also explains the high demands on quality: "We work entirely to accuracies within tens of microns and we do it with components that are over three meters long."

»



We work entirely to accuracies within tens of microns and we do it with components that are over three meters long.

Thorsten Deumlich
Head of Large Part Machining
Baltic Metalltechnik GmbH



Baltic Metalltechnik produces large, complex, high-precision parts that are over three meters long on the DMC 340 U.

Optimum project management from design through to commissioning

This first criterion defined the investment in a new machining center for large components – frames and housings for example. The second criterion was a time-driven, according to Thorsten Deumlich: "We had to complete the entire project within a year and a half." DMG MORI proved an all-round and extremely reliable partner during this period. "Everything went smoothly, from the design of the system to testing in Pfronten right though to final acceptance at our premises."

DMC 340 U – accuracy to within tens of microns over a length of three meters

The DMC 340 U was technologically convincing even in the early testing phases. Thanks to the expertise of all those involved and the precision package with which the machine is equipped, the XXL model achieved all drawing tolerances. "We are talking here about a few hundredths of a millimeter over three meters", says Thorsten Deumlich, clearly impressed.

1. Thorsten Deumlich, Head of Large Part Machining at Baltic Metalltechnik GmbH
2./3. Complex, high-precision machine components are produced in 5 axes for the Hauni Group on the DMC 340 U. **4.** Operator Marc Hänel sets up workpieces for machining, a process that is simplified using a bespoke table with special slots.

Perfectly coordinated equipment

The portal machine with its extensive equipment was installed at the beginning of 2019 after Baltic Metalltechnik had excavated a pit in the factory floor so the DMC 340 U could be installed at a user-friendly height. The 5-wheel tool magazine with space for 303 HSK-A100 tools reduced idle times, as did the laser system that establishes the contours of the part or the position of the workholding devices and table supports. "A monitor simultaneously displays which tools are required", explains Thorsten Deumlich. This means employees can set up new pallets in the shortest possible time during production. "The customized table also has special slots that simplify the process even further."

CELOS – future-oriented functions for the digital future

In the case of the DMC 340 U the process optimization goes a step further, because the CELOS Performance Package is also installed. This includes the CONDITION ANALYZER for the analysis of machine and process signals as well as the PERFORMANCE MONITOR for maximum transparency and monitoring of machining parameters. The SERVICE*camera* providing a fast and simple remote solution for service queries rounds off the groundbreaking specification of the machine.

Experience has proved that the machine was a sound investment for the future. Thorsten Deumlich says in this respect: "We have boosted our efficiency sustainably where large part machining is concerned and in so doing have created further capacity."As Baltic Metalltechnik is planning further growth: "Our core business remains production within the Hauni Group, but our manufacturing competence and machining portfolio are also available for external customers."

«

BALTIC METALLTECHNIK FACTS

+ Founded in 1946 in Hamburg, part of the Hauni Group
+ 248 employees
+ Specialist in modern manufacturing technologies for producing complex mechanical components and assemblies

BALTIC METALL
KÖRBER SOLUTIONS

Baltic Metalltechnik GmbH
Kurt-A.-Körber-Chaussee 8–32
21033 Hamburg, Germany
Tel.: +49 40 / 72 50 - 2784
Customer.Service.Baltic@hauni.com
www.hauni.com

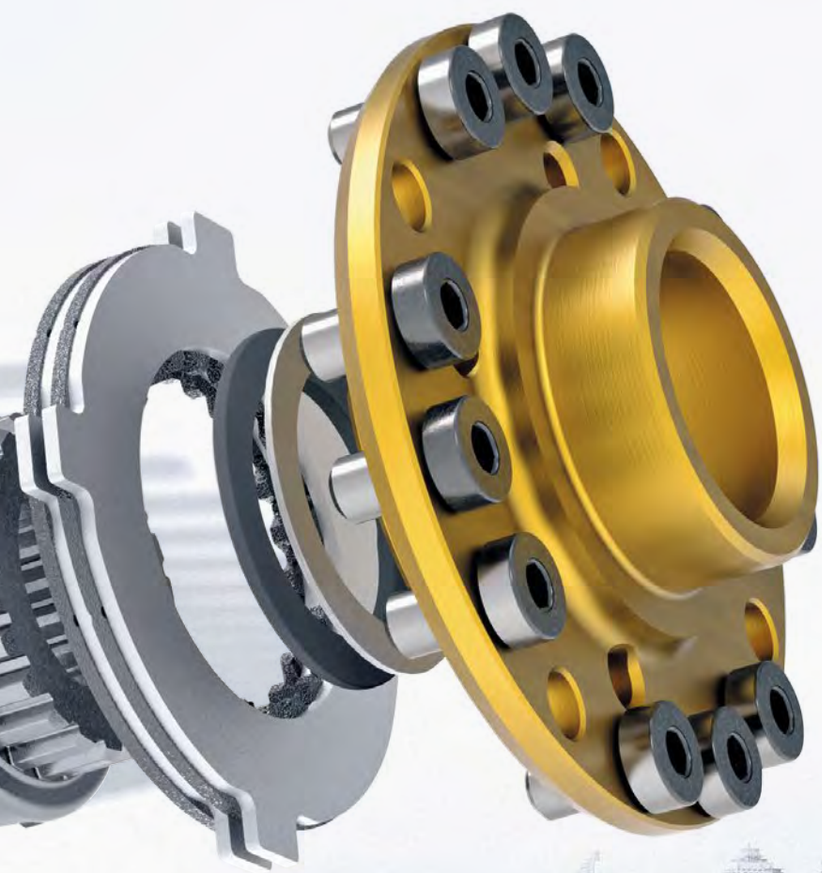
OVER 30 YEARS OF MOTOR SPORT EXPERIENCE ...

THE KNOW-HOW FOR SERIES PRODUCTION

Drexler high-performance limited slip differentials
Optimum quality and efficiency – for maximum agility and driving pleasure.

Whether in conventional, hybrid, or e-mobility vehicles – our products will play a key role in new drive concepts.

Tamara Drexler, *responsible for Marketing at Drexler Automotive and daughter of the founder Herbert Drexler*



As a development partner and manufacturer of innovative drive technology, Drexler Automotive combines years of experience in motorsport with expertise in production. Herbert Drexler founded the company in Salzweg near Passau in 1998 after his Porsche 911 GT2 caught fire during the FIA GT World Cup and he retired from his active racing career. The company's beginnings date back to the 1980s when Drexler Automotive developed and produced the first locking differentials and racing transmissions – including for its own racing cars. Today, Drexler Automotive employs 130 highly skilled people who develop and produce top quality limited slip differentials and other drive components with the help of 27 machine tools from DMG MORI. The products are put through their paces on in-house test benches. The most recent investment was in an NMV 3000 DCG with an AWC system for 34 pallets.

»

You will find a video of DMG MORI and Drexler Automotive at: **dmgmori.com/drexler**

And if necessary we can produce around the clock. Reliability is essential here, which is why we trust in DMG MORI.

Herbert Drexler
Founder and owner
Drexler Automotive

Auto-mechanical – dynamic-variable

With over 30 years of experience in motorsport racing, Herbert Drexler knows all too well the impact of high-quality drive components on the control of a vehicle and on drive dynamics. From the very outset he aimed at developing products at Drexler Automotive that would achieve maximum efficiency from the vehicles. "Our expertise benefits both motor racing and the major manufacturers in series vehicle production." The company has long been a tier-1 supplier for Daimler, BMW and Opel, to name just three of its renowned customers. The patented multi-plate limited slip differential is used primarily in high-performance vehicles such as the Mercedes-Benz AMG and BMW M models, for example. "Auto-mechanical in its functioning and dynamic-variable in behaviour, it engages optimally at exactly the right time," explains Herbert Drexler.

Optimum drive characteristics thanks to employee know-how and DMG MORI machines

Over 800,000 of these limited slip differentials and other drivetrain components already guarantee optimum and controlled vehicle handling worldwide, both on and off the racetrack. This has established Drexler Automotive as a reliable partner in development and production. Highly skilled staff are essential for top quality production and ensuring future growth. "We have built up a team of around 70 specialists in production alone", says Tamara Drexler, daughter of the founder. Their expertise is the basis for productive manufacturing. Powerful machine tools from DMG MORI are used throughout our factory – from several turning centers from the NLX series to CL 2000 turning machines and on to include the latest additions: an NLX 1500 | 500, two NLX 3000 | 700 machines and a 5-axis NMV 3000 DCG with a large-capacity, 34-station AWC pallet storage system.

HIGH QUALITY AND LONGER TOOL SERVICE LIFE THANKS TO DCG TECHNOLOGY

24-h race – reliability is essential

In order to remain competitive, Herbert Drexler pursues a multi-machine operation approach. Just one employee is responsible for three turning centers: "The NLX 1500 | 500 produces the three axles for the differential gears of the limited slip differentials – fully automatically thanks to the bar loader." All the operator has to do is monitor the housing production on the two NLX 3000 | 700 machines. In combination with the NMV 3000 DCG, 15,000 housings a year are produced in this way.

The reason for deciding on 5-axis machining on the NMV 3000 DCG was the machine design. "The vertical spindle orientation combined with the swivelling rotary table enables optimum chip flow during the manufacture of housings", says Herbert Drexler. The DCG technology reduces vibration because the drives are positioned at the center of gravity. "This means we achieve better surfaces, better roundness and longer service life of the tools."

»

Drexler Automotive develops and produces high-quality limited slip differentials and other drive components primarily for high-performance vehicles such as Mercedes-Benz AMG and BMW M models.

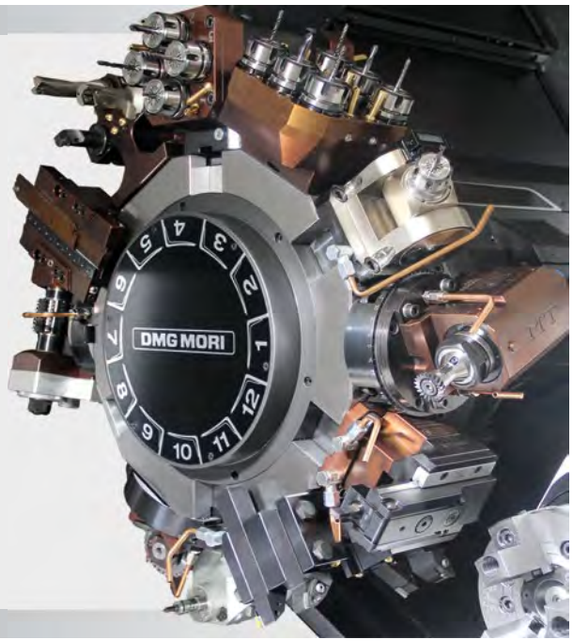
MT

Tailored to Perfection

The best precision machining
on CNC lathes

www.mtmarchetti.com

DMQP
DMG MORI QUALIFIED PRODUCT



Pallet handling for up to 114 palettes in < 3.8 m²

NMV WITH AWC

AWC PALLET HANDLING

HIGHLIGHTS

+ **34-position AWC pallet pool** (Automatic Work Changer) for workpieces up to ø350 × 300 mm and 80 kg
+ **Up to 114 pallets optional**
+ For the **NMV 3000 DCG** or the **CMX 600 V with MAPPS**

This machine is also automated. The AWC pallet pool has space for 34 components with diameters up to 350 mm and 300 mm maximum height. "Set-up during machining ensures maximum utilization of the machine", adds Herbert Drexler. "And if necessary we can produce around the clock. Reliability is essential, which is why we trust in DMG MORI."

Conventional, hybrid and e-mobility – ready for all motor concepts

Herbert Drexler's loyalty to motor sport is reflected in his commitment to the Drexler Automotive Formula 3 Cup: "The racing series is the perfect springboard for talented drivers of tomorrow." Both he and his daughter Tamara Drexler view the automobile future optimistically, because they see great growth potential for the company in the sustainable progress being made in the automotive industry: "Our products will play a key role in electromobility and for hybrid vehicles." The multi-stage automatic transmission for e-vehicles developed in house is extremely light and can optimize the gear change significantly. The e-differential from Drexler Automotive copes perfectly with the high torques of e-motors and offers maximum driving convenience.

«

DREXLER AUTOMOTIVE FACTS

+ Founded in Salzweg near Passau in 1998
+ 130 employees, of whom 70 work in machining
+ Development and production of high-quality limited slip differentials and other drive components.

Drexler Automotive GmbH
Postgasse 12C
94121 Salzweg, Germany
www.drexler-automotive.com

One operator is responsible for two NLX 3000 machines and an automatic NLX 1500 with bar loader.

The axles (left) for the differential gears of the limited slip differentials are produced on the NLX 1500, the housing (right) on two NLX 3000 machines.

M-Series High-Speed Spindle Bearings

X-life
proven to be better

VCM version
With maximum performance density

M version
Cost-effective and robust

HCM version
For outstanding productivity

The X-life High-Speed spindle bearings are available in three versions: For maximum speeds, the highest possible machining forces, and outstanding precision.

VCM version: Made from VACRODUR material for maximum performance and outstanding operational reliability.

www.schaeffler.de/en

- X times longer service life
- X times greater load-carrying capacity
- X times more efficient use of space

The VACRODUR VCM spindle bearings from Schaeffler are one of the reasons we offer a 36-month warranty with no hourly limit on all new MASTER spindles.

Alfred Geißler, Managing Director, DECKEL MAHO Pfronten GmbH

FAG

SCHAEFFLER

GREENFIELD PROJECT
EVERYTHING FROM A SINGLE SOURCE

The DMU 600 Gantry *linear* is the highlight of production at SPINTO. It enables 5-axis simultaneous machining of large components up to 150 t and 6,000 mm in length with a contouring accuracy of 10 µm.

The foundation of SPINTO Hungária was a project that came into being in 2014 due to the positive development of automotive engineering in the CEE region, specifically in Hungary. Since 2018, the company with headquarters in Miskolc has been establishing itself as reliable supplier of tools and molds for the large automotive manufacturers. Around 100 employees are responsible to development, design and production of the complex components. The machine highlight in production is a DMU 600 Gantry *linear* for the machining of components for large molds. In addition to this is a HSC 55 *linear*, which machines graphite electrodes for sink erosion, as well as models of the monoBLOCK, DMC V and DMF series. Since the company's foundation, a total of eight DMG MORI machines have been installed.

"Whilst growth of the automotive industry in our region was driven by quantity in the past, the focus is now on quality", says János Pócs, Managing Director of SPINTO. This represents a big opportunity for further economic development as well as an improvement in technical competence in the labor market. "For this reason, we have established SPINTO in Miskolc." The region has a long industrial tradition and there is a technical university, that meets the demand for engineers.

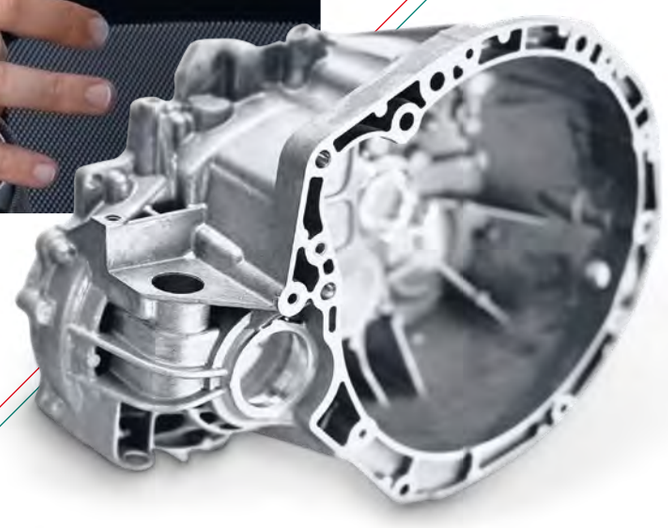
Investment into future-proof production

Private and institutional investors supported the greenfield project with 22 million Euro. "The aim was to build a plant that meets all requirements for future-proof production in automotive tool and mold making", says

SPINTO has a production area of 5,000 m².

The DMU 600 Gantry linear enables us to achieve a contouring accuracy down to 10 µm.

János Pócs
Managing Director of SPINTO Hungária Kft.



Amongst others, SPINTO produces molds for aluminum high pressure die castings like this gear housing.

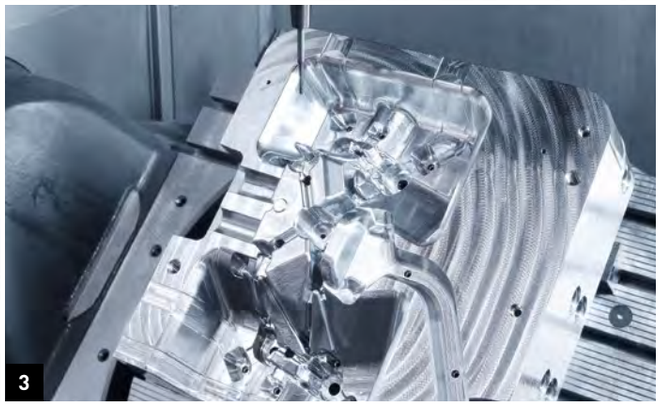
János Pócs. Consequently, a large proportion of the money, about two-thirds, was spent on manufacturing technologies. "We essentially erected the 5,000 m² building around a state-of-the-art shopfloor." Today, SPINTO has sufficient capacity to build 100 XXL tools per year weighing up to 70 tonnes.

The product portfolio of SPINTO includes injection molds for producing plastic components, tools for pressing sheet steel body components and molds for aluminum casting, for example of gear housings. "We have experts for all three competence areas in CAD and CAM programming", says János Pócs. SPINTO is using SIEMENS NX as standard software. "An important rationalization effect is in machining, where all three competence areas come together." SPINTO can produce all products on the shopfloor and use the to capacity highly efficiently.

10 µm contouring accuracy for XXL molds up to 6,000 mm

In the course of early market research, SPINTO detected a gap in the market in the area of XXL machines and molds and production was optimized with this sector in mind. The DMU 600 Gantry *linear* from DMG MORI confirms this impressively. With a work area of 6,000 × 4,500 × 1,500 mm, the 5-axis high-gantry machine meets all demands for producing large components up to 150 t with perfect surfaces.

»



1. SPINTO has installed a total of eight machine tools from DMG MORI.
2. The integral range of services at SPINTO comprises CAD and CAM programming ...
3. ... and quality-focused production of complex tool components, e. g. on the DMU 75 monoBLOCK.

DMU 600 GANTRY *linear*

HIGH-GANTRY MACHINE IN XXL FORMAT

HIGHLIGHTS

+ 6,000 × 4,500 × 2,000 mm work area
+ Direct Drive technology in all axes for high quality surface finish and maximum dynamics
+ Machine structure optimized for static and dynamic rigidity
+ Long-term accuracy due to contactless drives
+ 5 years warranty on the linear motors

"We achieve a positioning accuracy and contouring accuracy with the linear drives that are unique for the machining of top precision, visible surfaces", János Pócs says, praising the machining results on the DMU 600 Gantry *linear*. "We manage up to 10 µm contouring accuracy here."

Linear drives for 3 m/s² axis acceleration

The contactless and consequently maintenance-free linear drives in the X- and Y-axes enable high surface qualities and maximum dynamics with 3 m/s² acceleration and 45 m/min feed rate. DMG MORI provides an additional 60-month warranty on the drives. Spindle speeds up to 28,000 rpm similarly support the high surface quality. The DMU 600 Gantry *linear* has three exchangeable heads that can be exchanged automatically. Due to its good accessibility, the XXL machining center provides combines ergonomics with user convenience. The production hall is so large that a truck can drive up to the machine.

DMF 260|11 – High flexibility thanks to 5-axis machining

With its 5-axis simultaneous capability, the DMF 260|11 provides versatility in the machining of small to medium-sized tool components. "The traveling column can be used highly flexibly. This way, we can machine long, narrow components with dimensions up to 2,600 × 1,100 mm to high quality and with excellent surface finish", says János Pócs.

From 3 to 5 axes – everything from one source

When investing in the production capacity, SPINTO attached great importance to a varied machining range and flexibility of use. All models are equipped with HEIDENHAIN controls so that every operator can work on each machine. The 3-axis DMC 650 V and DMC 1150 V are used for producing simple components, the traveling column machines DMF 180|7 and DMF 260 for longer workpieces and the DMU 75 monoBLOCK and DMU 95 monoBLOCK as 5-axis universal machining centers for complex tool components. They are joined by the HSC 55 *linear* and DMU 600 Gantry *linear*. "We want to cover the full range of machining so that we can respond to each order flexibly and quickly", says János Pócs about their approach. In DMG MORI we have found a partner that provides the best solution for all our requirements." The objective is high utilization of production. "This is when the investment will quickly pay for itself."

THE RIGHT SOLUTION FOR ALL REQUIREMENTS

«

SPINTO HUNGÁRIA FACTS

+ Established in Miskolc in 2014
+ Approximately 100 employees
+ Design and manufacture of tools for injection molding, sheet steel pressing and aluminum die casting

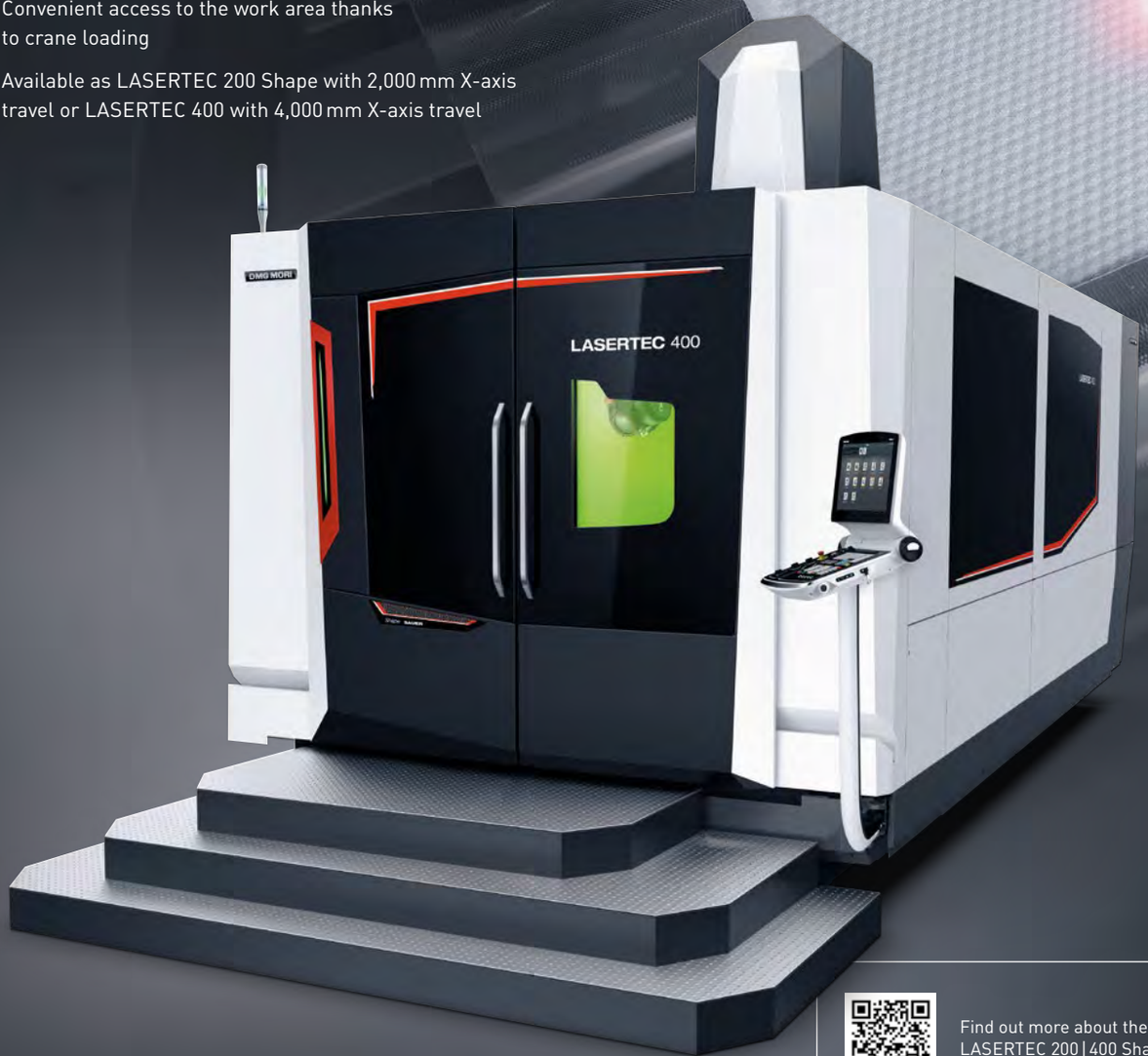
SPINTO Hungária Kft.
Miskolc, Galamb József utca
3516 Hungary
www.spintohungaria.com

WORLD PREMIERE 2020

LASERTEC SHAPE – OUTSTANDING LASER TEXTURING OF LARGE 3D MOLDS

MACHINE HIGHLIGHTS

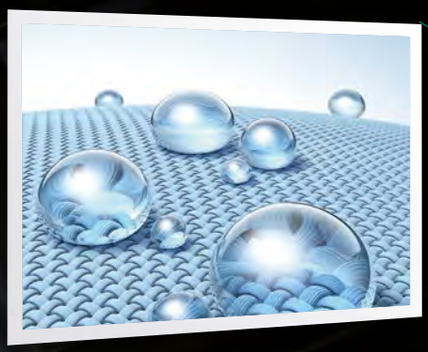
+ 5-axis laser ablation for outstanding texturing quality plus rapid machining
+ Workpieces up to 3,350 × 1,350 × 1,000 mm and workpiece weights up to 20,000 kg
+ Thermo-symmetrical gantry design with extensive cooling measures for maximum precision and long-term stability
+ Convenient access to the work area thanks to crane loading
+ Available as LASERTEC 200 Shape with 2,000 mm X-axis travel or LASERTEC 400 with 4,000 mm X-axis travel



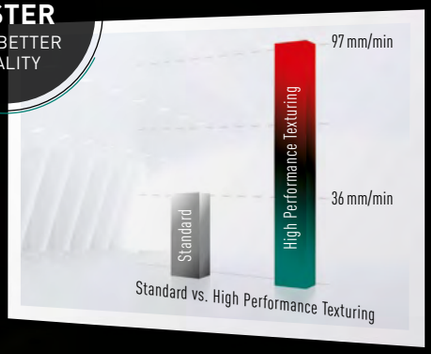
Find out more about the LASERTEC 200 | 400 Shape at:
lasertec-400-shape.dmgmori.com

Surface texturing of a mold for the interior trim of a vehicle.

UP TO
3-TIMES FASTER
WITH BETTER QUALITY



Textures with technical effects such as scratch resistance, hydrophobic properties or different gloss finishes.



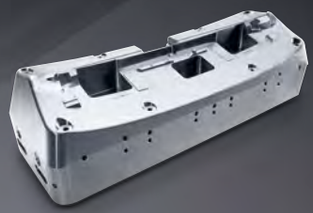
NEW: High performance texturing integrated in the entire LASERTEC Shape series.

NEW LASER HEAD

+ High speed Z-Shifter with up to 5 m/sec. in X/Y/Z
+ Swivelling laser processing head with a 235° swivel range, **undercuts possible**
+ Lightweight construction produced on the LASERTEC 65 *3D hybrid*

TECHNOLOGY HIGHLIGHTS

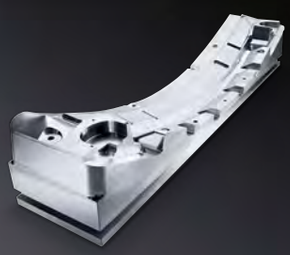
+ Freedom of design as well as repeatable, accurate texturess
+ High Performance Texturing: Outstanding texture quality with exceptional processing speed
+ Textures with technical properties:
  – Scratch resistance
  – Hydrophobic properties
  – Different gloss finishes



DIE & MOLD / AUTOMOTIVE

MOLD INSERT FOR INTERIOR TRIM

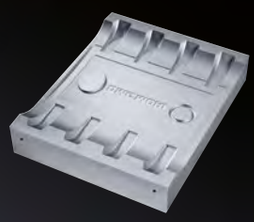
Dimensions: 1,630 × 490 × 405 mm
Material: Tool steel
Texture: Honeycomb structure



DIE & MOLD

COVER SECTION

Dimensions: 1,700 × 400 × 350 mm
Material: Tool steel
Texture: Carbon fiber structure



DIE & MOLD / AUTOMOTIVE

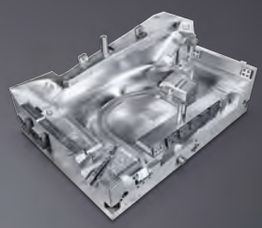
MOTOR COVER

Dimensions: 400 × 320 × 60 mm
Material: Tool steel
Texture: Cubic structure

DIE & MOLD / AUTOMOTIVE

MOLD INSERT FOR CAR BUMPERS

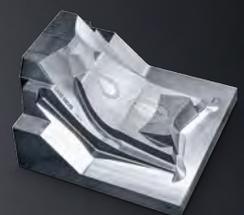
Dimensions: 2,800 × 1,500 × 1,255 mm
Material: Tool steel
Texture: Fine structure



DIE & MOLD / AUTOMOTIVE

PRESS TOOL FOR CAR WINGS

Dimensions: 940 × 530 × 210 mm
Material: Tool steel
Texture: Fine structure



DIE & MOLD / AUTOMOTIVE

REFLECTOR

Dimensions: 460 × 500 × 300 mm
Material: Tool steel
Texture: Prismatic structure

TECHNOLOGY EXCELLENCE FOR THE HIGHEST QUALITY COMPLEX MEDICAL COMPONENTS

The history of Smithstown Light Engineering began in 1974 with the manufacture of tools and molds for the electronics industry. From its beginnings as a three-man operation, the company now has 130 employees. It concentrates its experience and know-how on the development and manufacture of medical technology products. Smithstown Light Engineering operates in Shannon, Ireland with a diverse fleet of machines including eleven DMG MORI turning and turn-milling centers, four NLX 2500|700 and six NTX models.

"We benefited from the fact that large American medical technology companies such as Boston Scientific and Johnson & Johnson wanted to gain a foothold in the European market in the 1990s," recalls Gerard King, son of the company founder and current managing director. Smithstown Light Engineering has also reaped benefits from its experience producing high-precision tools and molds for the medical sector. "With this comprehensive expertise in manufacturing complex and high-precision workpieces, we have always been and will continue to be a partner for demanding customers in the medical technology sector." The aim is to optimize manufacturing processes at an early development phase and thus be in a position to offer competitive prices. The product range includes orthopedic instruments for knee and hip operations as well as orthopedic implants.

MAXIMUM EFFICIENCY THANKS TO 6-SIDED COMPLETE MACHINING

6-sided complete machining as efficiency driver

Since 2013, Smithstown Light Engineering has been regularly investing in manufacturing technology in order to continue to optimize their processes. "After a visit to the DMG MORI plant in Iga, we were sure that the NTX 1000 was the right step," says Gerard King, looking back on the acquisition. The turn-milling center won us over with its stable construction and high performance.

DMG MORI impressed us so much with the NTX 1000 that we have now purchased a further nine machines.

Gerard King
Managing Director of
Smithstown Light Engineering

Smithstown Light Engineering's product range includes orthopedic instruments for knee and hip operations as well as orthopedic implants.

"6-sided complete machining on one machine not only reduced our throughput times and labor, but also increased capacity on other machines at the same time."

High-precision 5-axis simultaneous machining of complex workpieces

DMG MORI put on such a winning performance with the NTX 1000 that Smithstown Light Engineering has now purchased a further nine of the highly stable turning centers: two NTX 2000 machines and recently three second-generation NTX 1000 machines, along with four NLX 2500|700 machines. The NTX models feature a rigid machine bed, roller guide ways and a thermo-symmetrical machine design that includes coolant circulation. "This ensures both high precision and outstanding long-term accuracy during daily operation," sums up Gerard King.

The compactMASTER turning and milling spindle with a speed of up to 20,000 rpm ensures optimal performance. And the B-axis with direct drive enables high-precision 5-axis simultaneous machining of complex instruments and implants. In the case of the two NTX 2000s, Smithstown Light Engineering also benefits from the larger turning diameter and longer turning length.

Smithstown Light Engineering uses a total of six NTX models.

"660 mm diameter and 1,540 mm length considerably expand our range of complex components that can be produced by 6-sided complete machining," says Gerard King.

The continuous investment in manufacturing processes demonstrates the healthy growth of Smithstown Light Engineering. Gerard King is optimistic about the future: "The rapid development in medical technology is a great opportunity for sustained growth for us – provided we continue to optimize our processes."

«

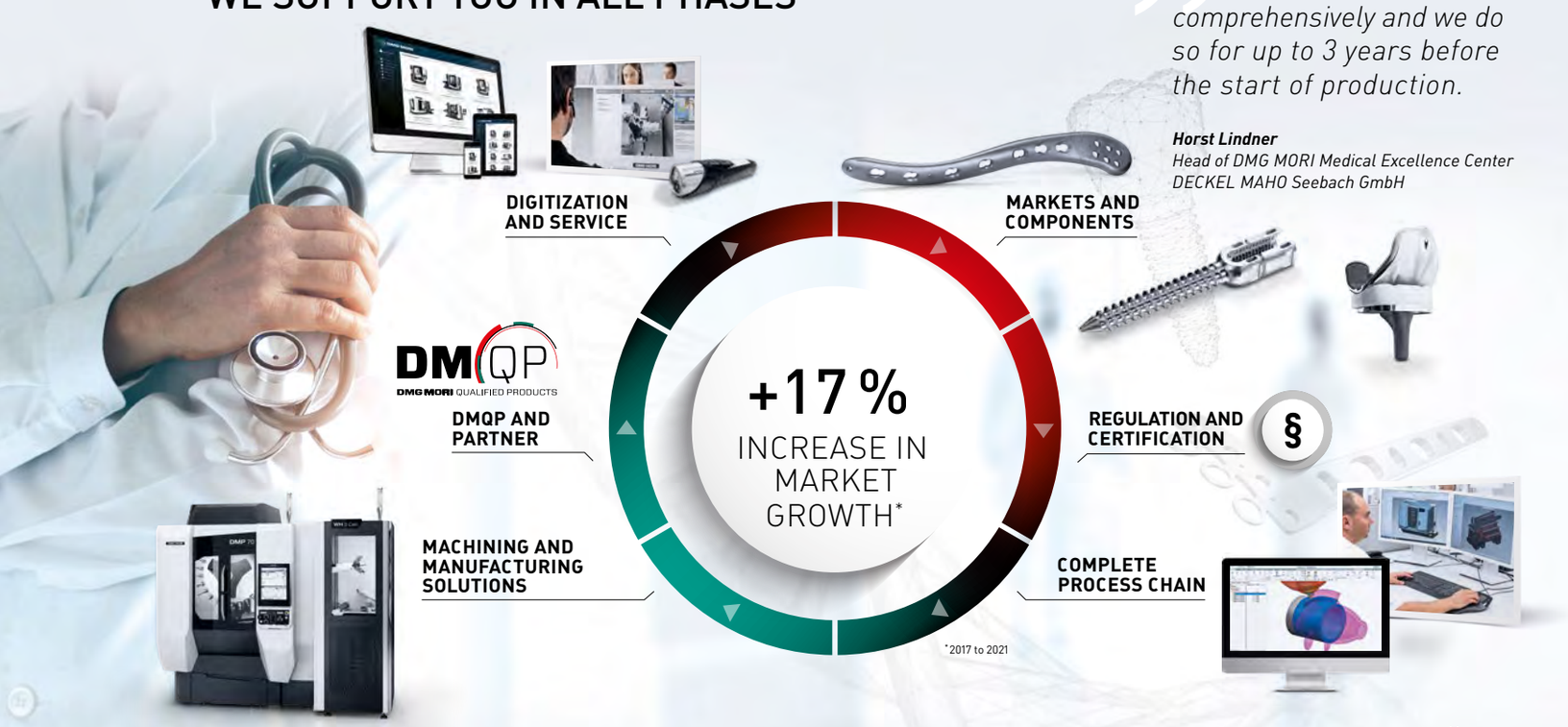
SMITHSTOWN LIGHT ENGINEERING FACTS

+ Founded in Shannon in 1974
+ 130 employees
+ Development and manufacture of orthopedic instruments and implants

Smithstown Light Engineering
Bay H1A, Smithstown Industrial Estate, Shannon, Co. Clare, Ireland
www.sle.ie

DMG MORI MEDICAL EXCELLENCE CENTER

WE SUPPORT YOU IN ALL PHASES



"We advise our customers comprehensively and we do so for up to 3 years before the start of production.

Horst Lindner
Head of DMG MORI Medical Excellence Center
DECKEL MAHO Seebach GmbH

MANUFACTURING CAPACITY DOUBLED

THANKS TO PARTNERSHIP BETWEEN SANDVIK COROMANT AND DMG MORI

Assembly of Bremont chronometer at the company headquarters in Henley-on-Thames.

The Bremont Watch Company, co-founded by brothers Nick and Giles English in 2002, specializes in the manufacture of certified chronometers for the aviation sector. These watches are assembled as well as shock and quality tested at dedicated headquarters in Henley-on-the-Thames, Oxfordshire in Great Britain. Production of the main components such as stainless steel backs and casings takes place just a few minutes' drive away.

High demand and the launch of six new watch designs meant that production capacity had to be increased. To achieve this the company purchased an NTX 1000, a state-of-the-art 5-axis machining center from DMG MORI, equipped with tool packages from Sandvik Coromant. Production capacity was doubled thanks to this joint project.

CAPACITY DOUBLED WITH SANDVIK COROMANT AND DMG MORI

"The project took 6 months", explains Mathew Bates, a specialist in machine tools from the team at Sandvik Coromant UK Machine Tool Solutions. "The aim from the very outset was to deliver the right solution", says Bates. "We wanted Bremont to be able to use the new turnkey system straight away." Close collaboration with application technicians from DMG MORI was needed with regard to the selection of suitable tools. "We knew that we

had to produce six new watches", Bates tells us. "As soon as the drawings were ready we met with specialists from DMG MORI to compile a list of standard tools and to determine which special tools would be needed."

Integrated automation for 24/7 operation

The DMG MORI NTX 1000 is equipped with a magazine for 38 Coromant Capto® tools, with the option of expanding the capacity up to 76 tools. The Turn & Mill machine is suitable for turning and high-speed milling in 5 axes simultaneously. Thanks to the bar loader, the machine produces the different stainless steel components around the clock without any operator intervention.

Everything from a single source: Tools, machine, automation and programming

Even before the installation of the machine, Frederick Shortt, applications manager at DMG MORI, and his development team created and simulated the NC programs with the Vericut CAM system. "Together with Sandvik Coromant we optimized all programs in such a way that as few tools as possible are needed." In other words, Bremont only bought what they really needed. As this all took place before the installation, Bremont was able to start producing on the very first day. "This joint optimization meant that any teething problems were reduced to a minimum and the investment quickly paid off for Bremont", explains James Rhys-Davies, Strategic Relations Director, Northern Europe at Sandvik Coromant. "The call for such turnkey solutions will increase steadily. Although the preliminary costs are sometimes a little higher, the benefits of a fast ROI and maximization of machine availability make such turnkey production cells a very attractive option, as cost per part is generally much lower".

NTX 1000 and Sandvik Coromant – Tolerances between 3 and 5 µm

Exactly as planned, Bremont was able to start full production of the watch components immediately after installation of the new machine. Malcolm Kent, Production Manager at Bremont, was extremely satisfied with the results. "We were surprised at the speed and high quality to which we can now produce the individual components", he says. "We produce very complex parts with tolerances of 3 – 5 µm, where quality and precision are of paramount importance. Thanks to the NTX 1000 in combination with the Sandvik Coromant tools, the processes are absolutely trouble-free."

«

Thanks to the collaboration between Sandvik Coromant and DMG MORI it was possible to start production on the NTX 1000 on the very first day.

Mathew Bates
Specialist for tool systems
Sandvik Coromant

NTX 1000

MAXIMUM TURN AND MILL PERFORMANCE PERFECTLY COMBINED

HIGHLIGHTS

+ **6-Sided complete machining** Production turning through synchronous machining with the B-axis and the lower 10-station turret at the main and counter spindles
+ Direct Drive Motor (DDM) on the B-axis for 5-axis simultaneous machining of complex workpieces
+ Thermo-symmetrical headstock structure with coolant circulation

SANDVIK COROMANT FACTS

+ Over 75 years of experience in precision tools for machining
+ Inventor of the modular Coromant Capto® tool system

SANDVIK Coromant

Sandvik Coromant UK
Manor Way
B62 8QZ Halesowen, England
www.sandvik.coromant.com

45 % FASTER THROUGHPUT TIMES
WITH CLX AND CMX U MACHINES

CLX/CMX
PRECISE, FAST AND COST-EFFECTIVE PRODUCTION!

With 60 years of experience in the development and manufacture of bending machines for tubes and profiles, AMOB is one of the leading suppliers in this industry. The family business is managed today by the third generation and supplies customers from the oil and gas, shipbuilding and automotive industries with its extremely wide range of products. 160 employees are responsible for the development and production of the complex CNC bending machines in the 18,000 m² factoy. AMOB relies on innovative CNC technology from DMG MORI for their machining: A total of six 5-axis CMX 70 U machines, a CLX 350 and a CLX 550 have been installed since 2018.

Insourcing for a long-term and trusting partnership

As a solution provider, AMOB continuously supports its customers. "This also applies to the manufacture at our plant of new tool sets for our bending machines," cites Manuel António Barros, operations director and grandson of the company founder. Competitors would generally outsource this function. AMOB has drastically increased its production capacity to ensure it is able to supply customers with high-quality tools at short notice using six CMX 70 U machines, one CLX 350 and one CLX 550.

PH 150

PH 150 PALLET HANDLING
OPERATION DIRECTLY FROM THE MACHINE CONTROL

PH 150
COMPLETE SOLUTION FROM A SINGLE SOURCE!

+ Available for all **CMX V** and **CMX U machines**
+ **Max. load capacity 150 kg** (250 kg*)
+ **One clamping unit for three pallet sizes:** 10 pallets 320 × 320 mm, 6 pallets* 400 × 400 mm, 4 pallets 500 × 500 mm
+ **EROWA clamping system** as standard, optionally SCHUNK
+ **Maximum clamping force** of up to 112 kN with turbo function with **SCHUNK VERO-S cuck**
+ **High repeatability** of pallet position; < 0.002 mm with **EROWA UPC-P chuck**

*optional

The new CLX and CMX U machines ensure our customers are able to get new tool sets quickly and even more economically.

***Manuel António Barros** (left), Operations Director*
***Manuel Barros** (right), Owner and Manager*
AMOB S. A.

"Our business philosophy and that of DMG MORI are very similar," says Manuel António Barros about their relationship. "We place great value on long-term, trusting and particularly close partnerships with our customers. The new CLX and CMX U machines ensure they are able to get new tool sets quickly and even more economically."

5-axis complete machining on six CMX 70 U machines

Because tool sets are essential components of bending machines, AMOB has always relied on powerful machining centers and lathes that efficiently machine parts in small to medium batch sizes. According to Eleutério Fernandes, industrial manager responsible for production, the CMX U and CLX models are the ideal solution: "5-axis machining on the CMX 70 U enables us to manufacture complex geometries in one clamping." The throughput time ranges from a few minutes to several hours depending on the workpiece. "We have been able to reduce throughput times by up to 45 % with the new machines compared to the previous manufacturing process." The rigid table design of the universal machining center, temperature compensation, MAGNESCALE linear encoders for direct feedback of axis position and the IoT*connector* as standard ensure accuracies down to 5 µm for AMOB workpieces. The latest CMX U machines already feature the new inlineMASTER spindles with 36-months warranty without any hourly limit. They are available in 12,000 or 15,000 rpm versions and achieve better cutting performance thanks to 53 % higher spindle power and 45 % higher torque.

CLX – 6-sided complete machining of complex turn-milled parts

Further advantages of the CLX series include stability and versatility – AMOB has one CLX 350 and one CLX 550. The counter-spindle with 168 Nm and 5,000 rpm (CLX 350) or 630 Nm and 3,250 rpm (CLX 550) enables machining on the reverse end of a component without the need to manually reclamp. The Y-axis enables more efficient milling, for example of the lateral surfaces. Travel is ±40 mm for the CLX 350 and ±60 mm for the CLX 550.

All CLX series models are available as turning (V1), milling (V3), Y-axis (V4) and counter-spindle (V6) versions and, like all CMX V and CMX U models, also feature the IoT*connector* as standard in addition to linear scales – ready for digitized production processes.

»

WH CELL

MODULAR WORKPIECE AUTOMATION FOR THE CMX V AND CMX U

+ **Modular automation system** for workpieces up to 15 kg
+ **Circulatory or drawer workpiece storage:** max. workpiece size of 300 × 300 × 220 mm max. load capacity of 250 kg
+ **KUKA/FANUC INDUSTRIAL ROBOTS with different gripper variants from SCHUNK:** Single or double gripper including customer-specific gripper jaws
+ **Expansions** (optional): SPC drawer, NOK chute, blow-off device, turnover station and much more

Availability	CMX 600 V	CMX 800 V	CMX 1100 V	CMX 50 U	CMX 70 U
WH 6 CELL	•	•	•	•	•
WH 8 CELL	○	○	–	•	–
WH 15 CELL	•	•	•	•	•
WH 25 CELL	•	•	•	•	•

● Available – Not available ○ WH 8 CELL: Only on request

Cables and tubes are bent into the desired shape on AMOB machines using these customer-specific tools.

"We now also manufacture more complex turn-milled parts very economically," says Eleutério Fernandes, summing up the extensive equipment.

DMG MORI Multitouch 3D controls for maximum operator convenience

Above all, the ergonomic design and user friendliness of the innovative CLX and CMX machines mean they enjoy an excellent reputation amongst in the AMOB team. Eleutério Fernandes refers to the convenient 19" DMG MORI SLIM*line* Multitouch controls: "FANUC on the two CLX turning centers offers 3D simulation with simple contour drawing and HEIDENHAIN on the CMX 70 U guarantees easy and efficient programming.

The great thing is that all CLX and CMX machines have the same 'look and feel' for our operators and ensure maximum operator convenience."

Investment with foresight – into the future with automation and digitization

The two turning centers along with two of the CMX 70 U machines are prepared for automation. Manuel António Barros sees great potential here: "We would like to modernize our factory and take a step toward digitization in the next few years." Automation solutions from DMG MORI are an integral part of this. "We will also be able to continue to increase our capacity in this way. And thanks to the IoT*connectors*, we will be able to easily connect the machines to our systems in the future."

«

FANUC TOUCH FOR SIMPLEST PROGRAMMING!

AMOB S. A. FACTS

+ Founded in Portugal in 1960
+ Leading manufacturer of CNC machines for tube and pipe bending and forging
+ 140 employees work at the 18,000 m² headquarters in Porto

AMOB S. A.
Rua Padre Domingos
Joaquim Pereira, 1249
4760-563 Louro
V. N. de Famalicão, Portugal
www.amobgroup.com

CLX SERIES

AUTOMATION

+ **Robot or bar loader**
  for automation of production processes
+ **Bar loader** (draw tube inner diameter)
  CLX 350 – ø 65 mm
  CLX 450 – ø 80 mm
  CLX 550 – ø 80 mm (ø 102 mm optional)
  CLX 750 – ø 127 mm (optional)
+ **Robo2Go** for all CLX machines with SIEMENS or FANUC
  – Workpieces up to ø 170 mm
  – Load capacity 10 / 20 / 35 kg
+ **Gantry GX 6** (CLX 350 with SIEMENS)
  – Workpieces up to ø 180 × 140 mm

Robo2Go also available for:
CTX alpha / beta, CTX 2500, NLX 2500, CTX beta TC, CTX beta 4A

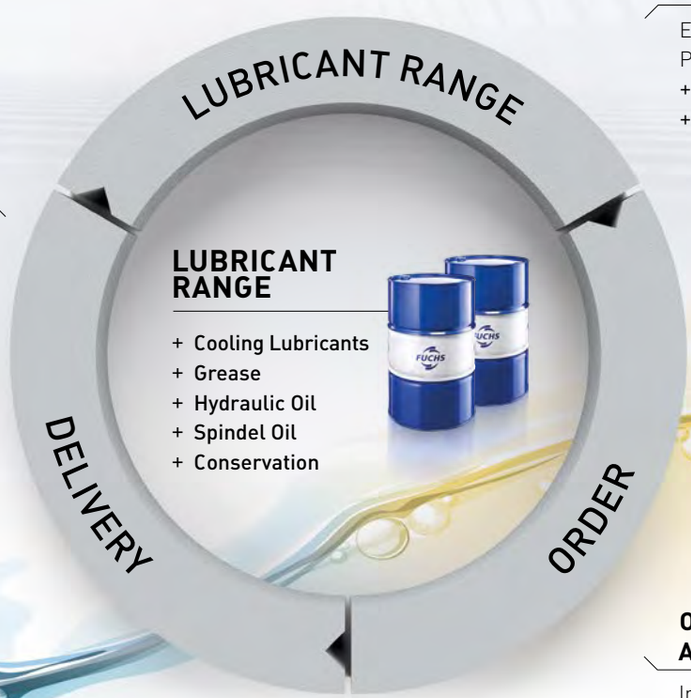
LUBRICANTS CYCLE

HOLISTIC
SUSTAINABLE
QUALIFIED

DMQP
DMG MORI QUALIFIED PRODUCTS

EXPERT KNOWLEDGE

Exclusive and free of charge
Product Expert's consultancy
+ personally
+ via service hotline



DELIVERY

of Fluid Services in
5 working days
+ Technology
+ Fluid Management
+ Reliable waste management
+ Simulation and sensor measurement
+ Data analytics

ORDER QUICK AND EASY ONLINE

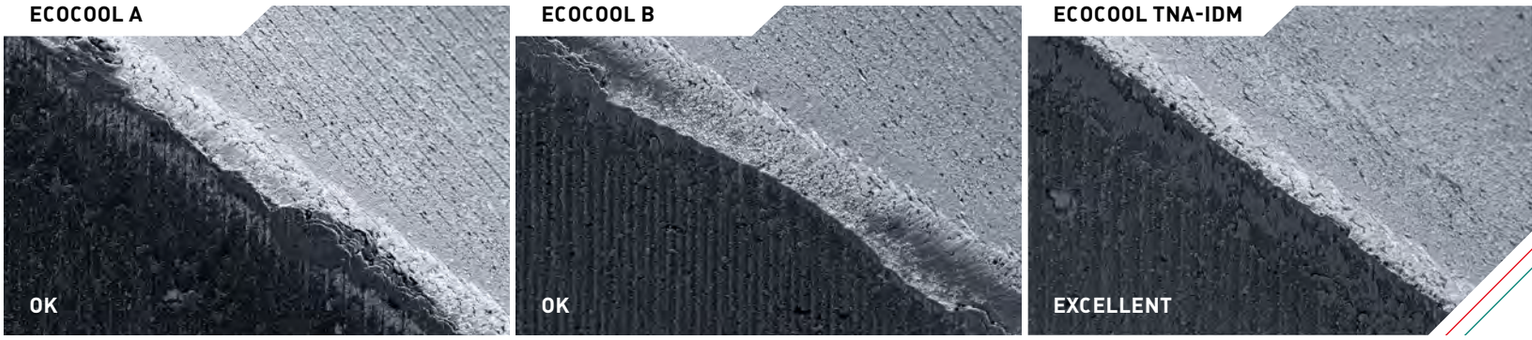
Individual, quick and simple
Re-ordering with free shipping
in our DMG MORI Online Shop:
shop.dmgmori.com

DMG MORI
TECHNOLOGY PARTNER
FUCHS

ECOCOOL TNA-IDM
ECOCOOL AFC-IDM

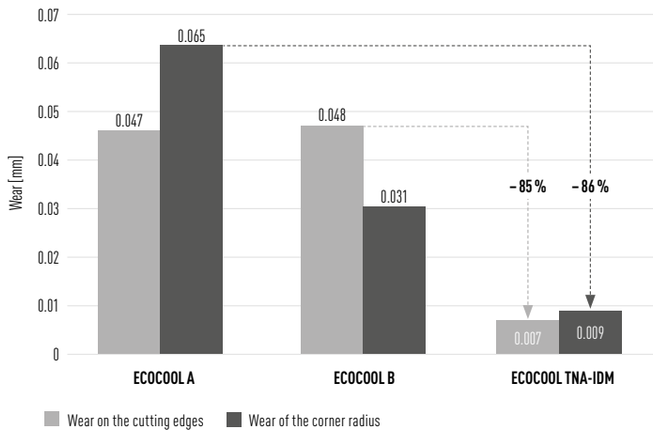
Recommended by
DMG MORI Technology
Excellence Center
Aerospace | Automotive |
Die & Mold | Medical

Christoph Grosch
Head of DMQP
GILDEMEISTER Beteiligungen GmbH
christoph.grosch@dmgmori.com



With magnification of the cutting edges under an optical microscope, ECOCOOL TNA-IDM shows homogenous wear without fracturing of the cutting edges.

MAXIMUM TOOL SERVICE LIFE
WITH COOLANTS FROM FUCHS AND DMG MORI



85 % less tool wear thanks to ECOCOOL TNA-IDM.

Key sectors like the aerospace industry, car manufacturing and medical engineering increasingly rely on sophisticated titanium and nickel-based alloys in manufacturing. These materials, which are difficult to machine, pose great challenges in the machining process, as the thermal and mechanical stress on the tools is tremendous. To counter abrasive wear, high-performance coolants are used with elevated cooling efficiency and lubrication performance. The effect the coolant has on titanium machining was tested and proven by DMG MORI together with its DMQP partners FUCHS and Sandvik Coromant in the DMG MORI Aerospace Excellence Center.

L. to r.: ***Janos Jenei,***
Head of Product Management Metalworking and Quenching Fluids, FUCHS SCHMIERSTOFFE GmbH
Marco Elkendorf,
Head of Application Technology DMG MORI Aerospace Excellence Center and
Michael Kirbach,
Head of DMG MORI Aerospace Excellence Center

To test the effect of coolants on the machining process, all products involved must be pushed to their limit under extreme conditions. The basis for the series of tests in the DMG MORI Aerospace Excellence Center was the 5-axis machining center DMC 65 monoBLOCK, an uncoated CoroMill solid carbide end mill of ø 10 mm and three coolants from FUCHS with respectively different raw material compositions: ECOCOOL A, ECOCOOL B and ECOCOOL TNA-IDM. This was developed exclusively for DMG MORI customers. IDM stands for **"Initiated by DMG MORI".**

85 PERCENT LESS WEAR WITH ECOCOOL TNA-IDM

The coolant benchmark test involved milling titanium alloy Ti6Al4V based on a cutter path of 120 m and a machining time of 120 mins. Sandvik Coromant defined the optimum cutting data, from which the product differences could be compared. The coolant was supplied both through the tool and externally.

The technology partners used reproducible tests to prove that ECOCOOL TNA-IDM shows significantly more homogenous wear and is thus suitable for long-term machining of titanium. The wear is 85 percent less on the cutting edges as well as the corner radius. Stefan Fuchs, chairman of FUCHS PETROLUB SE, is very satisfied with the close cooperation and the resulting ECOCOOL TNA-IDM: "As certified DMQP partner, we are pleased to contribute to high machining performance and a consequent productivity increase for customers using our innovative and technologically complex lubricants."

Perfectly adapted lubricant for complex machining

The characteristics of good-quality lubricants are explained by Thomas Wilke, Industrial Sales Manager at FUCHS SCHMIERSTOFFE: "Lubricants for metal machining in a machine tool must be powerful, economical, reliable and free from substances that are detrimental to the environment and health." All relevant processes and associated lubricants should also be coordinated for reasons of sustainability. "FUCHS can guarantee this as lubrication partner in the DMQP Program, including in the case of ECOCOOL TNA-IDM."

ECOCOOL TNA-IDM is a high performance coolant that ensures a stable and safe process.

«

FUCHS SCHMIERSTOFFE FACTS

+ FUCHS has been developing and producing high-quality lubricants for more than 85 years
+ With 58 companies and more than 5,000 employees worldwide, the FUCHS Group is the leading independent supplier of lubricants

LUBRICANTS. TECHNOLOGY. PEOPLE. FUCHS

FUCHS SCHMIERSTOFFE GMBH
Friesenheimer Straße 19
68169 Mannheim, Germany
www.fuchs.com/de

DMU 50 3rd GENERATION

5-AXIS SIMULTANEOUS MACHINING AND 5 µm ACCURACY

HIGHLIGHTS

+ 5-axis machining with 15,000 rpm speedMASTER spindle as standard
+ Swivelling rotary table for 5-axis simultaneous machining of workpieces up to 300 kg
+ Highest accuracy down to 5 µm thanks to integrated cooling concept and MAGNESCALE linear encoders in all axes

Precision components for the printing industry are the core business of Nakahara Works. Eight DMG MORI machines are employed for machining them.

DMG MORI 5-AXIS EXPERTISE FOR ALL WORKPIECES
FROM SMALL TO LARGE

Nakahara Works, founded in 1948, has been producing printing machine components since the 1960s. With the continuously increasing size of newspaper print runs, print rollers have become the company's core business. In order to promote growth and to develop new business areas in spite of the economic crisis and declining order intake, Nakahara has been progressively modernizing its production facility since 2008. Today eight DMG MORI machines are employed in the machine shop, ranging from the DMU 50 3rd Generation to the DMU 210 P.

For Kenichi Nakahara, President of Nakahara Works, a visit to the DMG MORI plant in Iga encouraged him to introduce 5-axis simultaneous machining into his company. "Both the multi-sided machining capability and the efficient process integration were very impressive." He realized at that moment that Nakahara Works would benefit from the technology in the long term.

5-axis machining from DMG MORI for higher productivity and accuracy

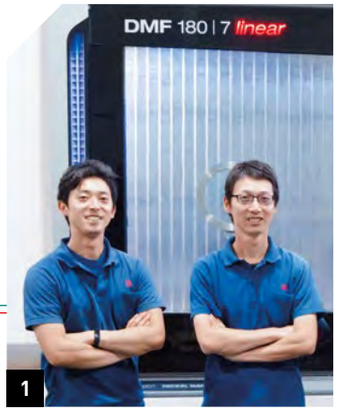
In 2016, the company installed its first 5-axis machine, a DMC 80 H *linear*, in order to increase productivity and accuracy in the manufacturing facility. This was followed by further models up to the most recently installed DMU 60 eVo *linear*, making a total of eight DMG MORI 5-axis machines processing a wide range of components. "The DMU 50 3rd Generation has established itself a compact all-rounder for small components, while the DMU 210 P efficiently machines large workpieces up to 2,100 × 2,100 × 1,250 mm and 8,000 kg," declares Kotaro Nakahara, Senior Director and son of the President. The DMC 80 H *linear* is particularly well-suited to the dynamic production of complex components where efficient chip evacuation is necessary. "Originally we wanted to optimize our general part production with the DMG MORI 5-axis machines. Now we even manufacture parts for other industries."

5-AXIS MACHINING FOR ALL SIZES OF COMPONENT

The specification of the 5-axis machines tells a clear story. The space-saving DMU 50 3rd Generation offers axis travels of 650 × 520 × 475 mm and a maximum load capacity of 300 kg. speedMASTER spindles, fitted as standard, with 36-month warranty ensure high-performance production. The swivel range from –35° to +110° provides maximum flexibility. An integrated cooling concept guarantees high precision even with exacting components. On the other hand, Nakahara Works has installed the DMC 80 U duoBLOCK as a highly stable 5-axis machining center for milling components weighing up to 1,400 kg with maximum accuracy. The fully cooled feed drives, a Spindle Growth

Thanks to the DMG MORI 5-axis machines, we were able to optimize our general part production and open up new industries.

Kenichi Nakahara
President
Nakahara Works Co., Ltd.



1

2

1. Mr. Kotaro Nakahara, Senior Director / Chief of Production Department (left), Mr. Kentaro Nakahara, Executive Director / General Manager of Development and Technology Department (right).
2. Nakahara Works has installed eight DMG MORI machines since 2016 including 5-axis machines such as the DMC 80 H *linear*, the DMU 210 P and the DMC 80 U duoBLOCK.

Sensor (SGS) that compensates for spindle growth, and optimal thermal response make high-accuracy machining possible.

On-site training by DMG MORI experts

"The wide machine spectrum enables us to respond flexibly to the order situation at any particular time," says Kentaro Nakahara, Executive Director and son of the President. DMG MORI's versatile offering is therefore to the company's benefit. But Kenichi Nakahara also believes the range of services regarding all aspects of the machine program to be a decisive factor. "In 2018 DMG MORI held a 5-axis seminar at our plant, in which other customers from the region also took part. This enabled us to incorporate even more advantages of 5-axis machining in our production shop." The machines owned by Nakahara Works were ideal for this purpose. In future, DMG MORI will hold such events – this was the first of its kind in Japan – on a regular basis. Nakahara Works' many years of experience in the precision machining of rollers and other components for the printing industry coupled with its new expertise in 5-axis simultaneous machining are already bearing fruit. Kenichi Nakahara is delighted to be developing new areas of business: "Today, for example, we are also making components for the production of lithium batteries."

«

NAKAHARA WORKS FACTS

+ Founded in 1948
+ Many years of experience in the production of precision components for the printing industry
+ Modern production facility for developing new sectors

NAKAHARA
NAKAHARA WORKS CO., LTD.

Nakahara Works Co., Ltd.
463, Otami, Naka-ku Okayama
703-8228 Japan
www.nkhr.info

ULTRASONIC technology is the optimum method in the semiconductor industry for highly precise machining of components made from hard, brittle materials.

André Pisch
Process Engineering CNC
Berliner Glas KGaA Herbert Kubatz GmbH & Co.

ULTRASONIC TECHNOLOGY
FOR MACHINING PRECISE COMPONENTS IN THE **SEMICONDUCTOR INDUSTRY**

Since its foundation in 1952, Berliner Glas KGaA Herbert Kubatz GmbH & Co. has grown into a group of companies with 1,500 employees and locations in Germany, Switzerland and China, as well as a sales office in the USA. As an expert for the development and production of optical components, assemblies and systems, the company supplies leading customers worldwide in the semiconductor industry, laser and space technology sectors as well as medical technology. Berliner Glas has been working with CNC technology from DMG MORI in its production department for over 20 years. 23 of the 38 models are ULTRASONIC machining centers, which provide Berliner Glas with the world's largest installed base of ULTRASONIC models from DMG MORI. The team uses them to machine high-precision components made of hard, brittle materials like silicon carbide and Zerodur©.

With a comprehensive range of services from development up to series production, including installation of complete assemblies, Berliner Glas makes a major contribution to the value-added chain of its customers. "Today, almost one-third of the order volume is from the semiconductor industry", states André Pisch, who is responsible for process technology, providing an insight into his portfolio. More than 400 of the 1,000 employees at the Berlin headquarters are responsible for leading companies in this industry. "The component range includes vacuum and electrostatic chucks, reference mirrors and stage modules for highly precise movement and measurement in lithography systems." The highest yield can be achieved in chip production with these high-quality components. "ULTRASONIC technology is the optimum machining method for this."

ULTRASONIC for process-reliable machining of brittle, hard materials

Complex brittle, hard materials pose a great challenge in production. "In the machining of high-performance ceramics and glass ceramics like silicon carbide and Zerodur©, tool wear is extremely high and cracked edges can easily occur on the workpieces", says André Pisch. For this reason, ULTRASONIC machines from DMG MORI have been used from an early stage. In ULTRASONIC

machining, the rotary movement of the tool is superimposed, by inductive transmission, with an oscillation in the longitudinal direction, reducing the process forces by up to 50 percent. Randolph Hennig, responsible group leader for the CNC production area, describes the positive effect of the ultrasound technology: "It minimizes tool wear as well as the depth of micro-cracks and break-outs on the material." Feed rates and infeed can be increased for improved productivity.

ULTRASONIC FOR HIGHER PRODUCTIVITY AND LONGER TOOL LIFE

Up to 3 times higher productivity through development in partnership

Both partners benefit from the long-standing cooperation: "Our know-how with regard to the machining of ceramics can also be used for the development of new ULTRASONIC actuators", says Randolph Hennig. DMG MORI has optimized the latest ULTRASONIC actuator once again with regard to rigidity. A stronger ULTRASONIC booster enables two to three times higher amplitudes to a maximum of 15 µm. "This means we can increase productivity up to 3 times, while at the same time reducing tool wear and micro-cracks."

»

Cost-efficient ULTRASONIC grinding of lightweight structures made of SiC or Zerodur© for supporting mirror substrates and complete machining of quartz glass rings and SiC wafer chucks for the semiconductor industry.

The range of features of the ULTRASONIC machines also includes DMG MORI technology cycles, including for automatic frequency and amplitude optimization as well as feed adjustment. There is also a well established cooperation at service level thanks to concrete agreements. "This reduces machine downtime to a minimum", Randolph Hennig adds.

67 % shorter throughput times thanks to milling-turning & ULTRASONIC technology

The ULTRASONIC machines at Berliner Glas include amongst others a highly dynamic ULTRASONIC 20 *linear* for hand-sized parts, seven compact ULTRASONIC 50 with 650 × 520 × 475 mm travels as well as four ULTRASONIC 85 monoBLOCKs and two ULTRASONIC 125 monoBLOCKs for larger parts. Travels are 935 × 850 × 650 mm and 1,335 × 1,250 × 900 mm respectively. One of the ULTRASONIC 85 monoBLOCKs is equipped with a mill-turning table. Randolph Hennig refers to the numerous rotationally symmetrical components: "On a normal milling machine, circular interpolation by simultaneous control of three linear axes is extremely complex." Thanks to integrated turning in one set-up, there is now the option to include external and internal cylindrical grinding operations. As a result, the throughput time of some workpieces can be reduced by more than 67 percent to 30 minutes. "This alone makes the milling-turn technology an important criterion for us in the future", André Pisch adds.

67 % SHORTER THROUGHPUT TIME WITH MILL-TURNING & ULTRASONIC TECHNOLOGY

In view of the successful business development of Berliner Glas, it is certain that further investments in machinery as well as in personnel – just over 50 employees currently work in machining – will follow. "On one hand we must meet the demand for skilled employees", says André Pisch. Part of the young talent comes from in-house training. "On the other hand, we are increasing our production capacities with further investments in new ULTRASONIC machines and continuous process optimization."

«

1

2

3

BERLINER GLAS FACTS

+ Established in 1962 in Berlin
+ 1,500 employees worldwide at locations in Germany, Switzerland, USA and China
+ Development and production of optical components, assemblies and systems for the semiconductor industry, laser and space technology sectors as well as medical technology.

BERLINER GLAS
BERLINER GLAS GROUP

Berliner Glas KGaA
Herbert Kubatz GmbH & Co.
Waldkraiburger Straße 5
12347 Berlin, Germany
www.berlinerglas.de

1. Berliner Glas uses a total of 23 ULTRASONIC machines from DMG MORI. **2.** These include 7 ULTRASONIC 50 machines and 4 ULTRASONIC 85s. **3.** One of the four ULTRASONIC 85s has a mill-turning table, reducing the machining time by up to 67 %.

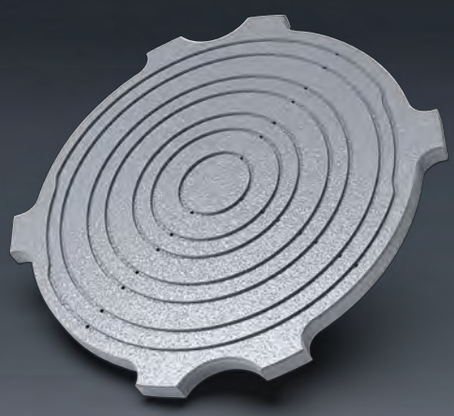
EXAMPLES SEMICONDUCTOR

WAFER

Dimensions: ø 300 × 3 mm
Material: Silicon
ULTRASONIC 50 3rd Generation

RING

Dimensions: ø 600 × 50 mm
Material: Quartz glass
ULTRASONIC 80 eVo



WAFER CHUCK

Dimensions: ø 300 × 10 mm
Material: Silicon carbide
ULTRASONIC 60 eVo

AeroEdge is a first-tier supplier for the series production of the LEAP turbine from Safran Aircraft Engines, which are used in the A320 and other aircraft.

CREATE ONE FROM ZERO WITH 3D PRINTING TECHNOLOGY

AeroEdge – FROM PROTOTYPE PRODUCTION TO THE NEW TIER SUPPLIER

HIGHLIGHTS

+ Combined laser deposition welding and milling
+ Automatic changeover between additive and milling operations in a single setup
+ Complete hybrid CAD/CAM process chain
+ AM Assistant: adaptive process control, powder feed rate sensor, AM evaluator, AM guard for maximum quality and process security

NEW PRODUCTION

Blade – 90 % weight reduction thanks to lightweight structures and multi-material (Sandwich structure)

NEW PRODUCTION

Closed impeller: 10 % higher performance owing to new design

REPAIR

Pressure die casting core – 3-times normal service life due to the use of multi-material (Sandwich structure)

AeroEdge originated in 2015 in the Japanese city of Ashikaga from the aerospace division of a machining service provider in order to produce prototypes and now also serial parts for customers in the aerospace industry, among them Safran Aircraft Engines. Since then, AeroEdge has acquired the necessary certification and an impressive quality management system and has been growing continuously. In order to keep pace with the rapidly expanding sector, the company is also treading new paths in manufacturing. Since 2018, a LASERTEC 65 *3D hybrid* from DMG MORI has extended the range of services for the additive manufacturing of complex prototypes and the repair of damaged components.

In Japan, AeroEdge is often described as the "Hope of Ashikaga", as it was the first company in the country to conclude a direct supply contract with a global aeroengine manufacturer. Safran Aircraft Engines was impressed by the team's commitment, as it had overcome the challenge of producing complex components from a demanding titanium aluminide material. "In this regard, we benefited to a great extent from our experience in prototype production," recalls Jun Morinishi, President and CEO of AeroEdge. Following a selection procedure with stringent criteria and exacting delivery requirements, AeroEdge succeeded in becoming the new supplier for the serial production of Safran Aircraft Engines' LEAP engine.

Additive manufacturing as a key technology for the future

The range of services offered by AeroEdge extends from development and manufacturing to quality assurance. "With continuous development in quality management and investment in a modern production facility, we will remain competitive in the long term," explains Jun Morinishi. This investment also includes the recently installed LASERTEC 65 *3D hybrid* from DMG MORI. "We see additive manufacturing as a seminal key technology in the aerospace sector and therefore also for our continued growth."

LASERTEC 65 *3D hybrid*: BUILD RATES UP TO 1 kg PER HOUR

Complex prototypes thanks to hybrid manufacturing in a single setup

"The combination of laser deposition welding and 5-axis simultaneous milling on the LASERTEC 65 *3D hybrid* has enhanced our prototype production processes," believes Takuya Honda, Chief of Production Headquarters at AeroEdge. The changeover between subtractive and additive manufacturing enables highly complex geometries to be realized

Jun Morinishi (left), President and CEO of AeroEdge Co., Ltd. and Production Engineer Mr. Fukushima (right) of AeroEdge Co., Ltd. in front of the LASERTEC 65 *3D hybrid*.

The combination of laser deposition welding and 5-axis simultaneous milling on the LASERTEC 65 3D hybrid has enhanced our processes for the long term.

Jun Morinishi
President and CEO
AeroEdge Co., Ltd.

with, at the same time, component quality that is identical to pure machining. "This enables us to manufacture components that would be impossible to produce by conventional methods alone." For this purpose, the work area of the LASERTEC 65 *3D hybrid* makes it possible to manufacture large workpieces up to ø500 × 400 mm with build rates of approx. 1 kg per hour.

The user-friendliness of the LASERTEC 65 *3D hybrid* was also an important criterion during the selection of the machine. This is accomplished by the software with user-oriented interface integrated within CELOS, monitoring for the highest process reliability and quality assurance, and adaptive process control. The latter includes continuous melt pool analysis using a camera and automatic control of the laser power in real time for homogenous component quality.

Efficient MRO processes on the LASERTEC 65 *3D hybrid*

Jun Morinishi has further plans for the LASERTEC 65 *3D hybrid*: "The MRO business, that is to say maintenance, repair and overhaul, of aerospace components is increasingly gaining in importance." The hybrid machine also shows its strengths in this sector. "With the LASERTEC 65 *3D hybrid*, we can weld on new material to the original quality in defective areas and subsequently mill to the required precision in a single manufacturing process."

At AeroEdge, the continuous search for new challenges is part of the business philosophy. Jun Morinishi is therefore hoping for further demanding orders and business opportunities: "We want to further enhance our manufacturing technologies and develop new solutions together with DMG MORI."

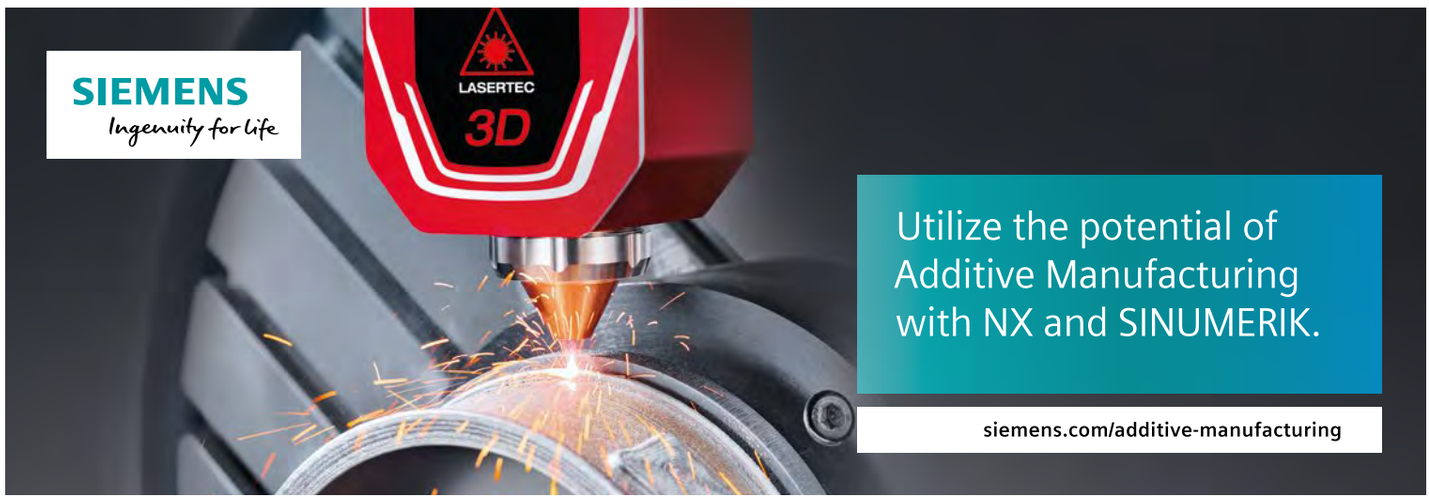
«

AeroEdge FACTS

+ Founded in 2015 in the Japanese city of Ashikaga
+ Production of prototypes and serial parts for the aerospace industry
+ Supplier to Safran Aircraft Engines

AeroEdge

AeroEdge Co., Ltd.
482-6 Teraokacho, Ashikaga
Tochigi 329-4213, Japan
www.aeroedge.co.jp



NOTHING IS IMPOSSIBLE

FILIGREE STRUCTURES & CONFORMAL COOLING

Thanks to the LASERTEC 30 SLM 2nd Generation, we can now realize the required conformal cooling channels – geometries that were not possible before.

Rico (left) and Ulli Clauß
Managing Director
Modellbau Clauß GmbH & Co. KG

With the additive production of metal components, Modellbau Clauß has rounded off its range of services in 3D printing.

Modellbau Clauß GmbH & Co. KG, founded in 1948 in Neukirchen near Chemnitz in Germany, has its origins in the production of foundry patterns – initially made of wood, later of plastic and then also of metal with the advent of the first CNC machine tools. The range today also includes molds and prototypes. The family business with 45 employees supplies customers from the automotive, machine building and plant engineering sectors. Modellbau Clauß has been working with turning and milling machines from DMG MORI since 2003. This was followed in 2018 by a 3D printing investment, a LASERTEC 30 *SLM* 2nd Generation for additive production of metal components.

"With regard to the production of models and prototypes, we benefit from ongoing development of 3D printing", states Ulli Clauß. Together with his brother Rico Clauß, they are third-generation managers and have added this technology to the company's production department. "Following the first 3D printers for plastic models, we quickly recognized the potential for the production of metal prototypes", Rico Clauß adds.

NEW BUSINESS FIELDS WITH SLM TECHNOLOGY

New potential and new component geometries using the powder bed process

The cooperation with DMG MORI – five machine tools are already in use at Modellbau Clauß – now also involves 3D printing. "The LASERTEC 30 *SLM* 2nd Generation ideally complements our machinery", says Ulli Clauß approvingly. With the powder bed machine, highly complex and filigree components, for example made of aluminum or steel, can be produced in a footprint of 300 × 300 × 300 mm. "Such geometries could not be realized subtractively." The combination of 3D printing with DMG MORI 5-axis machines allows high-precision metalcutting of additively manufactured components that cannot be produced in a conventional way.

In such complex geometries, Rico and Ulli Clauß see the great added value of selective laser melting in a powder bed: "It enables highly complex component requirements to be met and new business fields to be opened up." Molds for producing carbon fiber wheel rims are a current example. "Thanks to the LASERTEC 30 *SLM* 2nd Generation, we can now realize the required conformal cooling channels."

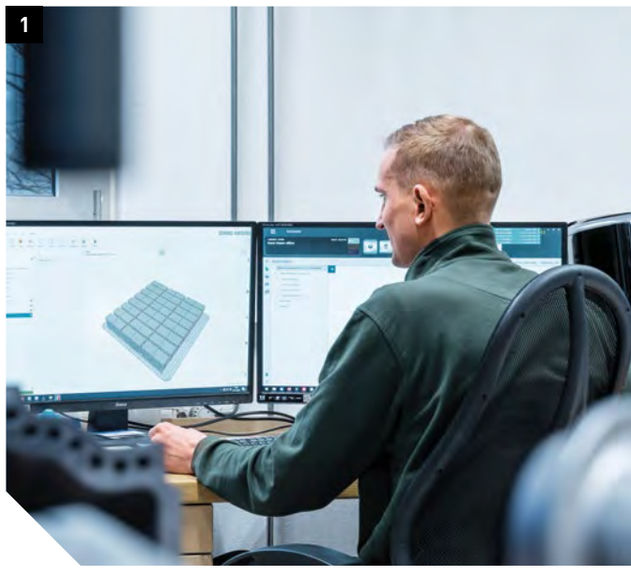
»

rePLUG – safe material changeover in less than two hours

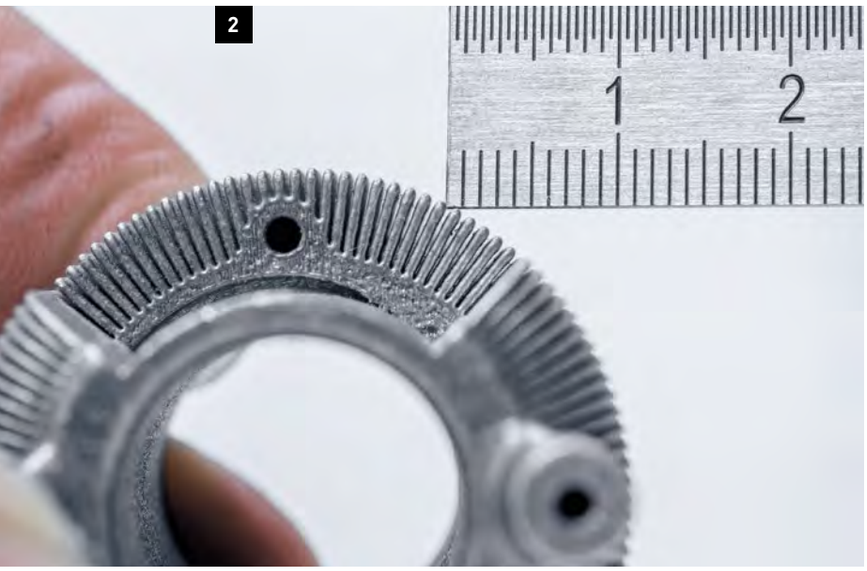
Modellbau Clauß has purchased the LASERTEC 30 *SLM* 2nd Generation with a total of three *re*PLUG powder modules. "Therefore we always have different metal powders on hand", Ulli Clauß explains. An operator can change the individual modules in less than two hours, of course without contamination. Rico Clauß also sees an advantage in the closed material cycle: "This means we have absolutely safe powder handling."

CELOS as an innovative and integral software solution

The LASERTEC 30 *SLM* 2nd Generation is equipped with DMG MORI's proprietary control and user interface, CELOS. Geometrically highly complex components can be programmed quickly off-line and transferred to the machine. "The process is a completely open system. In other words, all machine settings and parameters can be adapted individually", says Ulli Clauß, giving us an insight into the day-to-day use of the machine. CAM programming is carried out in the CELOS APP RDesigner based on CAD models. Heat calculation is also integrated. It calculates the mass distribution in advance and automatically adjusts the laser parameters. The CELOS APP JOB CONTROL supplies all relevant machine and job parameters – including camera-based tests and error detection of each individual component layer.


1

Powder change < 2 h
The *re*PLUG powder modules ensure safe powder handling.



1. The workpieces are programmed externally and transferred to the CELOS APP RDesigner. User-friendly CAM programming from the CAD data is carried out. **2.** Even the most filigree geometries can be realized effortlessly in the powder bed process. **3.** Modellbau Clauß uses a microscope to check the structural density of the workpieces created in the powder bed.

With SLM technology, Modellbau Clauß can produce highly complex prototypes.

New service thanks to know-how in ADDITIVE MANUFACTURING

With experience in 3D printing, especially in the powder bed process, as well as upstream and downstream process steps such as design and post-processing, Modellbau Clauß is building a further of the company. Additive manufacturing has not yet arrived in all development departments, says Ulli Clauß: "We would like to show our customers the design freedom that is possible and support them in optimizing their components with the help of additive manufacturing."

«

MODELLBAU CLAUSS GMBH & CO. KG FACTS

+ Established in 1948 in Neukirchen near Chemnitz, Germany
+ 45 trained employees
+ Development and production of foundry patterns, molds and prototypes for automotive applications and mechanical engineering

Clauß MODELLBAU Neukirchen

Modellbau Clauß GmbH & Co. KG
Südstraße 16
09221 Neukirchen/Erz.
Germany
www.modellbau-clauss.de

80 % HIGHER PRODUCTIVITY
WITH DUAL LASER SYSTEM

FIRST TIME RIGHT
The new OPTOMET software for parameter optimization

HIGHLIGHTS

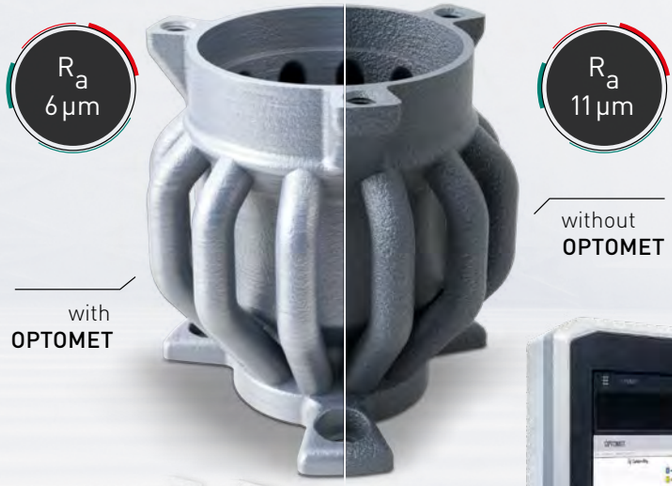
+ **Generative manufacturing in a powder bed** with build volumes up to 300 × 300 × 300 mm
+ **2 × 600 W DUAL laser system** for build-up rates up to 90 cm³/h
+ **Highly precise optics module** with variable focus diameter (50 µm – 300 µm) and active cooling
+ **100 % overlap of the scanning fields** with complete digital control
+ **Variable definition of the scanning strategy** for maximum efficiency during the printing process
+ **Actively cooled build chamber** for reduced set-up times
+ **NEW: Material-independent permanent filter system** with automatic passivation of metal particles
+ ***re*PLUG –** The powder module for fast material changeover < 2 hours

***re*PLUG-powder module**

POWDER CHANGE < 2 h

OPTOMET SOFTWARE

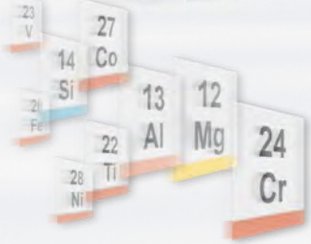
AUTOMATIC CALCULATION
OF PROCESS PARAMETERS FOR THE POWDER BED PROCESS



HIGHLIGHTS

+ **Parameter development** for new and existing materials within minutes instead of days
+ Up to **50 % more efficiency** with OPTOMET Max. Power*
+ **Advance calculation** of mechanical properties for selected materials
+ **70 % shorter material development cycles** with unrestricted choice of the material supplier
+ Better after every print job – **„Machine learning“ with integrated database**

*Exclusive function for LASERTEC *SLM*



NEW
DUAL LASER SYSTEM

KNEE IMPLANT
Basic tibial plateau
Material: Titanium

DMQP
DMG MORI QUALIFIED PRODUCTS

POWDER CIRCUIT

Open, continuous, qualified:
Order additive manufacturing powder from the DMG MORI Online Shop.

+ **QUALIFIED**
  Compliance with all required QS standards, powder verification on a LASERTEC *SLM*
+ **DELIVERY**
  Within 3 days (EU-wide)
+ **READY-TO-USE**
  Delivery of material and process parameters

Simply order additive manufacturing powders at:
shop.dmgmori.com

DMG MORI ACADEMY

ADDITIVE INTELLIGENCE – IMPLEMENTATION OF ADDITIVE MANUFACTURING

CONSULTING › DESIGN › PRODUCTION › TRAINING

ADDITIVE MINDSET

HIGHLIGHTS

+ **Additive Manufacturing Quickcheck** for the identification of your specific additive manufacturing requirements
+ **Redesign of your components** for additive manufacturing
+ **Engineering and design** of new components and assemblies
+ **Simulation and topology optimization**
+ **Production of prototypes** and small batches of your components
+ **Courses and training** for management, design and manufacturing
+ **Consultation** for additive manufacturing strategies through to optimization of your additive manufacturing production

Dr. Rinje Brandis
Head of Additive Intelligence/Consulting
DMG MORI Academy

WE WILL SUPPORT YOU START OUT IN ADDITIVE MANUFACTURING

ORIGINAL SPINDLE SERVICE

REPAIRED BY DMG MORI WITH A WARRANTY AT THE FAIREST PRICE

No-one knows the heart of a machine as well as its manufacturer. We repair at the fairest price.

Dr. Christian Hoffart
Managing Director, DMG MORI Spare Parts GmbH

For the best price:
Phone: +49 8171 817 4440, spindle@dmgmori.com

HIGHLIGHTS

+ **Fair Price Guarantees** for spindle service
+ Over **2,000 spindles worldwide, immediately available!** More than 96 % stock availability
+ **New, or exchange spindle service within 24 hours;** alternatively, inexpensive spindle repair by the manufacturer within a few business days
+ Our spindle experts use manufacturer's know-how to swap or repair your spindle and **only use genuine spare parts**
+ DMG MORI solves your spindle problem quickly and honestly. **Repair by a third party often needs further work!**

36-MONTH WARRANTY ON ALL MASTER SPINDLES WITH UNLIMITED SPINDLE HOURS

+ **Technology partnership** is the basis of success
+ **Vacrodur** – the new material for spindle bearings
+ **Effective immediately** for all speedMASTER, powerMASTER, 5X torqueMASTER, compactMASTER and turnMASTER spindles on a new machine

SAVE THE DATE

+ **Open House, Bergamo / IT:** 13 – 16 May 2020
+ **Innovation Days Iga / JP:** 19 – 23 May 2020
+ **Open House Seebach / DE:** 16 – 19 June 2020
+ **Open House Tortona / IT:** 24 – 27 June 2020

Download our magazine:
magazin.dmgmori.com

LEGAL NOTICE: DMG MORI TECHNOLOGY EXCELLENCE _____ magazine for customers and interested parties. Publisher and responsible for content: DMG MORI Global Marketing GmbH, Walter-Gropius-Straße 7, D-80807 Munich, Germany, Tel.: +49 (0) 89 24 88 359 00, info@dmgmori.com
Circulation: 300,000 copies. Subject to technical changes, availability and prior sale.
Our general terms and conditions apply.

DMG MORI

P20190831_012DEN-OS