DMG MORI

TECHNOLOGY EXCELLENCE

NEW BUSINESS MODELS

PAYZR® by DMG MORI

PAY WITH ZERO RISK

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

DMG MORI *STORE*
powered by ADAMOS

DMGMORISTORE.COM

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DMG MORI *STORE*
powered by **ADAMOS**
DMGMORISTORE.COM

06 DMG MORI STORE

"APPs & More" applies for our new DMG MORI STORE powered by ADAMOS.

WITH PAYZR TO THE NETFLIX OF MANUFACTURING

Ladies and Gentlemen,
Dear customers, suppliers and partners,

we look back on challenging months. The world has changed within a very short time. A complete new mindset was called for; things had to become more digital and especially faster. In these times so demanding for all of us, DMG MORI emerged stronger and more resilient.

Our strategic fit of automation, digitization and sustainability is more suitable than ever – and fits perfectly into the new normal. We are realizing new and demanding technologies with courage, optimism and full of anticipation. To this end we have made DMG MORI more innovative, more digital and more powerful.

Everything integrated and sustainable from a single source – worldwide!
Our vision is to become the most attractive machine tool manufacturer worldwide with digital and sustainable products. It is our mission is to strengthen our customers in manufacuring and digitization. We rely on our TOP values: Trust, Openness and Passion.

DIGITAL ARCHITECTURE GREATLY DEVELOPED AND EXPANDED

This applies above all to our cooperation with you. We are convinced: with trusting partnerships, open dialog and our united passion for machines, technologies and processes we will successfully master the tasks ahead of us. Times are improving, positive signals getting louder. DMG MORI can feel the tailwind. Many of our talks with you, our customers, are marked by optimism and the determination to take new paths and make new discoveries. Because the times remain challenging. Everything stays different in the new and next normal of volatility, uncertainty and complexity.

All the more I am convinced: innovations are the only way out of the crisis. We intend to make you strong in manufacturing and digitization. For us that means leading you forward on the path into the future.

»

Christian Thönes
Chairman of the Executive Board
DMG MORI AKTIENGESELLSCHAFT

In my inaugural speech as Chairman of the Executive Board of DMG MORI AKTIENGESELLSCHAFT in 2016 I raised a provocative question: How can we transition to a modern platform-based business model in a manner comparable to Netflix or Spotify? How can DMG MORI become the "Netflix of mechanical engineering", the "Netflix of manufacturing"?

Today I pronounce proudly: DMG MORI starts with PAYZR into the world of the subscription economy.

With PAYZR, DMG MORI offers not only purchase, loan or leasing, but also all the benefits of data-based business models such as subscription and pay-per-use. With PAYZR, customers always get exactly what they need. And they only pay for what they actually use, with no investment risk, but with full price and cost transparency, maximum flexibility and utmost planning certainty. "**PAYZR – PAY with Zero Risk".** The name says it all and is our customer promise.

PAYZR includes all Software-as-a-Service offers from DMG MORI Digital on one hand – starting with cloud-based systems from WERKBLiQ, ISTOS and TULIP. And on the other hand we open up all the advantages of Equipment-as-a-Service with PAYZR. The business model celebrates its premiere with the 3-axis universal milling machine M1. And I can promise you: we will purposefully expand our PAYZR program for both Software-as-a-Service and Equipment-as-a-Service.

We will do this just as we developed and expanded our digital architecture enormously in the past. Thanks to "Architecture First" we are now in a position to offer our customers digital products, services and end-to-end processes from a single source. And only thanks to this consistent architecture I can today present to you two more digital innovations from DMG MORI.

Of particular relevance for this end-to-end process is the new **DMG MORI STORE powered by ADAMOS.** Customers receive access to the complete diversity of digital products and value-added services from DMG MORI as well as entry into the world of data-based PAYZR business models. Unique in this context is also the cross-system single-sign-on concept with its single registration for the DMG MORI STORE, *my* DMG MORI and selectable partner applications.

The benefits become apparent in combination with the customer portal *my* DMG MORI and WERKBLiQ. Applications acquired in the DMG MORI STORE can be assigned immediately to specific machines in the customer profile from *my* DMG MORI. In addition, customer master data can be transferred automatically to the service and maintenance platform by WERKBLiQ after an upgrade in the DMG MORI STORE.

Ladies and Gentlemen,
Dear customers, suppliers and partners,

Excellence and the ability to innovate is what sets DMG MORI apart. But at our core we remain a machine tool manufacturer. We work day-in, day-out to achieve higher productivity, increased precision and advantages – from integral quality in products and processes and through our worldwide services.

Equally important: mechatronics and digitization will only master the future if they are in unison. To conclude I would like to present the new **Cloud-based Offering** as an example. Different machine and system configurations can be compared in real-time and tailored perfectly to your own application. This means that the search for the individual ideal machine solution plus its selection and evaluation can for the first time be

With PAYZR, DMG MORI impressively underscores its status as a holistic pioneer for its customers. PAYZR stands for "PAY with Zero Risk" and marks the entry into the world of data-based business models "SUBSCRIPTION & ALL-IN".

displayed in a holistic customer journey. With the Cloud-based Offering the machine, automation, digitization and technology cycles merge with our DMG MORI Qualified Products to create an impressive total experience. The customer is guided through the entire configuration process and receives appropriate suggestions regarding the selected set-up and expedient expansions. In addition, customers have the opportunity to contact their DMG MORI experts during the configuration and together work out the customization of their solution.

Convince yourself: of PAYZR, of the DMG MORI STORE powered by ADAMOS and of Cloud-based Offering. The first of our machines from the DMG MORI portfolio are already available in a virtual version. I wish you a lot of fun configuring your new 3-axis M1 milling machine, the turn-mill machining center CLX 450 TC or your next 5-axis universal milling machine DMU 75 monoBLOCK.

Contact us!
Christian Thönes «

VISION

Our vision includes three key factors **Firstly:** Machine tools remain the core of our business. Digital, sustainable product solutions serve to meet the megatrends in production and make us a future-oriented partner for every customer. **Secondly:** We think and act globally – we already support more than 100,000 customers from 54 industries in 86 countries. **Thirdly:** We wish to be the most attractive company for our team, for future colleagues as well as for our customers. Attractiveness is multifaceted: Top products, first-class service, a modern corporate culture and much, much more.

MISSION

DMG MORI has always stood for maximum customer focus – it is our principal task to help our customers achieve the greatest possible success. DMG MORI can only achieve sustainable success if our customers remain sustainably efficient. In this context we concentrate on production and also focus to an ever greater extent on digitization – from the machine to the process chain and on through to open ecosystems including platform-based business models, such as Equipment-as-a-Service and Software-as-a-Service.

TOP VALUES

TRUST:
We take full responsibility for the realization of our aims. We believe in the strength of our trusting, team-oriented cooperation!

OPENNESS:
We live an open and diverse corporate culture, design our products to be open for third parties and strive for transparency!

PASSION:
We are highly motivated and pursue our aims with full force, determination and enthusiasm!

DMG MORI STORE
powered by ADAMOS

The Netflix of Manufacturing

DMG MORI is its customers' partner and a pioneer for the future of data-supported manufacturing and production technology. The DMG MORI STORE powered by ADAMOS starts immediately as a digital point-of-sale from DMG MORI for all new PAYZR offers in the area of equipment and software-as-a-service. In the marketplace developed jointly with the ADAMOS Alliance, users will find four products to start with: The 3-axis M1 milling machine as the first PAYZR offer in the Equipment-as-a-Service area and the Software-as-a-Service solutions from ISTOS (PLANNING & CONTROL), TULIP (no-code platform) and WERKBLiQ (cloud-based maintenance and service management).

+ **Digital point-of-sale:** central marketplace for all PAYZR offers in the area of equipment and software-as-a-service
+ **Single sign-on:** uniform registration for DMG MORI STORE, *my*DMG MORI and selected partner applications
+ **Central administration:** simple management of data, applications, licenses and users
+ **Shop-in-shop:** easy access to other partner applications of the ADAMOS ecosystem

NEW

Register now for free and test the powerful software solutions without risk with just a few clicks:
dmgmoristore.com

PAYZR® by DMG MORI

PAY WITH ZERO RISK

4 PRODUCTS TO START OFF THE DMG MORI STORE

	Planning	Preparation	Production	Monitoring	Service
EaaS			1 M1 by PAYZR		
SaaS	2 ISTOS		3 TULIP		4 WERKBLiQ

The entire spectrum of digital added value products now at: **dmgmoristore.com**

EQUIPMENT-AS-A-SERVICE (EaaS)

1 M1 by PAYZR

+ **Usage instead of ownership:** Maximum planning certainty, Flexibility plus price & cost transparency
+ **Speed up innovation cycles:** Avoid long-term investment expenses
+ **Flexible operating expenses:** Attractive usage-based hourly spindle fee plus basic monthly fee incl. all-round carefree package

DMG MORI M1 DESIGNED FOR YOUR PROFIT

ALREADY AVAILABLE IN THE STORE

SOFTWARE-AS-A-SERVICE (SaaS)

+ **Predictable monthly costs:** No high IT infrastructure and maintenance expenses
+ **Start now:** Highest security standards without local installation
+ **Continuous updates:** New features & improvements at no expense

2 ISTOS

USE CAPACITY EFFICIENTLY
PRODUCTION PLANNING & CONTROL optimized planning & control

3 TULIP

INCREASE TRANSPARENCY – REDUCE ERRORS
End-to-end and paperless production

4 WERKBLiQ

BOOST AVAILABILITY
Intelligent maintenance

CONNECTIVITY by DMG MORI

1 WHY CONNECTIVITY?

Data are the basis for the optimization of the shop floor through digitization. As a holistic partner DMG MORI makes these data available to you with Connectivity – not only for our current machines, but for your existing machines and third-party products as well.

2 WHAT DO YOU GET?

+ **Secured and standardized machine data interfaces**
  OPC UA, UMATI, MTConnect, MQTT
+ **Simple connection to existing systems, such as MES**
+ **17 machine signals directly via the IoT*connector***
  for new and existing machines built after 2013

17 MACHINE SIGNALS AS STANDARD

MACHINE DATA

1. Serial number of the machine
2. Operating hours
3. Machine on hours

MACHINE STATUS

4. Status signal light
5. Number of alarms
6. Messages, alarms & warnings
7. Control mode
8. Execution status of the machine

PRODUCTIVITY

9. Workpiece counter current
10. Workpiece counter total
11. Target number of workpieces
12. Current program runtime

PROCESS DATA

13. Spindle speed override
14. Rapid traverse override
15. Feed override
16. Active tool
17. Name of the current NC program

OTHER MACHINE SIGNALS

such as spindle speed, fill level of the coolant and others based on the actual machine configuration possible – please get in touch with us

③ YOUR PATH TO CONNECTIVITY
for your entire shop floor

CONNECTIVITY by DMG MORI

Free of charge as standard with the IoT*connector*

Upgradeable with **Digital Manufacturing Package**

Existing machines before 2013

Individual solution after individual case check

DMG MORI

New machines

Existing machines

SHOPFLOOR

THIRD-PARTY PRODUCTS

PERIPHERALS

WASHING
MEASURING
DEBURRING
etc.

- **New machines – 17 signals as standard**
  + Secure connectivity automatically free of charge as standard
- **Existing machines from 2013 – 17 signals**
  + Upgrade for 899 £ as part of the Digital Manufacturing Package carried out by our service technicians on-site on your premises
  + Please get in touch with your sales contact or the DMG MORI Professional Service
- **Existing machines before 2013, Third-party products & peripherals, at least 3 signals**
  + Minimum dataset available, other signals based on individual case check possible
  + Please get in touch with your sales contact or the DMG MORI Professional Service

YOUR CONTACT

Stephen Diekmann
Professional Services
professional-service@dmgmori-digital.com

DIGITAL MANUFACTURING PACKAGE

YOUR "MUST HAVE" FOR THE DIGITAL FUTURE

4 PRODUCTS – ONE PACKAGE – ONE PRICE

CONNECTIVITY by DMG MORI

1 SECURE CONNECTIVITY

- **Simple digitization**
  Your existing machines
- **Highest security standards**
  thanks to modern security architecture and regular security **updates**
- **Secured, standardized machine data interfaces**
  (OPC UA, MTConnect, MQTT, UMATI)

WINNER BI BEST OF INDUSTRY AWARD

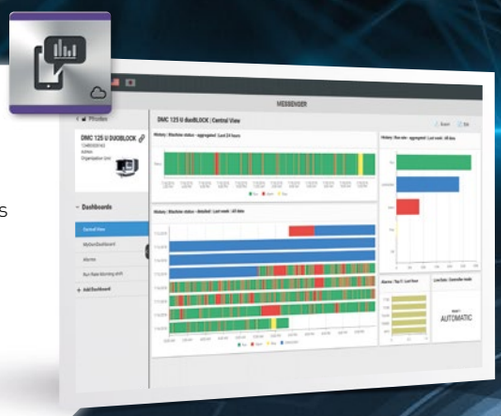
BEST OF INDUSTRY AWARD 2020 – Industry 4.0 category

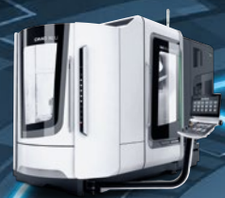
Package offer

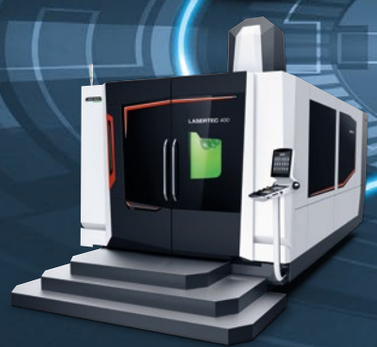
only 899 £

2 MESSENGER

- **Current status** Always keeping an eye on your machines
- **Continuous machine monitoring** with status display, status history and machine logbook
- Detailed **evaluations** of your machine utilization
- **Reduction** of downtimes thanks to automatic notification in the case of unplanned downtimes







GOVERNMENT FUNDING FOR DIGITIZATION PROJECTS

PLEASE GET IN TOUCH WITH US!

UPGRADE NOW!
YOUR CONTACT

Dr. Marco Husmann
Division Head Digital & Technical Service
marco.husmann@dmgmori.com

③ CELOS V6 Update

+ **Latest CELOS version V6** for your existing machine
+ **Added value** through openness for external connections
+ **New APPs** such as APPLICATION CONNECTOR (CONNECTION TO YOUR OWN ERP SYSTEMS), TULIP Player or JOB MANAGER

④ NET*service* + *my* DMG MORI

+ **REMOTE Service** and **multi-user sessions for faster troubleshooting** with NET*service*
+ **Over 60 %** of all problems can be solved remotely
+ Top class **fast digital service.**
+ ***my* DMG MORI** always ready on your PC, smartphone and on the shop floor
+ **Over 25,000 customers** already benefit from maximum process efficiency & transparency in *my* DMG MORI

umati
OPC UA MQTT
MTconnect

More information can be found online. Make use of the chance to get your DMG MORI existing machines fit for the future:
d-m-p.dmgmori.com

DMG MORI STORE
powered by ADAMOS

PAYZR® by DMG MORI

PAY WITH ZERO RISK
EQUIPMENT-AS-A-SERVICE

"SUBSCRIPTION & ALL-IN"
INSTEAD OF INVESTMENT & PURCHASE

As a holistic pioneer of digitization, DMG MORI now opens up the world of data-based business models for its customers with PAYZR, based on subscription and pay-per-use. In this Technology Excellence Interview Christian Thönes, Chairman of the Board of DMG MORI AKTIENGESELLSCHAFT and Asef Duratovic, Head of Subscription at DMG MORI Digital, describe the basic aspects of the new As-a-Service models for software and machines as well as special features of the Equipment-as-a-Service offer for the new 3-axis M1 milling machine.

So-called As-a-Service offers are considered the business models of the future – at DMG MORI as well. Why now?

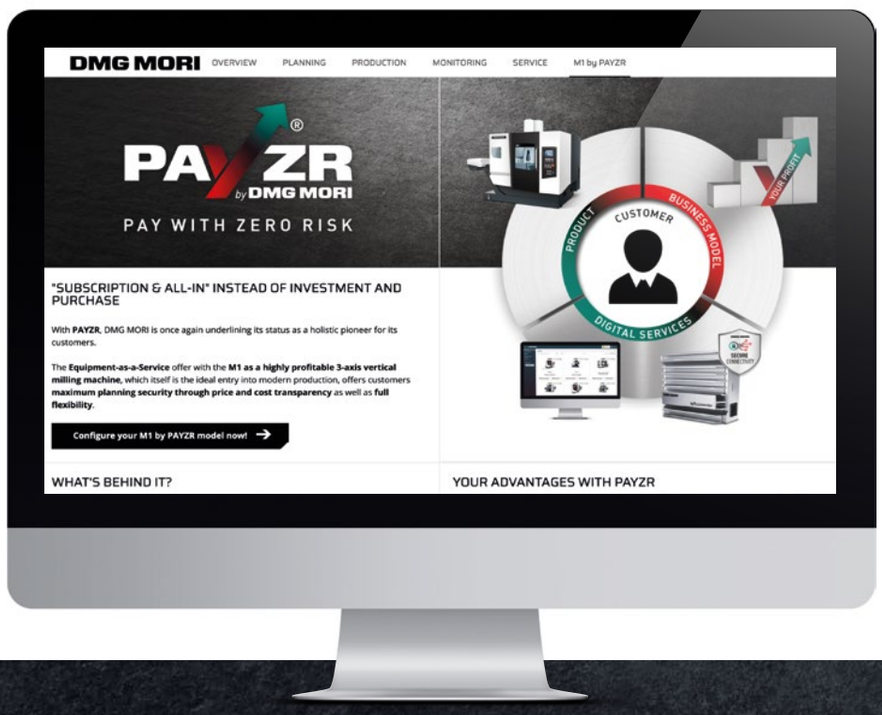
Asef Duratovic: Two aspects must be mentioned here. Firstly, the recent past has shown clearly just how important the attribute resilience is for companies. And this is exactly where PAYZR can make a decisive contribution in helping customers with their strategic orientation. There is no investment risk and no long-term capital tied up, but instead maximum planning certainty thanks to price and cost transparency and complete flexibility.

And secondly?

Christian Thönes: Secondly, as a global one company we have invested an enormous amount of time and money here and put our heart and soul into it. Most especially DMG MORI has pushed ahead the development and expansion of its digital architecture enormously and boosted the overall clout with "Architecture First".

Architecture First?

Christian Thönes: "Architecture First" describes the solid basis of our digital end-to-end solutions from a single source – always flexibly



DMG MORI STORE
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networked from the work area through to digital ecosystems. The functionality extends from the connectivity of machines via the IoT-*connector*, with which current information on program status, performance and quality can be communicated securely in real time, and on to interfaces in the leading IIoT platforms and to the new customer portal *my*DMG MORI. PAYZR now brings together this end-to-end holistic approach in the hotspot of data-driven business models. In this way we create exactly the innovative freedom that customers need to design their digital transformation with planning certainty and so respond adequately to the challenges posed by the new normal.

Asef Duratovic: The area Equipment-as-a-Service also reflects the holistic approach in particular in the interaction of DMG MORI Finance as the investor in the machine, DMG MORI Digital as 360° digitization and service partner and ADAMOS as the integration platform and secure data room for the new DMG MORI STORE, our digital point of sale for all PAYZR offers.

What products are available for customers in the DMG MORI STORE?

Christian Thönes: Where Software-as-a-Service is concerned we currently offer our customers cloud-based products from the manufacturer-independent service and maintenance platform WERKBLiQ, from ISTOS in the field of PLANNING & CONTROL plus the manufacturing platform of our partner TULIP. In the area of Equipment-as-a-Service we are focusing initially on our offer for the 3-axis M1 milling machine. The general approach with PAYZR is that we will expand our range of services for customers continuously in the coming months and years.

HYBRID MODEL – SUBSCRIPTION AND PAY-PER-USE

What can customers understand specifically by the term Equipment-as-a-Service?

Asef Duratovic: In the case of Equipment-as-a-Service, we make the M1 available to our customers as a service, which is billed flexibly based on use. One difference to the normal Software-as-a-Service offers is the hybrid billing model.

Hybrid billing model?

Christian Thönes: Hybrid because we chose a combination of subscription and pay-per-use to get started. Our customers pay a monthly fee, which depends on the configuration and the duration of the contract, and includes an all-round carefree package. These include, for example, packaging and transport, commissioning, training, all service and maintenance costs as well as a machine crash and loss of earnings insurance. All that remains to be paid is the usage-based fee per spindle hour used.

»

"Loss of earnings insurance" sounds interesting ...

Asef Duratovic: Loss of earnings insurance means: If the M1 is temporarily out of operation, completely or partially, due to insured damage, so that the customer is not able to use the machine, the financial loss of interruption will be compensated. What is also interesting is that the all-round carefree package does not include any obligation to use the minimum number of spindle hours.

YOUR CONTACT

Mr. Asef Duratovic
Head of Subscription
asef.duratovic@dmgmori-digital.com

What contract duration options are there?

Christian Thönes: We offer terms of 12, 24 and 36 months, which can be extended by 12 months respectively. The short contracts offer our customers a high level of flexibility and especially complete freedom in always using the best and most innovative technology. Flexibility and freedom also apply to the end of the contract. If the contract is not extended, the customer can either purchase or return the machine.

And what do customers actually pay for the M1?

Asef Duratovic: The monthly subscription fee for a 36-month contract for the M1 amounts to just € 599.00 plus a fee of € 5.99 per spindle hour (≈ 517 £ // ≈ 5.17 £).

What sounds attractive can quickly become too expensive with high usage rates, can't it?

Christian Thönes: No, not with the integrated expenditure cap! This ensures quite literally that no PAYZR user is charged excessively for their machine. In practice the customer has a special right of cancellation, whereby the machine can become his property if a defined cap is reached!

So until then the machine in fact remains the property of DMG MORI?

Asef Duratovic: Yes, strictly speaking DMG MORI Finance is the owner. But it all remains in the family, an additional boost to the trust of customers in the PAYZR model. We as the organization then take care of all other services – from delivery of the machine to the 360-degree service and on to include the acquisition of usage data for billing.

All that remains is how customers get their M1 with PAYZR.

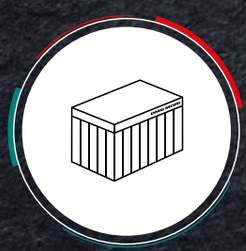
Christian Thönes: Quite simple! The customer only has to register for it in the DMG MORI STORE once. They open the configurator there, select for example the M1 complete for 36 months as the new milling machine and if required adds individual options. All that needs to be done after that is finalize the order in the shopping cart and carry out the obligatory credit and identity check. After that: Enjoy milling.

Its sounds as if PAYZR could become DMG MORI's predominant business model in its external relationship with customers?

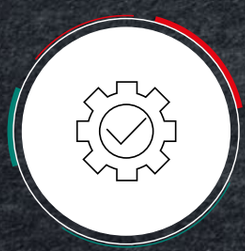
Asef Duratovic: We are convinced of that, if nothing else by virtue of PAYZR being a unique

10 ADDED VALUES IN YOUR ALL-ROUND CAREFREE PACKAGE – ALWAYS ALL-INCLUSIVE

1. TRANSPORT
The transport to you is included.



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



3. SETUP & COMMISSIONING
Setup and commissioning are included, of course!

4. TRAINING
We take over the training of an employee!

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

solution for customers that offers planning certainty through price and cost transparency as well as complete flexibility. It also gives customers the chance to always utilise the latest technology, instead of watching a purchased machine slowly lose its value and competitiveness.

Despite all the indisputable benefits, the change in the mindset of customers from ownership to usage is not going to happen overnight, so we will continue to offer the purchase of the machine as well as offering financing or leasing.

«

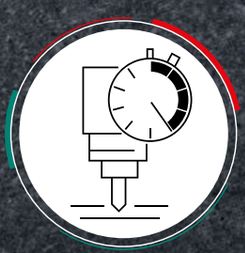
PAYZR® by DMG MORI

PAY WITH ZERO RISK

YOUR BENEFITS WITH PAYZR

+ **Maximum planning certainty thanks to price and cost transparency** plus **complete flexibility**
+ **Full financial flexibility –** No investment risk, no down payment, no obligation to use the minimum number of spindle hours
+ **Flexible monthly operating expenditure** (OPEX) instead of long-term investment and capital tied up in assets (CAPEX)!
+ **Flexibility and freedom of choice** in selecting the duration of the contract as well as what happens when it expires
+ **Needs-based configuration** and **digital order process**
+ **10 added values in the all-round carefree package – always all-inclusive**
+ In ***my*DMG MORI** Web/App monitor **machine status and usage at all times**

6. PROTECTION
An all-round machine crash insurance and loss of earnings insurance are also part of the package!



7. FREEDOM OF USE
No obligation for minimum usage of spindle hours!

8. FLEXIBILITY
No long contract terms and freedom of choice at the end of the contract.

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

10. EXPENDITURE CAP
You can take over ownership of the machine after reaching a defined maximum amount (cap)!

THE FLEXIBLE AND DIGITAL ALTERNATIVE FOR YOUR MACHINES

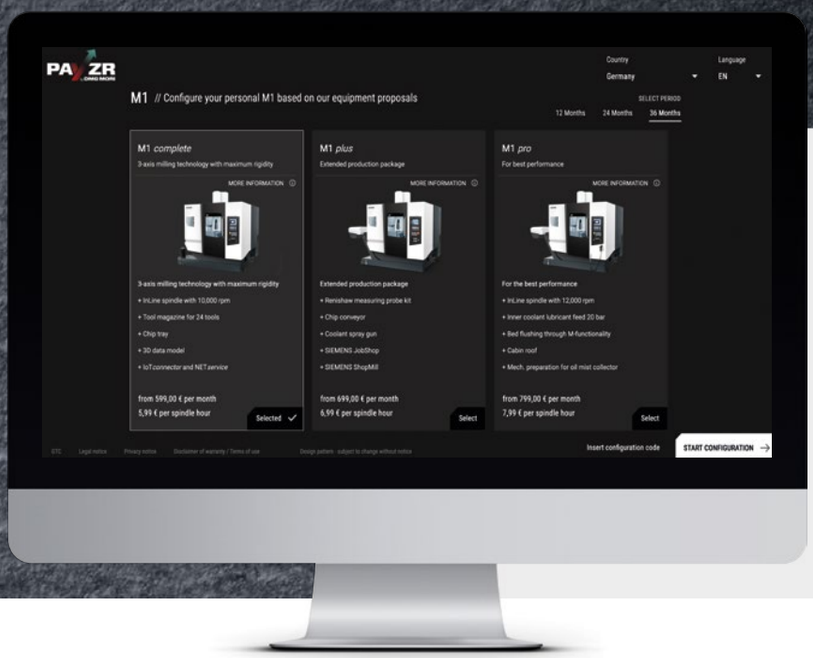
IoT*connector* as standard

+ Secured, standardized machine data interfaces (OPC UA, MTConnect, MQTT, UMATI)
+ Secure network integration and operation using firewalls and virus scanners
+ Regular security and function updates through DMG MORI Device Management

HYBRID MODEL – SUBSCRIPTION AND PAY-PER-USE – WHAT'S BEHIND IT?

+ **Attractive usage-based fee** from € 5.99 (≈ 5.17 £*) per spindle hour
+ **Low basic monthly fee** from € 599 (≈ 517 £*) **incl. all-round carefree package!**
+ **Flexible choice of contract duration** between 12, 24 and 36 months – can be extended by 12 months at any time
+ **Cap on expenditure** on reaching a defined capped amount and possibility of acquiring the machine
+ **Complete freedom of choice at the end of the contract** – return of the machine**, purchase of the machine or contract extension by 12 months

* The billing and invoice is in EURO // Based on Exchangerate 1.16 € ≈ 1 £
** One-off costs for packaging, transport and dismantling when the contract expires



CLOUD-BASED OFFERING

Start now with the configuration of your M1 with PAYZR!

SIMPLE – QUICK – EASY!

Design your PAYZR model with the online configurator:
payzr.dmgmori.com/m1

PAYZR AND M1 – YOUR SUCCESS PACKAGE

All PAYZR packages relating to the highly profitable M1 can be expanded individually!

M1 **complete**

+ SIEMENS 828D control
+ Inline spindle 10,000 rpm
+ SK 40 tool holder
+ Automatic tool changer (24 pockets)
+ Swarf tray
+ IoT*connector* & NET*service*
+ 3D data model

€ 5.99 (≈ 5.17 £*)
per spindle hour
basic fee € 599 (≈ 517 £*) a month***

M1 **plus**

In addition to complete:

+ Chip conveyor
+ Renishaw measuring probe kit
+ Coolant spray pistol
+ JobShop package

€ 6.99 (≈ 6.03 £*)
per spindle hour
basic fee € 699 (≈ 603 £*) a month***

M1 **pro**

In addition to plus:

+ Inline spindle 12,000 rpm
+ ICS 20 bar
+ Bed flushing through M function
+ Cabin roof
+ Mech. preparation for oil mist separators

€ 7.99 (≈ 6.89 £*)
per spindle hour
basic fee € 799 (≈ 689 £*) a month***

*** Examples for a 36-month contract

JUST A FEW STEPS TO YOUR M1 WITH PAYZR!
SIMPLE – QUICK – EASY!

3 ENTRY OPTIONS: my DMG MORI, DMG MORI STORE, DMG MORI WEBSITE

1 → 2 → 3

1a DIRECTLY VIA *my* DMG MORI

In your customer portal *my* DMG MORI you can simply use the link to go directly to the DMG MORI STORE:
mydmgmori.com

→ Single-Sign-On directly with your *my* DMG MORI access to the DMG MORI STORE.

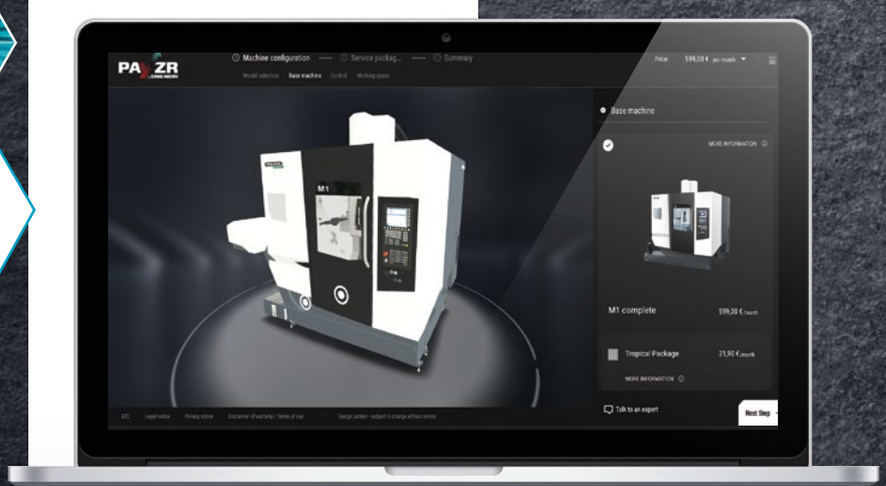
DMG MORI STORE
powered by **ADAMOS**
DMGMORISTORE.COM

1b DMG MORI STORE
1c DMG MORI WEBSITE

View all information about PAYZR transparently in the DMG MORI STORE and on the DMG MORI website and access the configuration of your M1 easily from several places:
dmgmoristore.com
dmgmori.com

CONFIGURATION & ORDER

Select your M1 package and the contract duration, add the individual options and accessories you need! Then finalize the order in the shopping cart of the DMG MORI STORE.



CLOUD-BASED OFFERING
Design your PAYZR model with the online configurator:
payzr.dmgmori.com/m1

CREDIT & IDENTITY CHECK

Fill in the online self-disclosure for the credit check and after a positive response start your online identity check and then finally sign your contract.

PAYZR by DMG MORI

PAY WITH ZERO RISK

4

DELIVERY DATE COORDINATION

Our local DMG MORI Sales and Service company will contact you to arrange your personal delivery date with you!

5

DELIVERY, INSTALLATION & CONNECTIVITY

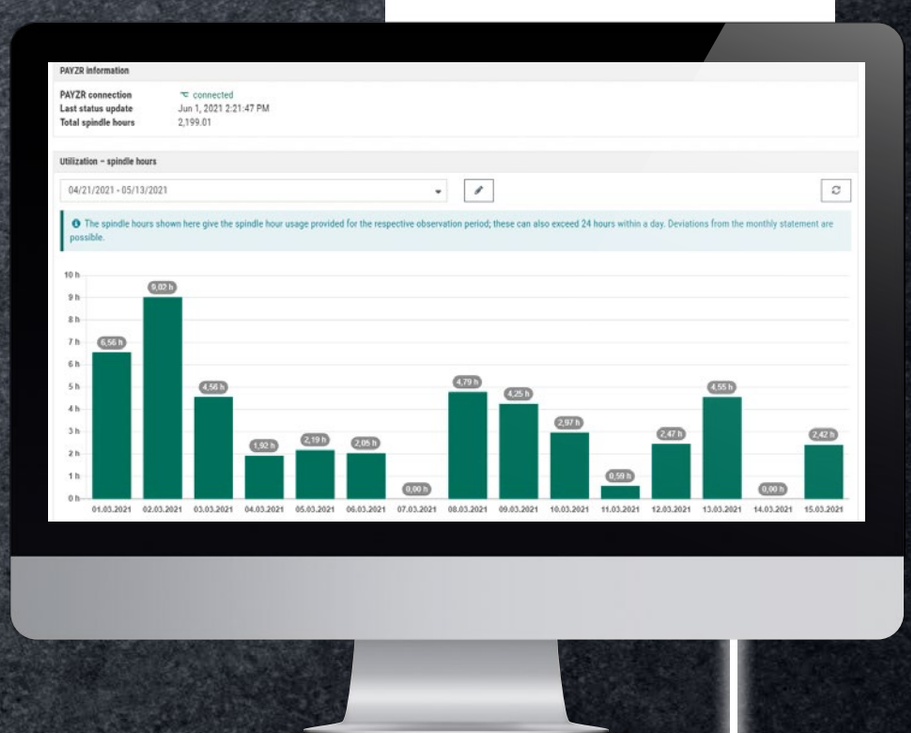
We deliver your M1, install it, commission it and connect you to *my* DMG MORI!

6

my DMG MORI

You have complete transparency over your machine status and its usage in your customer portal *my* DMG MORI!

Simple overview of your machine status and the hourly spindle usage in *my* DMG MORI.



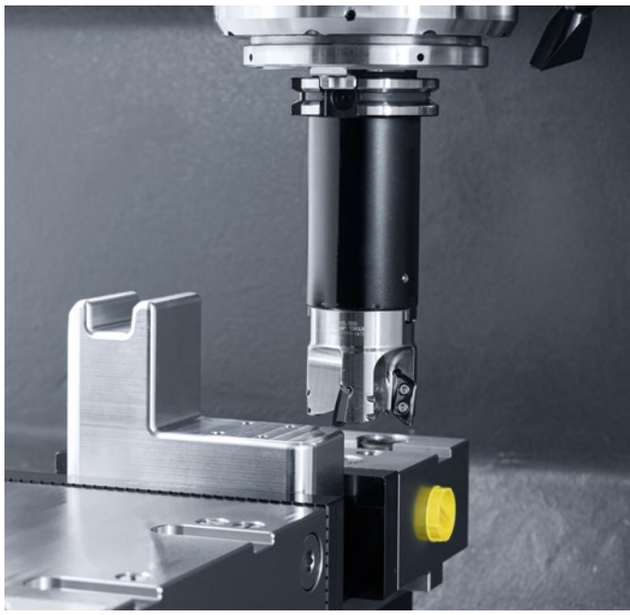
BILLING & SUBSCRIPTION MANAGEMENT

In the DMG MORI STORE you have complete transparency regarding your expenditures and can manage ALL YOUR APPs and services.

DMG MORI STORE
powered by ADAMOS

7

MS Ultraschall Technologie acquired four M1 machines within just a few months to boost the percentage of in-house production.



MS Ultraschall Technologie equipped all four M1 machines with the same tools so it could place orders flexibly and minimize setup times.

M1 – COMPACT, PRECISE AND HIGHLY PROFITABLE

For four decades the company MS Ultraschall Technologie GmbH, which was founded in 1965 as Maschinenfabrik Spaichingen at that time, has been developing machines for ULTRASONIC welding of plastics and textiles. Door panels and center consoles for the automotive industry are produced with this technology as well as products for the packaging industry and medical sector. Even the textile industry, where MS Ultraschall Technologie has its roots, uses ULTRASONIC welding. The company employs around 500 people in Spaichingen and another 300 at its locations in the USA, Brazil and China. Well-trained and experienced engineers ensure the high quality demanded by its customers. MS Ultraschall Technologie achieves an extremely high percentage of in-house production using over 30 CNC machine tools from DMG MORI. This year saw four M1 machine tools put into operation in addition to machining centers from the CMX U, DMU and DMU eVo *linear* series and CTX beta TC turning centers. With the favorably-priced, compact machining center MS Ultraschall continues its strategy of recent years: To drastically increase the percentage of in-house production.

90 % vertical integration thanks to machines from DMG MORI

"Vertical integration of 90 percent makes us extremely flexible and enables us to consistently deliver our machines on time," is the reason Sascha Medenica, Production Manager at MS Ultraschall Technologie, gives for the regular investment in production. It also means we can control quality ourselves. MS Ultraschall Technologie regards itself as a provider of complete ULTRASONIC welding solutions – from development to production and on to service. Its business often involves individual customer solutions, which are addressed by experienced personnel and junior staff trained in-house by the company. They operate an ultra-modern fleet of machines, which MS Ultraschall Technologie expands continuously in order to boost capacity and machining possibilities.

"It does not matter what we need, we always find the right machine at DMG MORI." A CTX beta 2000 TC, DMU 95 monoBLOCK and four M1 machines are among the latest acquisitions. The new, compact machining center from DMG MORI is a perfect example of increasing the percentage of in-house production, as Sascha Medenica explains: "We machine simple moldings that we have previously purchased on the 3-axis models for fixturing customers' workpieces." This almost always involves a batch size of 1. "We can plan orders with short and long runs in such a way that one person can operate all four machines."

ONE OPERATOR FOR FOUR M1 MACHINE TOOLS

Proven components and over 3,700 kg of castings for maximum stability

Machining on the four M1 machines is extremely standardized, as Dominik Mattes, group leader CAD/CAM, explains: "The 24 tool pockets are loaded identically. NC programs are created centrally and transmitted to the machines via the network." So there is practically no setup time. Travels of 550 × 550 × 510 mm and a table load of 600 kg are also more than enough for producing a wide range of parts, from plastic through to titanium. Where technology is concerned »

We were so impressed by the first M1 that we immediately purchased another three.

Sascha Medenica
Production Manager
MS Ultraschall Technologie GmbH

M1 – THE NEW MASTER CLASS FOR EVERY SHOP FLOOR

+ Machine bed in monolithic design for high static and dynamic rigidity as well as optimal damping characteristics
+ Rigid 850 × 650 mm table with 600 kg load capacity
+ The DMG MORI inline spindle – more than 3,000 units installed worldwide!
+ SIEMENS 828D high-performance control
+ Digitization with the IoT*connector* as standard!
+ NET*service* and 3D data model as standard!

550 × 550 × 510 mm WORK AREA IN A FOOTPRINT OF **< 6 m²**

Inline spindle with hydraulic clamping as standard!

NEW: 4th axis available as an option

3 PERFECTLY COORDINATED PACKAGES – INDIVIDUALLY EXPANDABLE

COMPLETE **SPECIFICATION**

+ SIEMENS 828D control
+ Inline spindle 10,000 rpm
+ SK 40 tool holder
+ Automatic tool changer (24 pockets)
+ Swarf tray
+ IoT*connector* & NET*service*
+ 3D data model

from 40,000 £

PLUS **SPECIFICATION**

In addition to COMPLETE:

+ Chip conveyor
+ Renishaw measurement probe
+ Coolant spray pistol
+ JobShop package

from 44,000 £

PRO **SPECIFICATION**

In addition to PLUS:

+ Inline spindle 12,000 rpm
+ ICS 20 bar
+ Bed flushing through M function
+ Cabin roof
+ Mechanical preparation for oil mist separators

from 48,000 £

The M1 is extremely profitable when seen in relation to the footprint of < 6 m² per machine.

Dominik Mattes
Group leader CAD/CAM
MS Ultraschall Technologie GmbH

the M1 is state-of-the -art: "The 10,000 rpm spindle is absolutely proven, there is a modern SIEMENS control on board and the IoT connector means the machine is ready for digitization." The M1 is also impressive with regard to stability and rigidity thanks to cast machine components weighing over 3,700 kg.

Highly productive in a footprint of < 6 m²

After just a few weeks, Sascha Medenica is more than satisfied with the high level of utilization of the space-saving models: "The M1 machines are extremely profitable when seen in relation to the footprint of < 6 m² per machine and our personnel deployment."

M1 – Seen, purchased, convinced and follow-up purchases

The fact that Ultraschall installed four M1 machines was in response to a tour of the FAMOT factory in Poland. The machine, which was launched at the beginning of the year, is produced there. "There was in fact a different reason for our visit, but we saw the M1 and realized straight away what significance it could have for our production and decided to purchase the display model. And so it was that MS Ultraschall became the first company to buy an M1.

"The new addition to our shop floor was so convincing that we immediately purchased another three M1s."

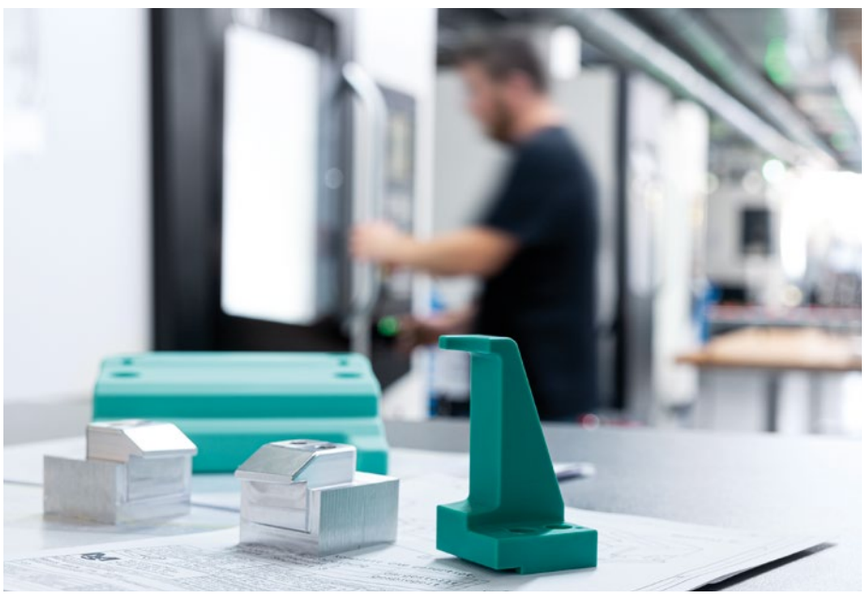
Although MS Ultraschall uses modern, high-tech machines for demanding applications, Sascha Medenica is quite sure that simple machine concepts also guarantee the necessary productivity. "They are an especially economical alternative in production."

TULIP – Error-free loading of automation solutions

Investments in production are often driven by modern innovations – both where the machine is concerned as well as in the field of software. Read on page 34 how MS Ultraschall uses TULIP on the machine and for work preparation on an automated DMU 50 3rd Generation, among others.

«

→ *Continue to page 34*



Ultraschall Technologie produces simple moldings for workholding in the ULTRASONIC welding systems. They are made of plastic and titanium, among other materials.

MS ULTRASCHALL TECHNOLOGY FACTS

+ Founded in Spaichingen in 1965
+ 800 employees worldwide
+ Development and production of machines for the ULTRASONIC welding of plastics and textiles.
+ Supplier for the automotive, packaging, medical and textile industries, among others

ULTRASONIC TECHNOLOGY GROUP

MS Ultraschall Technologie GmbH
Karlstraße 8 – 20
78549 Spaichingen, Germany
www.ms-ultraschall.de

ONLINE CONFIGURATION
IN JUST A FEW CLICKS TO YOUR MACHINE

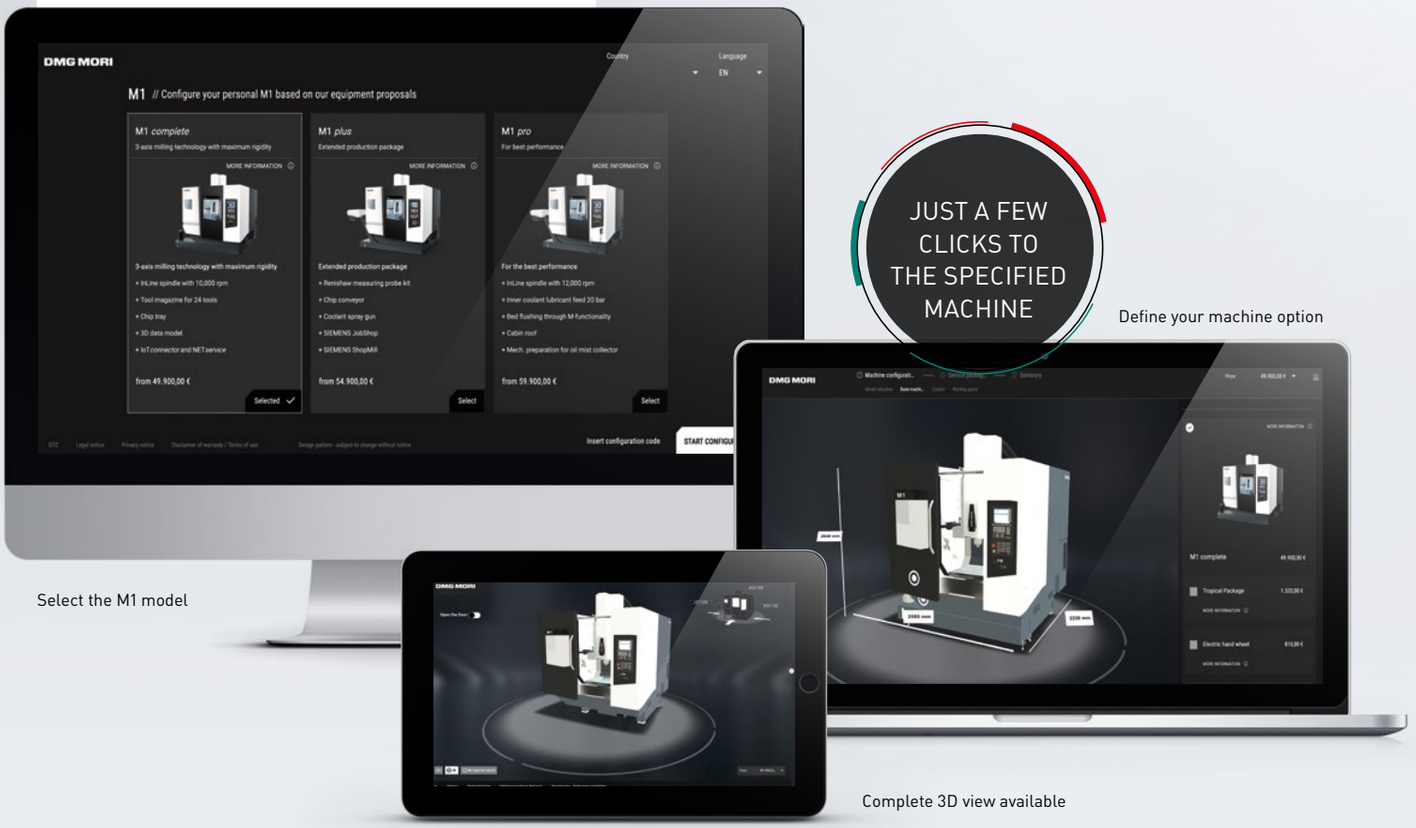
ORDER DIRECTLY ONLINE

Would you like to configure your machine yourself?
The brand new DMG MORI machine configurator offers you the perfect opportunity! Simple, intuitive and clearly structured, it is easy to adapt a machine to your individual requirements. Anytime, from anywhere! Get started now via dmgmori.com!

ALREADY AVAILABLE VIA DMGMORI.COM

+ CLX 450 TC
+ SPRINT 20|5 & SPRINT 32|8
+ M1
+ DMU 50 3rd Generation
+ DMU 75 monoBLOCK

Access the configurator via your desktop PC or tablet directly via the product page, e. g.: **M1.dmgmori.com** or via **dmgmori.com**



Select the M1 model

JUST A FEW CLICKS TO THE SPECIFIED MACHINE

Define your machine option

Complete 3D view available

USE INSTEAD OF OWN
YOU CAN GET THE M1 BY PAYZR IN OUR DMG MORI STORE:

DMG MORI STORE
powered by ADAMOS
DMGMORISTORE.COM

PRODUCTION PLANNING & CONTROL

PLANNING – FEEDBACK – VISUALIZATION

EXCEL is a thing of the past: PRODUCTION PLANNING & CONTROL ISTOS GmbH, a subsidiary of DMG MORI, consists of three coordinated applications: PLANNING BOARD, PRODUCTION FEEDBACK and PRODUCTION COCKPIT. Available immediately in the cloud, it enables simple entry into optimized PRODUCTION PLANNING and CONTROL.

+ **Simply replace EXCEL and paper** – digital planning in about a week
+ **Improved utilization –** by up to 25 %
+ **Reduced planning effort –** by up to 80 %
+ **Can be used immediately & maintenance-free –** for the entire shop floor

TEST FREE OF CHARGE FOR 30 DAYS

> 100 CUSTOMERS IN THE FIRST YEAR

DMG MORI *STORE*
powered by **ADAMOS**
DMGMORISTORE.COM

② PRODUCTION COCKPIT

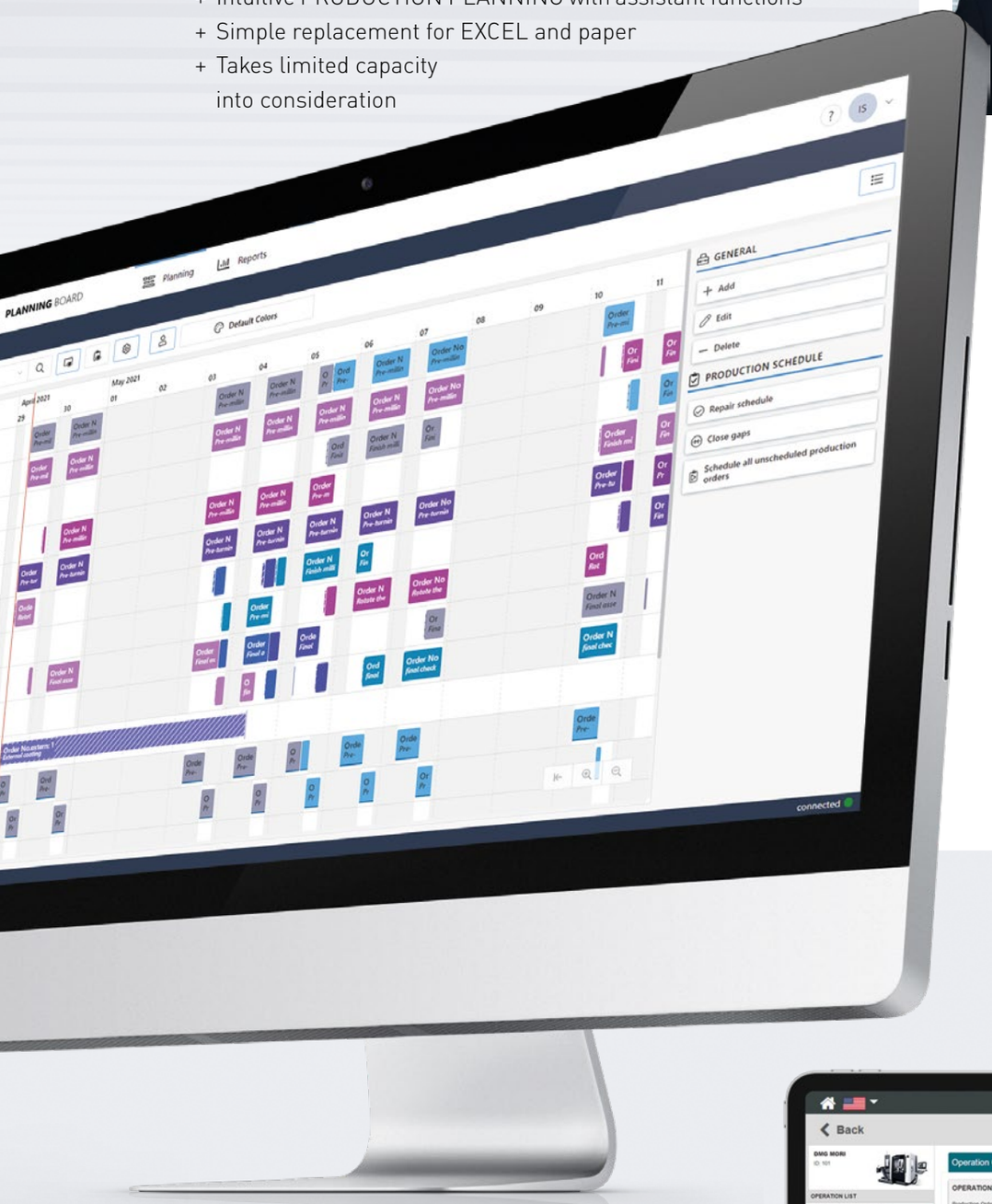
Production information at a glance

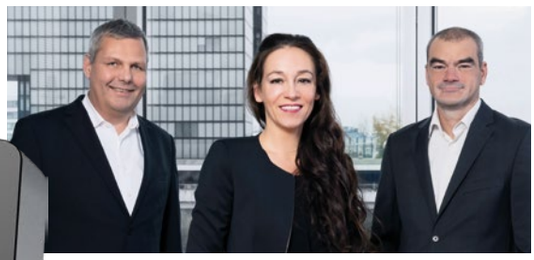
+ Dashboard for the current status of production
+ Individually configurable personal displays
+ Displays for planners, operators & management

① PLANNING BOARD

Manual planning board

+ Intuitive PRODUCTION PLANNING with assistant functions
+ Simple replacement for EXCEL and paper
+ Takes limited capacity into consideration





from left to right:
Christian Methe, *Managing Director*
christian.methe@ISTOS.com

Nadine Martin, *Director Business & Communication*
nadine.martin@ISTOS.com

Alexander Holzner, *Technical Director*
alexander.holzner@ISTOS.com

ISTOS
ENABLER OF SMES

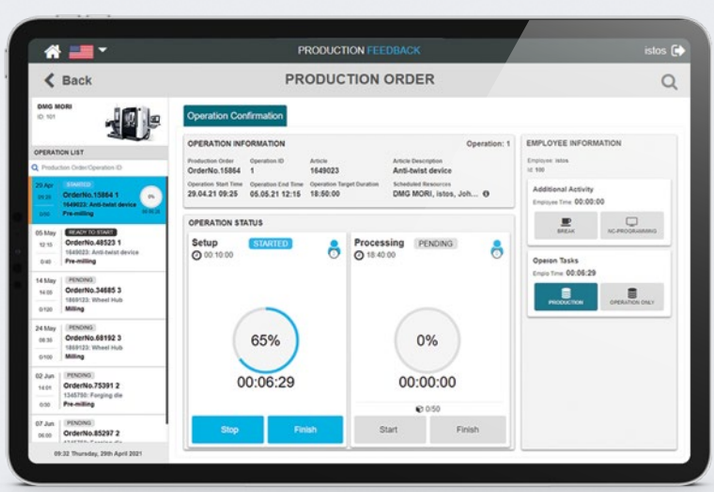
ISTOS GmbH, a digital DMG MORI start-up, develops applications for small and medium-sized manufacturing companies. The target is optimized PRODUCTION PLANNING and CONTROL.

+ DMG MORI digital start-up
+ Focus: PRODUCTION PLANNING and CONTROL
+ Established: 2017
+ 70-strong team
+ Headquarters in Düsseldorf

③ PRODUCTION FEEDBACK

Real-time feedback from production

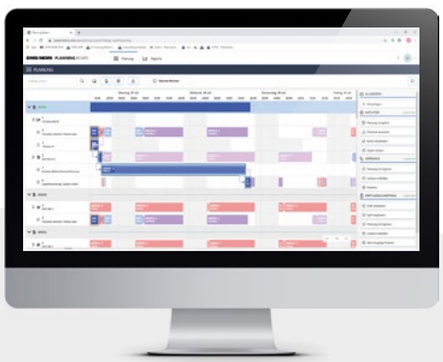
+ Directly linked to the PLANNING BOARD.
+ Short response times to changes
+ Track primary and secondary processing times



Thanks to PRODUCTION PLANNING & CONTROL we have increased utilization by 25 %.

Carmelo Bonanno
Managing Director
frabona – industrielle Fertigung von Metallwaren GmbH

Benefits for frabona: **1.** Exact determination of lead times **2.** Full transparency of capacity
3. Networking of planning and feedback from production **4.** Consideration of all dependencies & changes



FREE WEBINARS

PRODUCTION PLANNING & CONTROL

In the free webinars you will find out how cloud-based applications from PRODUCTION PLANNING & CONTROL always keep your PRODUCTION PLANNING up to date. Immediately available, maintenance free and without training.

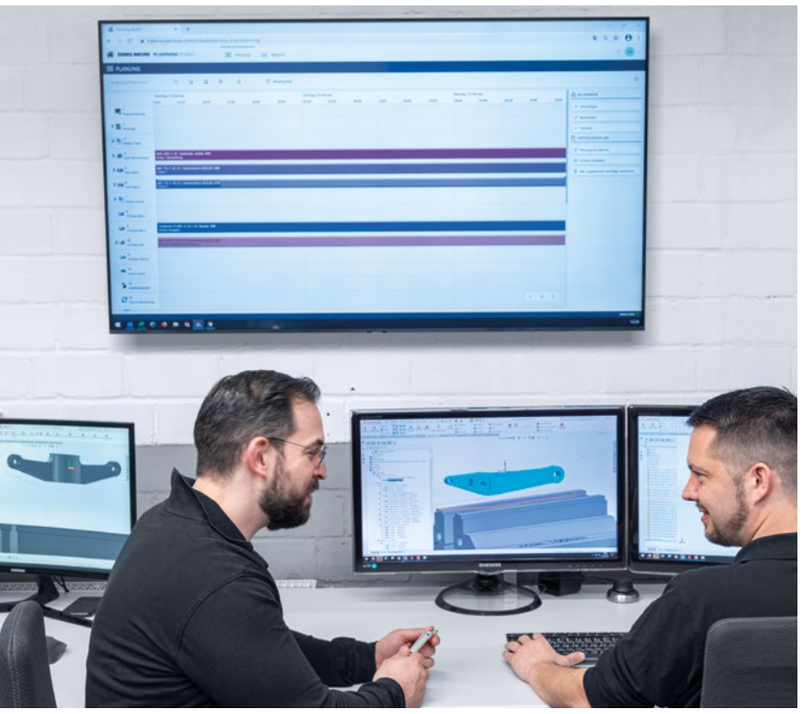
You can go to the free webinars here:
www.ISTOS.com/de/webinare

OPTIMUM CONTROL OF UTILIZATION

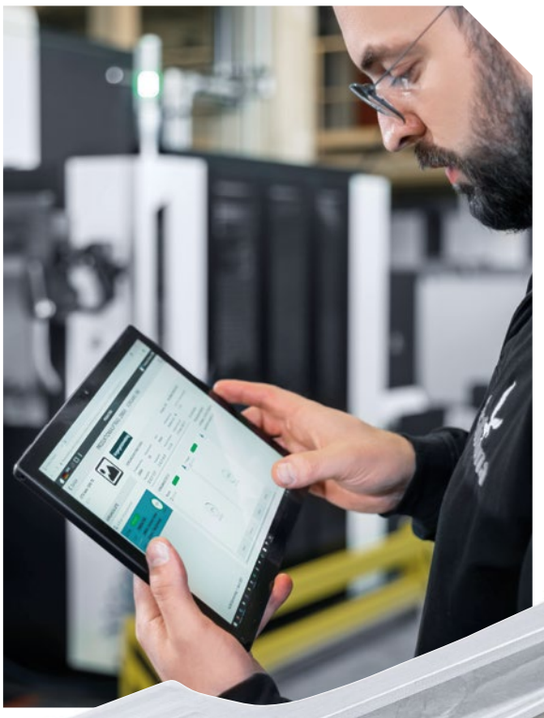
For more than 30 years, frabona GmbH from Frankfurt am Main has been producing sophisticated workpieces, complex assemblies and aluminum profiles for the automotive, aerospace, mechanical engineering and optical industries. frabona has trusted in CNC technology from DMG MORI since as far back as 2012. In addition, frabona relies on PRODUCTION PLANNING & CONTROL from ISTOS, a DMG MORI subsidiary, for consistent digitization of its processes.

Thanks to well-filled order books, frabona is in a position to utilize production capacity on a three-shift basis. "Our daily business demands a high level of flexibility to respond quickly to incoming orders" explains Carmelo Bonanno. So optimum control and high capacity utilization were therefore the main motivations to invest in digitized processes. Second-generation Carmelo Bonanno has managed the company together with his brother Francesco Bonanno since 2013. Until recently, frabona had used EXCEL and paper for its order planning. This made it impossible to respond to enquiries with reliable delivery times at short notice," recalls Francesco Bonanno. "That is why reliable and continuously updated PRODUCTION PLANNING is so important."

DIGITAL PLANNING AFTER JUST ONE WEEK



With PRODUCTION PLANNING & CONTROL, frabona can manage its complete planning without EXCEL and paper.



PRODUCTION PLANNING & CONTROL is a cloud-based solution that can be operated on all devices.

frabona produces sophisticated, high-precision components and complex assemblies.

Fast entry thanks to cloud-based applications

frabona found a solution from DMG MORI that covered all the functions they needed for the planning and control of their orders. PRODUCTION PLANNING & CONTROL consists of three coordinated products: PLANNING BOARD, PRODUCTION FEEDBACK and PRODUCTION COCKPIT. The applications are available immediately in the cloud, enabling simple entry. "Our first plan was ready after just one week", says Francesco Bonanno.

CAN BE USED IMMEDIATELY & MAINTENANCE-FREE

Carmelo Bonanno was immediately impressed by the intuitive operation of the PLANNING BOARD: "We can see at a glance which orders need processing and can prioritize these as required." The connection between PLANNING BOARD and PRODUCTION FEEDBACK makes planning especially reliable. "With PRODUCTION FEEDBACK we can report the status of production orders directly from the machine back to PLANNING BOARD." As a third tool in the bundle, PRODUCTION COCKPIT provides a comprehensive overview of the status quo. "PRODUCTION COCKPIT can be adapted individually", explains Francesco Bonanno.

25 percent higher utilization

Planning with PRODUCTION PLANNING & CONTROL currently includes 16 machines and work stations. The result tells it own story, Carmelo Bonanno tells us: Since the introduction of PRODUCTION PLANNING & CONTROL, we have managed to improve utilization by 25 percent, fill gaps in planning and cope with order peaks efficiently.

This experience has convinced frabona to continue investing in digitization and automation. The target is optimally utilized night shift production in unmanned operation with reliable processes. "PRODUCTION PLANNING & CONTROL plays a key role here", says Carmelo Bonanno. "It is the "single point of truth" for us for all information relevant to manufacturing."

«

FRABONA FACTS

+ Family run, second-generation business
+ CNC manufacturing, aluminum profile technology, assembly
+ Automotive, aerospace, mechanical engineering & optical industries
+ Planning of 16 machines & work stations with PRODUCTION PLANNING & CONTROL

frabona GmbH
Genfer Str. 4a
60437 Frankfurt a. M., Germany
www.frabona.de

You can find the video on the customer story here:
dmgmori.com/frabona

PLANNING MEETS ERP
DATA EXCHANGE AS STANDARD

TEST FREE
OF CHARGE
FOR 30 DAYS

Digitization promises companies the chance to act with agility, respond flexibly to developments on the market, plan production more efficiently and deliver more quickly and economically.

However, this requires the end-to-end connection of existing IT systems with software applications. What might sound simple often ends up requiring extensive individual project management due to the lack of standard solutions for the exchange of data. It is a considerable challenge for many companies, especially countless small and medium-sized enterprises.
DMG MORI sees itself as a pioneer where digitization, automation and sustainability are concerned, as it has an extensive digitization portfolio for the design of future-oriented production and first-class solutions for connecting leading ERP systems with shop floor applications, such as PRODUCTION PLANNING & CONTROL from ISTOS.

Planning & ERP connection as "standard"
ISTOS GmbH and a whole string of ERP providers are setting new standards with the initiative "Connected Shop Floor", with the aim of avoiding duplication of data maintenance and simplifying the realization of data exchange between ERP systems and PRODUCTION PLANNING & CONTROL. It is because many companies already have master data, production orders and workflows in their leading ERP systems. Bi-directional standard interfaces will enable seamless processing of this production-related information in future.

YOUR BENEFITS

+ Fast and simple introduction of PRODUCTION PLANNING & CONTROL with ERP connection
+ Available immediately
+ Reliable exchange of data
+ Tested & secure in use
+ 100 % update certainty if a version is changed

Customer feedback takes top priority: It is the reason DMG MORI and ERP providers offer standard interfaces for end-to-end networked order planning and control.

Christian Methe
Managing Director of ISTOS GmbH

Find out more:
christian.methe@istos.com

FIRST PROVIDERS OF FUTURE INTERFACES

+ APplus | Asseco Solutions AG
+ AVENTUM GmbH
+ BEOSYS GmbH
+ Bleckmann Informationssysteme GmbH & Co. KG
+ Cpro IoT Connect GmbH | SAP Connector
+ FORB | R+B Entwicklungs- und Vertriebs GmbH
+ MAIT Germany GmbH
+ Meusburger Georg GmbH & Co KG
+ mesonic Winline 11.0
+ Microsoft Dynamics NAV 2015
+ NTS APOLLO GmbH
+ Octoflex ERP | Octoflex Software GmbH
+ Orgavision S. à. r. l.
+ premium technologies
+ Sage b7
+ sou.matrixx | SOU AG

Your ERP provider or ERP system isn't among them?
Please get in touch with us.

Oliver Czempiel
Sales Manager
oliver.czempiel@ISTOS.com
Tel.: +49 160 160 225776

17 different master and transaction data – such as work plans, materials, production orders, parts lists or personnel – are exchanged bi-directionally between PRODUCTION PLANNING & CONTROL and the ERP systems.

The interfaces are created by direct cooperation between ISTOS GmbH and the ERP providers or system houses. In line with the DMG MORI quality first strategy, development and rollout are carried out step-by-step. The initial focus is on the ERP systems of customers in the German speaking regions. The first interfaces to complementary ERP systems on the European market will follow in the third quarter of 2021.

QUALITY FIRST – FOCUS ON GERMANY, AUSTRIA AND SWITZERLAND AS A FIRST STEP

The advantage of the interfaces lies in the fast and simple introduction of PRODUCTION PLANNING & CONTROL – entirely without any individual developments or extensive projects. Available immediately for manufacturing companies with guaranteed reliable data exchange.

«

The ERP interface enables trouble-free data exchange between order acceptance and planning.

Joshua Hempel
Jörg Lintzen GmbH

JÖRG LINTZEN GmbH
CNC Drehen & Fräsen

ISTOS PRODUCT
PRODUCTION PLANNING & CONTROL
(Cloud-based application)

ERP SYSTEM
Lexware

SYSTEMHAUS
premium technologies

Thanks to the reliable exchange of data, I receive a delivery date automatically and am better able to estimate deliveries.

Maximilian Stark
Zero.Point.Systems GmbH

Zero.Point.Systems

ISTOS PRODUCT
PRODUCTION PLANNING & CONTROL
(Fully-integrated on-site solution)

ERP SYSTEM
APplus

MANUFACTURER
Asseco Solutions AG

TULIP

FEWER ERRORS & HIGHER EFFICIENCY
ACROSS THE ENTIRE SHOP FLOOR

1 BESIDE THE MACHINE

REDUCE ERRORS DURING MANUAL ACTIVITIES

Create your own individual APPs with the visual APP Editor from TULIP. Free your production from paper with digital APPs for:

+ Assembly instructions
+ Quality control
+ Quality data acquisition
+ and much more

Paper continues to be the medium used most in production. Paper documents are used in most cases for assembly instructions, quality checklists, process documentation or for recording rework. However, paper documents not only increase the effort required for coordination within your company, they are often also the cause of errors and rework. With TULIP as a toolbox you can simply create consistent APPs for your processes yourself, without any programming knowledge.

TULIP is not an isolated solution, it is an open system. All TULIP APPs use the same database. This enables seamless data transfer, e. g. from the machine to assembly or from the measuring lab to the machine. TULIP can be integrated into existing ERP, MES or CAQ systems via standard software interfaces.

TEST TULIP
now for 30 days – free of charge and with no risk!

Regardless of whether on or beside the machine.

DMG MORI *STORE*
powered by **ADAMOS**
DMGMORISTORE.COM

2 ON THE MACHINE

OPTIMIZATION OF MACHINING TIMES AND UTILIZATION

With apps on your machine you can guide your employees safely and efficiently through all processes.
Interactive step-by-step instructions increase process reliability and ensure the basic data for optimizing utilization thanks to the feedback possibilities:

+ Setup instructions
+ Quality data acquisition
+ Machine monitoring & OEE calculation
+ and much more

Build your own APP!

HIGHLIGHTS

+ **No code:** Create customized APPs yourself, from assembly to setup instructions
+ **Easy access:** Access to TULIP APPs directly on the machine via CELOS V6
+ **Templates:** Simply download templates, e. g. for quality control, setup procedures and missing part reports, and adapt them yourself

ON THE MACHINE

NEW

TULIP ON EVERY MACHINE WITH **CELOS** + RETROFITTABLE

CUSTOMIZED TULIP APPS AS A GUARANTEE OF QUALITY

Andreas Lupold Hydrotechnik GmbH from Vöhringen in Baden-Württemberg has been supplying customers in a multitude of industries with high-quality, tailor-made hydraulic products for more than 70 years. The product portfolio includes custom-made valves, pumps and hydraulic lifting gear as well as control and regulation equipment. As part of the Hydraulik Nord Group since 2019, the approximately 140 experts from Lupold have supported the medium-size group of companies with their many years of experience. The enormous amount of assembly work involved in producing the sophisticated hydraulic components contributes greatly to the value creation process. That is why Lupold recently implemented TULIP from DMG MORI. The team creates its own apps with the no-code platform; these assist the staff, ensuring the consistent quality of the products.

Hydraulic components in all sectors

"Excavators, tractors, waste disposal and even operating tables – there is hardly any sector that can get by without hydraulic components", explains Marcus Joos, Plant Manager at Lupold. This shows just how varied the product range is. "Hydraulic valves account for 80 percent of the business." 600,000 a year for Bosch Rexroth axial piston variable displacement pumps alone serves to illustrate the high demand. Lupold supports its customers early on in the development phase in order to produce optimal components. "With our manufacturing competence in pump regulation, we assist and advise the customer's developers." The collaboration enables cost-efficient production of high-quality products.

Final inspection of every product

Lupold boosts the efficiency of machining and ensures consistent quality with flexible automation solutions for batch sizes of 1 to 1,000 through the use of modern measuring machines. Flexibility is also called for in assembly in order to produce the many different types of components efficiently. "It is equally important to guarantee consistent quality of the end product", stresses Marcus Joos. "This is carried out with test benches at the assembly stations." Every finished product undergoes a functional test.

Simple compilation of interactive assembly instructions

While clear parameters can help optimize machining, different rules apply to assembly, explains Marcus Joos: "The aim is to simplify the respective processes, document everything to ensure consistent quality, and

The rejection rate during the final check is virtually zero, thanks to the assembly processes optimized with TULIP.

Marcus Joos
Plant Manager
Andreas Lupold Hydrotechnik GmbH

Lupold produces an extremely diverse range of hydraulic products.

With TULIP, the team headed by Markus Joos, Plant Manager at Andreas Lupold Hydrotechnik GmbH (left), creates interactive assembly instructions to make assembly processes more reliable and to train employees faster. Dr. Damir Hrnjadovic, Managing Director of DMG MORI Digital GmbH (right).

not to assemble a product a couple of seconds faster." Lupold has found a partner in DMG MORI which makes it possible for the company to sustainably optimize the assembly processes with the no-code platform TULIP. "We store instructions for assembly in the apps we have created with TULIP." It is comparable to working with PowerPoint and requires no programming knowledge. "After just a short training period, four of our employees were able to create customized apps for our assembly. Since then we have already created 130 assembly instructions for 200 different types of product", says a pleased Marcus Joos.

CREATING TULIP APPS IS AS SIMPLE AS POWERPOINT

Flexible personnel deployment in assembly

TULIP is an enormous help with teaching new staff and flexibly deploying already trained assembly operators. The app visualizes every assembly step with photos and videos and the individual parts needed are removed from their respective boxes using a pick-to-light system. "This means we can exclude many errors in advance", explains Marcus Joos. Testing of the products also benefits from TULIP: "We have also connected our fastening technology with TULIP. The stored torques are automatically called up from the respective digital assembly instructions. In addition the data collected, torques or forces for example, are documented and integrated into our quality management."

TULIP as standard in assembly

Now that Lupold has digitized assembly with the aid of TULIP, other processes will follow, says Marcus Joos with a view to the future: "Step-by-step we will digitize our entire production with TULIP." But it goes even further. Lupold will then take over the role of competence center within the Hydraulik Nord Group as far as assembly is concerned with the aid of TULIP APPs. "Our long-term aim is to establish TULIP as standard throughout the whole group. TULIP provides the flexibility needed for this, because within the shortest possible time you can create customized apps yourself that are adapted exactly to your own processes."

«

ANDREAS LUPOLD HYDROTECHNIK GMBH

+ Over 70 years of experience in the development and manufacture of hydraulic products
+ 140 skilled workers at its headquarters in Vöhringen
+ Target sectors: agricultural machinery, waste disposal and the medical industry, among others

Andreas Lupold Hydrotechnik GmbH
Eythstraße 11
72189 Vöhringen, Germany
www.lupold.de

END-TO-END DIGITIZATION

WITH TULIP APPS BESIDE AND ON THE MACHINE

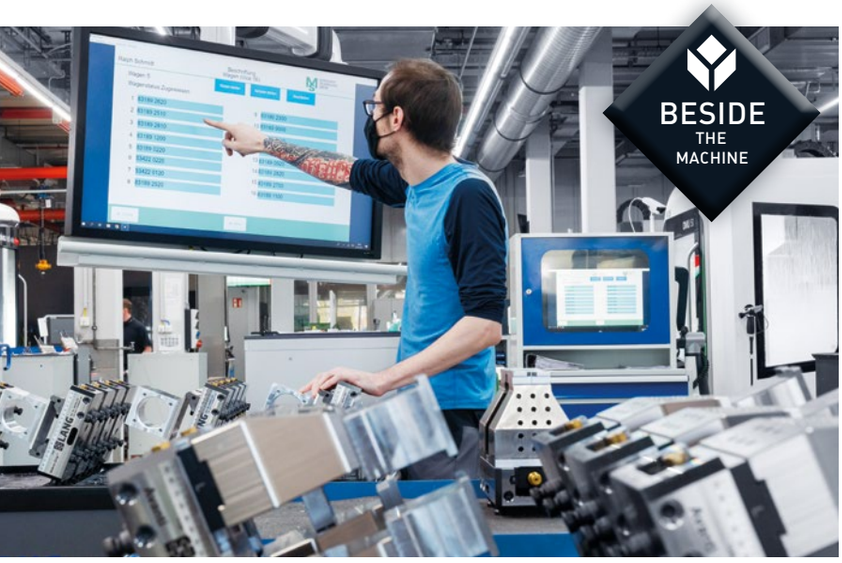
MS Ultraschall Technologie ensures machining productivity with continuous investment in future-oriented CNC technology. The acquisitions no longer just concern hardware. Digitization also plays a key role. All machines are connected via DMG MORI Connectivity, for example, to ensure fault-free processes from work preparation through to quality assurance. In addition, the company has been using TULIP in production since the beginning of 2021 – among other things for calling up interactive setup instructions for an automated DMU 50 3rd Generation.

"For the automatic production of one-offs, we have to make sure that all workpieces are correctly placed", explains Patrick Polster, Process Coordinator at MS Ultraschall Technologie. In the case of the DMU 50, a trolley with several fixtures is pushed into the automated cell. Once there, the robot loads

Thanks to TULIP APPs we have designed the entire process of setting up the the automation so that it is paperless and most especially reliable.

Patrick Polster
Process Coordinator
MS Ultraschall Technologie GmbH

MS Ultraschall Technologie GmbH uses an app it created itself with TULIP to guide employees reliably through the process of setting up the trolley for the automation and ensuring that all fixtures are loaded correctly.



MS Ultraschall Technologie has created its own app with TULIP, which supports the respective machine operators with work preparation.

In addition to the interactive setup instructions, MS Ultraschall has also created another TULIP APP for the systematic capture of machine run times and downtimes, which increases transparency of the machine utilization.

the fixtures into the machine and removes them after machining." If the wrong fixture is loaded, the blank will not match the NC program. In the worst case this could cause a crash.

Process reliability throughout several shifts – with customized TULIP APPs

With TULIP, DMG MORI has a tool in its range that constitutes the best and most flexible solution for MS Ultraschall Technologie. "We have quite simply created an app ourselves in line with our requirements, one visualized on the machine panel, which supports the respective operator with step-by-step work preparation", says Patrick Polster. Every trolley including fixtures is recorded digitally in the app. "In fact before it is pushed into the automation. Especially where automation solutions are concerned that span several shifts at a stretch, it is important to maintain an overview", claims Patrick Polster. After all, different operators are responsible for the machine. "In the past this was organized using pieces of paper."

TULIP on the machine with CELOS V6

The docking of the trolley can be displayed both on the machine control as well as seamlessly on a large, external touchscreen or tablet PC by the machine operator. "Since the update to CELOS V6, which we received with the purchase of the Digital Manufacturing Package, we can access our self-created TULIP APPs directly on the machine panel", Patrick Polster adds. This gives the machine operator all the freedom he needs to carry out the individual process steps and he can also make a photo documentation of the individual process steps with the camera integrated in the tablet PC. In addition to the interactive setup instructions, we have also created our own machine dashboard, which is used to monitor all machines. "We already have a lot of other ideas for apps, which we intend to create step-by-step. These will allow us to free even production from paper documentation bit by bit", says Patrick Polster.

Thanks to the TULIP APPs it created itself, MS Ultraschall can capture and track manual loading of the automation digitally as well as capture machine availability and unplanned downtime in real-time. In future, the team will not only establish this process reliability for machine-relevant processes, but for assembly as well. Patrick Polster says in this context: "There, too, we will be able to guide our employees through the assembly processes with a dedicated app and document the individual process steps digitally." According to Mr. Polster, this is exactly the basis needed to minimize errors and in so doing ensure continuous improvement of the processes. «

TULIP FOR RELIABLE LOADING PROCESSES FOR THE AUTOMATION

MS ULTRASCHALL TECHNOLOGY FACTS

+ Holistic process optimization through innovative CNC technology and digital solutions
+ Competitive edge thanks to autonomous manufacturing solutions
+ End-to-end documentation for continuous quality assurance

ULTRASONIC TECHNOLOGY GROUP

MS Ultraschall Technologie GmbH
Karlstraße 8 – 20
78549 Spaichingen, Germany
www.ms-ultraschall.de

DMG MORI MONITORING
POWERED BY TULIP

MORE TRANSPARENCY HIGHER PRODUCTIVITY

START IMMEDIATELY
WITHOUT LOCAL INSTALLATION

1 MONITORING

+ **Monitoring:** Detect downtimes and and take countermeasures
+ **Overview:** Clear visualization of all relevant data at a glance

2 PRODUCTION DATA ACQUISITION

+ **Process data:** Collection of manual employee entries for complete process transparency
+ **Sensor data:** Integration of additional external sensors (e.g. cameras) possible

3 OEE

+ **Optimization:** Continuous process optimization through data-based decisions
+ **Comprehensive:** Combination of employees, machines and sensor data

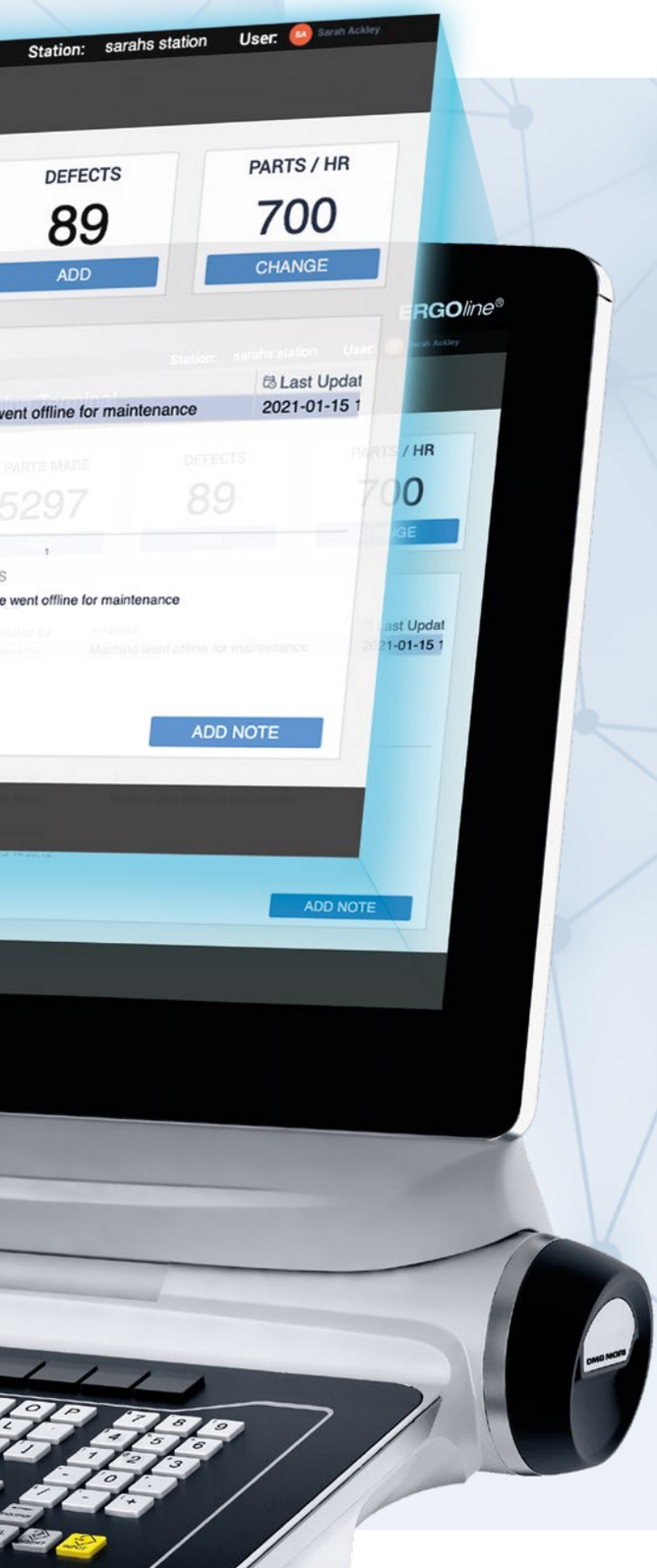
DMG MORI *STORE*
powered by **ADAMOS**
DMGMORISTORE.COM

ALTERNATIVELY WITH LOCAL INSTALLATION

DMG MORI MESSENGER

+ As part of the Digital Manufacturing Package, DMG MORI Messenger offers key functions for machine monitoring, such as status display, status history plus a machine logbook.
+ End-to-end production data acquisition and OEE calculation is possible with the solution **DMG MORI MONITORING powered by TULIP.**

DMG MORI Messenger



Build your own APP!

TULIP

INDIVIDUAL

+ **No code:** Simple creation of your own customized monitoring thanks to no code
+ **Adaptability:** Can be adapted flexibly to include additional buttons

CONSISTENT

+ **Independent of manufacturer:** Monitor all machines and systems individually
+ **On the machine:** APPs, dashboards and evaluations can be called up on the machine panel (as of CELOS V6) and on all devices

OPEN

+ **Interfaces:** Simple connection of new, old and third-party machines via OPC-UA, MQTT and MTconnect
+ **ERP connection:** Bi-directional IT interfaces to ERP, MES and other IT systems

my DMG MORI

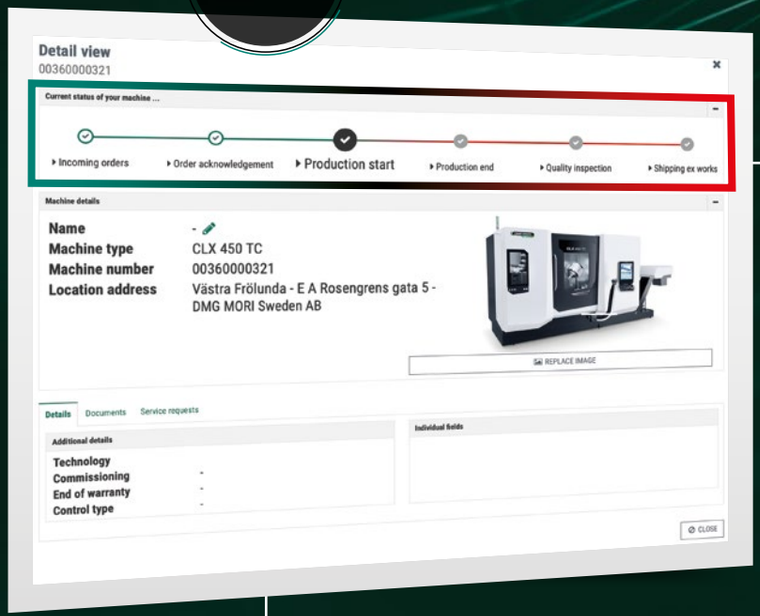
"YOU SEE, WHAT WE SEE."
DIRECT COOPERATION ON ONE PLATFORM

+ 24/7 Availability
+ Faster Support
+ Maximum Transparency

> 25,000 CUSTOMERS AND **> 125,000** MACHINES

Not registered yet?
Registration is free of charge at:
***my*dmgmori.com**

NEW



Product progress display of your new machine

TRACK YOUR ORDER – TRACK THE ASSEMBLY OF YOUR NEW DMG MORI MACHINE "LIVE"

+ **Know what is going on**: Current production step with detailed explanation
+ Available shortly: **Digital checklists** for trouble-free commissioning

FOR THIRD-PARTY PRODUCTS

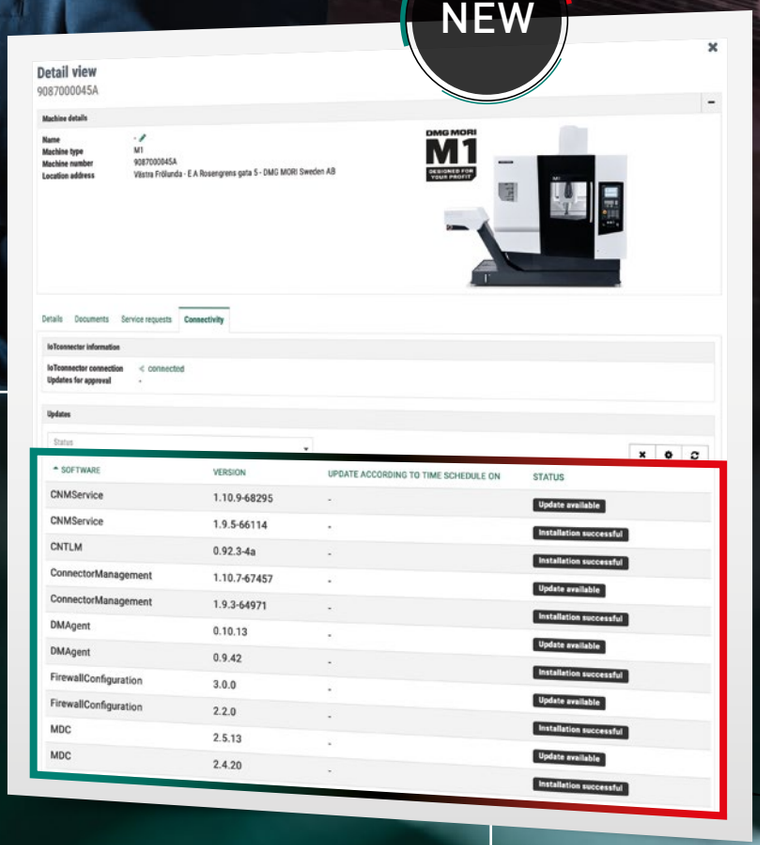
WERKBLiQ-UPGRADE

Enjoy these benefits also for third-party products, all information at **www.werkbliq.de**

Simply test WERKBLiQ via the DMG MORI STORE: **dmgmoristore.com**

DMG MORI *STORE*
powered by **ADAMOS**
DMGMORISTORE.COM

NEW



Update control of your connected machine.

CONNECTIVITY MANAGEMENT – UPDATES AND STATUS ALWAYS IN VIEW

+ **Knowledge:**
  Always know whether your machine is online
+ **Transparency**:
  All settings in detail and clearly organized
+ **Security:**
  You decide if and when you want to update

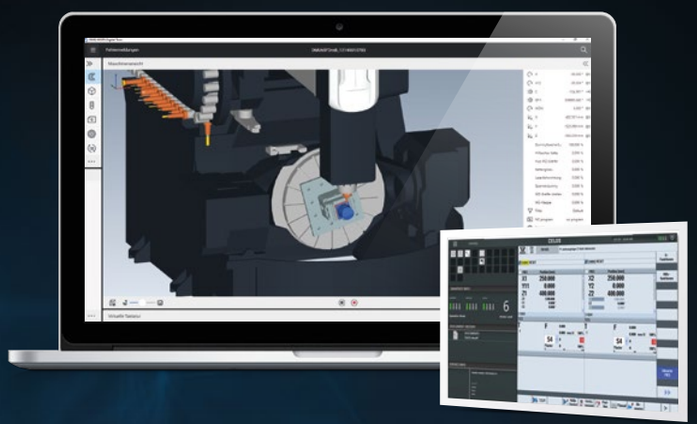
DMG MORI DIGITAL TWIN

OPTIMIZE YOUR PRODUCTION START-UP

FASTER – MORE ECONOMICALLY– WITHOUT RISK

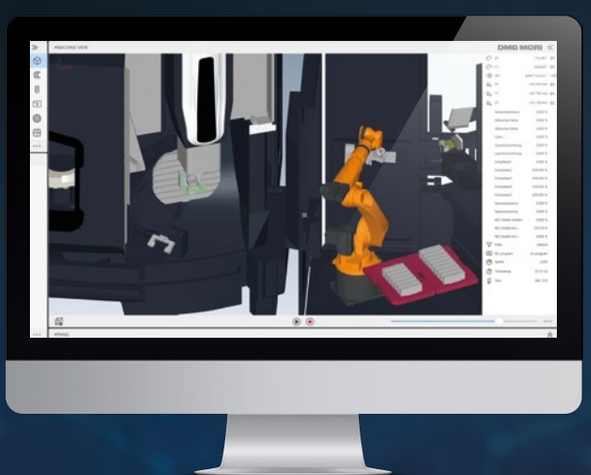
The **DMG MORI Digital Twin** is the digital mirror image of your individual DMG MORI machine tool. This mirror image contains the work area with all components, including all functionalities such as movement and control functions as well as the NC and PLC and their cycles.

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



1 MACHINE-INDEPENDENT PROGRAMMING

+ Integrated NC and PLC functionality manages the perfect 1:1 machine simulation
+ Check NC programs after post processor run or generate them directly on the virtual machine
+ Ensure complete operability



2 DIGITAL LOADING OF THE MACHINE

+ Faster and safer production ramp-up
+ Minimized risk of a crash on the real machine
+ Test and optimize processes and operational sequences

3 EARLY EMPLOYEE TRAINING

+ Possibility of realistic training without any unproductive machine time
+ Training of employees before delivery of a new machine
+ Greater learning success and around 50 % lower training costs

100 %
EXECUTABLE PROGRAMS
COLLISION-FREE PRODUCTION
EXACT MACHINING TIME

YOUR CONTACT

Dr.-Ing. Daniel Niederwestberg
Division Manager Digital Twin
daniel.niederwestberg@dmgmori-digital.com

DMG MORI TOOLING

GREATER EFFICIENCY AND LOWER COSTS

THANKS TO ORDERLY TOOL MANAGEMENT

There is no production without tools. But only the right tools enable optimum results.
Provided they are used properly and replaced in good time.
Too many tools tie up capital unnecessarily. Too few tools cripple production.
Replacing tools too soon increases costs unnecessarily.
Leaving it too late to replace tools jeopardizes the quality of the parts.

DMG MORI TOOLING
for 72 £
a month (duration 12 months)

① ORDER IN TOOL MANAGEMENT?

WHAT DO I NEED:
Tool-specific components

WHAT HAVE I GOT:
Stock of tools and components

WHERE CAN I FIND IT:
Storage location such as machine, tool cabinet, etc.

② DMG MORI TOOLING – HERE ARE THE BENEFITS:

+ Overview of your tool data
+ Tool data from different manufacturers
+ Desktop or tablet

Economic efficiency:
+ Predictable costs
+ No investment costs
+ No maintenance costs
+ Scalability

DMG MORI TOOLING

> 30 %	> 25 %	> 10 %	> 25 %
Less searching	Reduction in tool costs	Reduction in setup costs	Increase in spindle hours

REGISTER IMMEDIATELY, LOG IN AND **TEST FREE OF CHARGE** FOR 60 DAYS

+ No IT work necessary, as completely cloud-based. Access from any desktop or tablet.
+ Tools from different manufacturers already integrated.
+ Predicable costs, for 72 £ a month (duration 12 months) without any other installation or maintenance costs
+ Upgradeable with complete data transfer via TDM Global Line:
  – Integration of 3D data for CAM systems
  – Direct connection to tool presetters
  – Connection to your ERP system, incl. warehouse management as well as order and job management

③ YOUR STEPS TO SUCCESS:

+ **CAPTURE**
  Simple scanning of tool data via QR or data matrix codes
+ **MOUNTING**
  Create tools with 2D data graphic-guided design incl. dimensioning and parts lists
+ **STANDARDIZATION**
  – Creation of machine-relevant tool sets
  – Creation of tool-specific parts lists
+ **ANALYSIS**
  Transparent dashboard with customized criteria, such as manufacturer or machine-dependent service life, tool types, suppliers, etc.

Registration at:
orders@dmgmori-digital.com

powered by
tdmsystems

YOUR CONTACT

Torsten Böck
Division Manager CAD/CAM Systems
DMG MOR Digital GmbH
torsten.boeck@dmgmori.com

CONDITION ANALYZER

PREVENT DOWNTIME
OPTIMIZE PROCESS PARAMETERS

The CONDITION ANALYZER from DMG MORI expands your analysis possibilities. Detailed sensor and machine data can be evaluated in addition to DMG MORI Monitoring.
With this information it is easy to identify recurring problems and rectify them sustainably.

MONITORING
DETECTING STOPPAGES

CASE EXAMPLE:
TWO BROKEN CUTTING INSERTS

DMG MORI MONITORING

1 MACHINE DOWNTIME
DUE TO A DEFECTIVE TOOL:

+ Machine shutdown by MPC to prevent further damage
+ Two cutting inserts broken – cause not known

2 DETECT MACHINE DOWNTIME
WITH DMG MORI MONITORING:

+ View machine status live
+ Detect downtime and take countermeasures

CONDITION ANALYZER ANALYZING STOPPAGES

CONDITION ANALYZER

- **Capture, storage, and visualization of** machine sensor data
- **Improvement of machining processes** e.g. MPC Analysis and NC program optimization
- **Predictive Maintenance** Reduction of downtime

The visualization and documentation of sensor data ensures maximum transparency in production. Problems can be identified and process reliability increased.

YOUR CONTACT

Rolf Kettemer
Head of Software Solution DECKEL MAHO Pfronten
rolf.kettemer@dmgmori.com

DMG MORI CONDITION ANALYZER

3 TROUBLESHOOTING & ANALYSIS
PREVENT DOWNTIME IN FUTURE:

- Vibrations after tool changeover detected
- Risk of the fault recurring
- **Problem identified: Feed rate too high**

4 HIGHER PROCESS RELIABILITY
THROUGH MANUAL ADAPTATION OF THE NC PROGRAM:

- **Prevention of tool breakage and spindle damage**
- Reduction of rejects
- Cost reduction

CONDITION ANALYZER – DATA-BASED QUALITY PREDICTION

FOR 80 % REDUCTION IN MEASURING EFFORT

Customers and cooperation partners from leading sectors such as aerospace technology, car manufacture, tool and mold making and medical technology value the Fraunhofer Institute for Production Technology IPT as an experienced research institution. The team there develops system solutions for networked, adaptive production. This is carried out in close proximity and collaboration with the Laboratory for Machine Tools and Production Engineering (WZL) at RWTH Aachen, which focuses on basic and industry-oriented research. As digital solutions play a key role for both facilities, they have been using machine tools from DMG MORI for many years. A DMU 85 FD monoBLOCK was installed at the WZL and a DMU 65 FD monoBLOCK at the Fraunhofer IPT at the beginning of 2021 as part of a close research collaboration – the latter of the machines for the development of a data-based quality prediction solution.

DIGITAL SOLUTIONS ARE THE FUTURE OF MACHINE TOOL MANUFACTURE

For Philipp Ganser, Head of the department "High performance cutting" at the Fraunhofer IPT, digital solutions are an integral element of the future for machine tool manufacture. "Software-based applications give us the chance to further exploit the potential of machine hardware." An essential basis for this is the capture of machine data during production, like that offered by the CONDITION ANALYSER. "We work closely on this interface with DMG MORI." Together, machine and software are ideally coordinated in order to achieve maximum customer benefit. The focus of the development partner is on process optimization and the prediction of the achieved component quality.

Process optimization through digital solutions

One main reason for the installation of the two monoBLOCK machines at Fraunhofer IPT and WZL is the innovation-driven orientation of the machine tool manufacturer, according to Philipp Ganser: "DMG MORI concentrates on the end-to-end digitization of its products, a fact that gave rise to an extremely future-oriented collaboration." More specifically, the Fraunhofer IPT works with the DMG MORI Aerospace Excellence Center in Pfronten, for example, in its current project "Quantify". This project is concerned, among other things, with a data-based quality prediction in the production of so-called blade integrated disks, or blisks for short.

Blisks are one of the most sophisticated components used in aerospace and energy technology. The blades of these engine components made of titanium or nickel alloys are produced at the Fraunhofer IPT using 5-axis simultaneous milling on the DMU 65 FD monoBLOCK machine in a single setup. In addition, the integrated turning enables in-cycle rotational machining and therefore the production of the complete component. Machining of the blades takes up to 75 hours, depending on the material. "Almost as much time is spent on measuring in quality control", explains Philipp Ganser. Each individual blade has to be measured at numerous points. "It is exactly this effort that we can reduce drastically with our software solution."

»

The Fraunhofer IPT also tests its software on workpieces from other sectors – here on a knee implant.

Employees of the WZL at RWTH Aachen with the DMU 85 FD monoBLOCK.

With the CONDITION ANALYZER we visualize process data, enabling fast analysis on the machine and providing data for further analysis.

Michael Kirbach
Bereichsleitung
Head of Aerospace Excellence Center

CONDITION ANALYZER + data-based quality prediction for an 80 % reduction in measuring effort

The software developed in the Quantify project uses data determined during the machining process on the DMU 65 FD monoBLOCK machine – virtually in real-time. A critical tool for this task is the CONDITION ANALYZER from DMG MORI, which, for example, displays the positions and forces of the axes. In addition, the DMG MORI Tool Control Center provides important process-descriptive data, such as the bending moment and vibrations on the tool, via the CONDITION ANALYZER. Philipp Ganser says: "Our software calculates the geometrical quality of the components from this data and visualizes this clearly on the control or a tablet, for example, on conclusion of machining." The blue areas in the graphic display of the digital twin are within the tolerances. "The yellow or red areas are transmitted automatically to quality assurance for further testing." The conventional measuring effort can be reduced by up to 80 percent in this way.

CONDITION ANALYZER: DATA ANALYSIS IN REAL-TME

This software also constitutes an enormous advance for DMG MORI, as the machine tool manufacturer constantly pursues holistic solutions. Of course, this also includes quality control as part of the value creation chain. DMG MORI is working in a next step on the integration of the software into its own portfolio – one more step in the direction of complete production processes.

Long-term cooperation with DMG MORI

The cooperation with DMG MORI in all aspects of the two DMU monoBLOCK machines is planned for the long term. The two machines at the Fraunhofer IPT are to act as a test platform within the scope of the ICTM Aachen – International Center for Turbomachinery Manufacturing, which DMG MORI intends to join. Its members include large engine manufacturers worldwide and key suppliers to the sector. Moreover, the Fraunhofer IPT intends to address other industries with its developments. "In addition to the blisk, we are already successfully testing the CONDITION ANALYSER together with our software in the areas of tool making and medical technology", says Philipp Ganser, mentioning two examples.

With EXIST Transfer of Research to a spin-off company

The Fraunhofer IPT has already initiated the next steps in Quantify, says Philipp Ganser with his sights on the future: "We will found a spin-off with the software by the end of the year." The Fraunhofer IPT team will be supported by the Federal Ministry of Economic Affairs and Energy with its EXIST Transfer of Research. According to the website of the ministry, this is aimed at "outstanding research – oriented projects that involve expensive and high-risk resource development". For Philipp Ganser and his team, this is confirmation of their work: "We are pleased that our solution is met with such encouragement."

«

Very detailed evaluations can be created with the CONDITION ANALYZER, thanks to the many data points captured.

The CONDITION ANALYZER provides data to our software solution, with which the measuring effort is reduced by up to 80 % thanks to a reliable prediction of quality during the process.

Philipp Ganser
Head of the department
High performance cutting at the Fraunhofer IPT

FRAUNHOFER INSTITUTE FOR PRODUCTION TECHNOLOGY IPT FACTS

+ Application-related and industry-oriented research
+ Collaboration with the Laboratory for Machine Tools and Production Engineering (WZL) of RWTH Aachen as well as industry partners from all leading sectors

Fraunhofer IPT

Fraunhofer Institute for Production Technology IPT
Steinbachstraße 17
52074 Aachen, Germany
www.ipt.fraunhofer.de

In the age of digitization, it was important for us to exhaust all digital possibilities right from the start. With the DMG MORI CONDITION ANALYZER, we have found exactly the right solution for this."

Andreas Lieber
Staff Engineer Global Machining Technology at Kennametal

CONDITION ANALYZER – INNOVATIVE PROCESS DATA ANALYSIS

After years of research, metallurgist Philipp M. McKenna succeeded in 1938 in producing a tungsten-titanium carbide alloy that would give cutting tools greater durability while increasing cutting speeds. Based on this patented development, he founded Kennametal. In the decades that followed, the company became a globally active tool manufacturer and solutions provider with around 9,000 employees today. The portfolio includes products for metalcutting as well as for the infrastructure sector, which includes mining and oil & gas, for example. In Fuerth, one of the global Technology Centers was established, where experienced specialists continuously develop the standard product range as well as customer-specific tool solutions. The focus is on cutting tools, which the team there subjects to all the necessary tests on a DMU 80 P duoBLOCK dating from 2012 and a DMU 85 monoBLOCK installed in 2020. Also on board the newer machine is the CONDITION ANALYZER, which sustainably optimizes testing of the prototypes.

Over 1,730 patents for optimum machining results

"Transform how everyday life is built." With this vision, Kennametal develops tools that indeed literally shape everyday products – in the automotive, aerospace, and energy sectors, to name just three examples. "For us, it's all about producing innovative tools that are as wear-resistant as possible for the most demanding machining applications," Andreas Lieber, Staff Engineer Global Machining Technology , explains. This, he says, requires continuous development of tool materials, countless tests of prototypes and, last but not least, the inquiring mind of the company's founder. This is also reflected in the 1,730 active patents held by Kennametal. Over 140 new patents have been granted in the past year.

CONDITION ANALYZER FOR SUSTAINABLE OPTIMIZATION OF PROTOTYPES

CONDITION ANALYZER for optimizing the cutting properties of new tools

On one hand, the Technology Center in Fuerth works on innovations for the standard product range. These include tools for the Kennametal and Widia brands. On the other hand, the focus is on individual tool solutions for customers. "In both cases, we want to set new standards in metal cutting," Jochen Groß says, Senior Engineer Global Machining Technology. Machining tools are a decisive factor in optimizing productivity and quality in production, he adds. In standardized trials, Kennametal tests these tools in its Test & Demonstration Center to analyze and further improve their properties under specific application conditions. "To do this, we measure relevant data that we can access during machining, for example power consumption or spindle utilization," Jochen Groß explains. "Nowadays, we analyze these with the Condition Analyzer from DMG MORI."

The DMG MORI CONDITION ANALYZER provides us with the best comparison options with regard to our data collection and analysis and helps us with our new product development, which ultimately benefits our customers.

Jochen Groß
Senior Engineer Global Machining Technology at Kennametal

DMU 85 monoBLOCK

- 5-axis simultaneous machining of workpieces up to ø 850 × 750 mm and max. 1,500 kg
- 20,000 rpm speedMASTER spindle with 130 Nm | 35 kW (40 % DC)
- Machine Protection Control – MPC 2.0
- CELOS with SIEMENS 840D sl Operate, HEIDENHAIN TNC 640 or MAPPS on FANUC

For further information on the monoBLOCK visit:
monoblock2021.dmgmori.com

DMU 85 monoBLOCK:
Highly stable for tests up to 20,000 rpm

For testing the tools, Kennametal in Fuerth uses the DMU 80 P duoBLOCK and the DMU 85 monoBLOCK. "The crucial factor for us is the stability of the machines, so that we can carry out very dynamic machining at high speeds – the monoBLOCK machine has a speedMASTER spindle with 20,000 rpm – without hesitation," says Andreas Lieber, explaining the purchase in view of the wide range of applications. "The standardized workpieces are made of every conceivable material – from aluminum to titanium," Jochen Groß adds. But the size of the working area is also important, he says, given the length and diameter of some tools.

High data density and quality thanks to DMG MORI CONDITION ANALYZER

The investment in the DMU 85 monoBLOCK was made with an eye to future requirements, as Andreas Lieber recalls: "In the age of Industry 4.0, we wanted to consider all digital aspects in this project from the very beginning." That is why DMG MORI's CONDITION ANALYZER took on a central role, he says. Under manufacturing conditions, the software analyzes and visualizes the machine condition in real time on a component-by-component basis in order to avoid downtime. It supports preventive maintenance and improves workpiece quality by analyzing and optimizing NC processes.

"The fact that the CONDITION ANALYZER collects so much data and evaluates it in a user-friendly manner naturally also helps us when testing tools," Andreas Lieber comments. Specifically, Kennametal analyzes the power consumption curve and the performance data of the feed drives, from which the forces acting can be calculated. The CONDITION ANALYZER also measures the spindle temperature, which will be used to improve tools in the future. According to Jochen Groß, the added value compared to older machines lies in the large amount of data and its quality: "The CONDITION ANALYZER measures up to 20 data points per second and enables informative, high-resolution graphs." For example, he says, a load increase can be displayed during the short period of tool entry into the workpiece prior to full diameter engagement.

CONDITION ANALYZER for increasing competitiveness

The use of the CONDITION ANALYZER in this research environment was preceded by intensive cooperation with DMG MORI. Andreas Lieber is more than satisfied: "In the Technology Center, we have different requirements for a manufacturing solution than in production. Therefore, the Condition Analyzer had to be adapted to these conditions again and again." The final result impressed him and the entire project team – it offers Kennametal a better comparison and an easier exchange of data and experiences.

"This investment in digitization will benefit customers through improved quality, product performance and innovation and will bring added value," says Jochen Groß.

«

KENNAMETAL INC. FACTS

- Founded in Latrobe, Pennsylvania in 1938
- Approx. 9,000 employees worldwide
- Kennametal Inc. delivers productivity to customers through materials science, tooling and wear-resistant solutions for the aerospace, civil engineering, mining, energy, general engineering and transportation industries.

KENNAMETAL

Kennametal Shared Services GmbH
Wehlauer Str. 73
90766 Fürth, Germany
www.kennametal.com

55 TECHNOLOGY CYCLES

COMPLEX MACHINING, REALIZED IN A SIMPLE WAY

+ Safe and reliable processes
+ Clear program structure, program up to 60 % faster
+ Error reduction thanks to conversational programming
+ Technology integration, e. g. gearSKIVING and grinding
+ Technology know-how stored directly in the cycle

60 %
FASTER THANKS TO CONVERSATIONAL PROGRAMMING

More information about the technology cycles at:
techcycles.dmgmori.com

4 APPLICATION AREAS

① 15 HANDLING CYCLES

+ Simplifies machine operation – e. g. B-axis ramping
+ Automates processes – e. g. counter-spindle live centre
+ Protects against operating errors with increased safety – e. g. turret steady rest

② 9 MEASURING CYCLES

+ Increases machining accuracy – e. g. 3D quickSET
+ Opens up new metrology options on bulky component geometries – e. g. L-measuring probe
+ Increases transparency in QA processes – e. g. gearMILL with in-process measurement

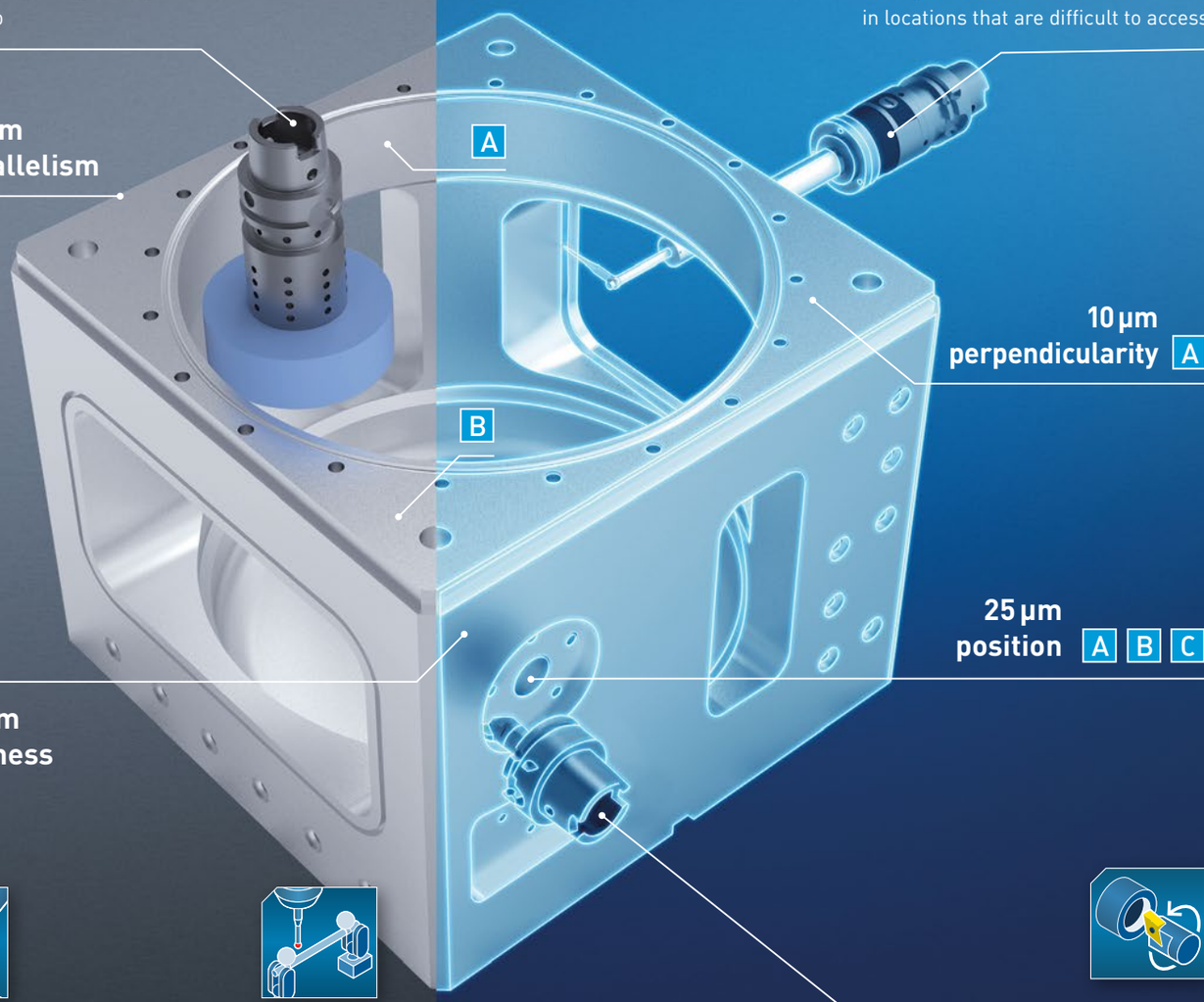
EXAMPLE WORKPIECE TO ILLUSTRATE THE USE OF TECHNOLOGY CYCLES

Grinding

Milling, turning and grinding in one setup

L-measuring probe package

Measurement of grooves and slots and diameters in locations that are difficult to access



3D quickSET

Checking and correction of the kinematic accuracy of 4 and 5-axis milling machines and turning/milling machines

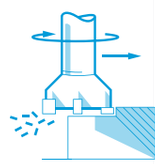
VCS Complete

Volumetric calibration of 5-axis milling machines at the push of a button

Interpolation turning

Centerline and off-center turning operations by means of axis interpolation, e.g. for machining sealing surfaces

③ 23 MACHINING CYCLES



+ Integrates new machining processes – e.g. gearSKIVING
+ Extends machine capability – e.g. grinding
+ Simplifies complicated programming – e.g. Multi-start threading 2.0

④ 8 MONITORING CYCLES

+ Increases machine safety – e.g. MPC – Machine Protection Control 2.0
+ Increases process reliability – e.g. Easy Tool Monitoring 2.0
+ Adapts processes for eliminating vibration – e.g. MVC – Machine Vibration Control

360°
TECHNOLOGY COMPETENCE
TURNING, MILLING AND NOW: GRINDING

+ Milling, turning and grinding in one setup
+ Grinding cycles for internal, external and face grinding, polygon and oval grinding, and dressing cycles
+ Simple setup and optimized start-up with the aid of structure-borne sound sensors
+ In-process measurement during production using fully integrated measuring gauge

Available for the CTX beta TC (4A) and CTX gamma TC

Ra to 0.1 µm, Rz to 0.8 µm, circularity to 1 µm IT5 for ø > 30 mm

WORM SHAFT

Dimensions: ø175 × 380 mm
Material: 16MnCr5

1 × CTX TC
42 min. Total

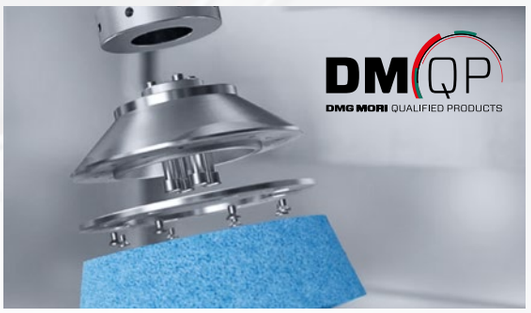
> 65 %
LESS THROUGHPUT TIME

1 INSTEAD OF **3**
MACHINES

SET-UP	SET-UP
Machine 1 turning	**Machine 2** milling	**Machine 3** grinding

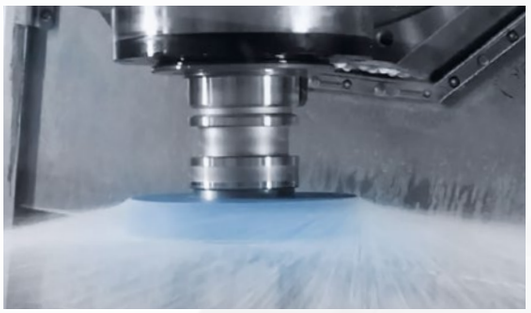
Conventional manufacturing = 123 min. total time

5 HIGHLIGHTS



1 TOOL AND BALANCING TECHNOLOGY

+ Exclusive tool technology from our DMQP partners (Haimer & TYROLIT)
+ Quick grinding wheel replacement thanks to ring holder
+ Standardized grinding wheel arbor with internal coolant supply

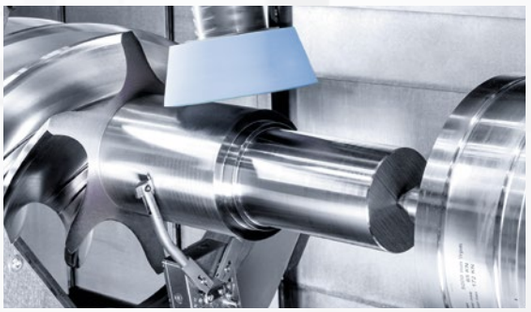


2 INTERNAL COOLANT SUPPLY

+ Through-coolant tool holders for best possible flushing of the contact area with 80 bar of coolant pressure
+ 1,300 L coolant system, with filter for particles > 5 µm
+ Flushing of working area guarding to protect against chips

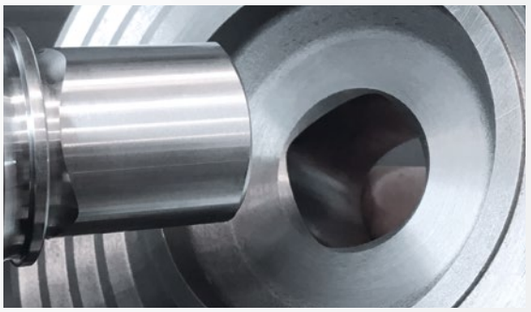
3 STRUCTURE-BORNE SOUND SENSORS

+ Spindle-integrated to minimize downtime
+ Makes dressing and grinding possible without cutting fresh air
+ Available for main and counter spindle



4 IN-PROCESS MEASUREMENT

+ Measure diameter during grinding
+ Relative or absolute measurement (depending on measuring gauge)
+ Measuring repeatability up to 0.8 µm



5 POLYGONAL, OVAL AND ECCENTRIC GRINDING

NEW

+ The ideal solution for polygonal shaft/hub connections with 3 or 4 sided polygons.

P3G (G = Orbiform) | P4H (H = Harmonic) | Ellipse | Eccentric

THE SEARCH FOR THE MICRON

Machining by chip removal down to tolerances of a few microns is only possible thanks to the symbiosis of human competence on the machine and maximum repeatability over the entire working volume.

Rainer Gottschling
Managing Director
of Kapplercnc

In order to avoid any vibration, the measuring machine is equipped with its own 6 m deep foundation, which is completely separate from the rest of the building.

Friedrich Kappler became self-employed in 1934, STARTING OUT with a press from his previous employer, and laid the foundation for the still-expanding Kappler GmbH & Co. KG (Kapplercnc) in Birkenfeld. Today the company manufactures complex precision components and assemblies for global key industries such as semiconductors, aerospace and optics. Some 150 specialists carry out efficient production processes in a new building that was completed in 2020 over an area of 23,000 m². For production, Kapplercnc puts its faith in machine tools from DMG MORI. About 25 models from the technology leader are currently installed – including two automated mega-centers for the machining of high-precision, large components for the semiconductor industry: a DMC 210 U *µPrecision* and a DMC 340 U *µPrecision*, each with a rotary pallet pool. Complex turn-milled components are manufactured on a CTX beta 1250 TC 4A. DMG MORI technology cycles and networked machines are also the guarantee of long-term, process-safe and future-proof production.

Accurate to the nearest micron thanks to a sustainable climate control concept

"As a service provider to high-tech companies in many future-oriented industries, a state-of-the-art production environment is crucial for our very existence", stresses Rainer Gottschling. He is the grandson of the company founder and the third generation to manage Kapplercnc. After years of growth, the company recently optimized its activities in a new building in Birkenfeld. The building has been constructed in accordance with KfW55 energy efficiency standards. It has the latest climate technology, a 1,190 kWp photovoltaic system has been installed, and a combined heat and power unit provides 50 percent of the power requirement. "Our challenge is to cool the building, even in the winter", explains Rainer Gottschling. 80 percent of the heat given off by the machines and the building can be used for cooling via heat exchangers. "In this way we achieve a constant 21 degrees C in the manufacturing area".

µm precision at the limit of the accuracy range

But back to the core of the Kapplercnc business model. When he is asked about the reasons for his company's success, Rainer Gottschling particularly likes to point to the well-trained and experienced engineers, who are in a position to fulfill all customer requirements at all times with regard to precision and quality down to the nearest micron. "With regard to the precision of our workpieces, we work at the absolute limit". The DMG MORI machines are said to be the perfect platform for this. "The icing on the cake, i. e. the last micron, is then provided by our employees". Kapplercnc trains its highly competent engineers in-house.

> WE WORK AT THE ABSOLUTE LIMIT AS FAR AS THE PRECISION OF WORKPIECES IS CONCERNED

Vibration-free measurement at XXL scale

100 % quality control of all parts and documentation takes place using cutting-edge measuring technology. An XXL measuring machine was installed on a foundation decoupled from the rest of the building and anchored on a six-meter high column deep in the ground in order to avoid any vibration from the environment. The manufacturing technology is equally "up to date". To ensure that it is, field tests with partners from the machine tool industry are carried out regularly in order to compare the status quo with new ideas in machine development. "This keeps us on our toes and keeps our eyes open at all times", says Rainer Gottschling.

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On the DMC 210 and 340 U µPrecision, Kapplercnc manufactures high-precision components which are used in the semiconductor industry for manufacturing wafers, for example.

Automated large machines with *micro-precision*

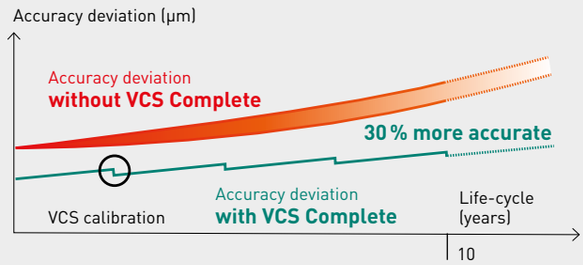
In DMG MORI, Kapplercnc has found a partner that continually enriches everyday manufacturing with powerful precision machinery and also innovative software solutions. The latest examples in 5-axis simultaneous machining are the DMC 210 U *µPrecision* and the DMC 340 U *µPrecision* from the technology leader. "The volumetric accuracy of less than 30 µm and the achievable positioning accuracy of 4 µm have allowed us to deal with every precision requirement", underlines Alexander Roeth, technical operations manager at Kapplercnc. He particularly highlights the demanding components for the semiconductor industry.

DMG MORI technology cycles for even greater accuracy

The reason for the high accuracy as far as the precision machining centers are concerned are the scraped guideways. There are also the exclusive DMG MORI technology cycles. 3D quickSET measures and corrects the positions of the rotating and swiveling axes, meaning that the machines can be reliably recalibrated at any time. "We do this prior to finish machining in order to get maximum accuracy out of the machine and minimize the amount of reworking", says Alexander Roth. VCS Complete is also soon going to be installed, which improves the volumetric accuracy of the machine. This enables up to 30 percent higher accuracy over the entire service life of the machine. Kapplercnc uses a third technology cycle, MPC 2.0 – Machine Protection Control, for process monitoring including machine protection. "In this way, through vibration we can detect when a tool is at risk of becoming blunt at an early stage", says Alexander Roeth, mentioning a decisive advantage. The process monitoring is also said to be beneficial for automated operation. Both machining centers are equipped with a rotary pallet pool – with five pallets in the case of the DMC 210 U *µPrecision* and four pallets on the bigger model. "Many components have long machining times, meaning that we also manufacture them in 2 or 3 shift operation with the aid of the automation".

VCS COMPLETE

+ Up to **30 % higher machine accuracy** over the entire life cycle
+ **Simple compensation** of the machine geometry
+ **Conversational software** for fast and simple operation
+ **Data recording** for further analyses and documentation of the measurements
+ **Compensation for deviations,** e. g. due to wear or collision



CTX beta 1250 TC 4A: 6-sided complete machining to within microns

"Workpieces produced during turning operations are also highly complex", explains Rainer Gottschling. 6-sided complete machining has established itself based on Turn & Mill machines. The third Turn & Mill machine was installed in 2020 with the arrival of a CTX beta 1250 TC 4A, on which Kapplercnc manufactures optical components, for example. "Here too, we use 3D quickSET to provide the high precision".

Thanks to the counter-spindle, the workpieces are completely machined on all 6 sides. Also with micron accuracy thanks to 3D quickSET.

Alexander Roeth
Technical Operations Manager at Kapplercnc

End-to-end digitization of all processes

According to Rainer Gottschling, the sustained growth in the semiconductor industry and its precision requirements are a perfect yardstick for modern manufacturing: "The industry requires components that can only be manufactured with state-of-the-art production technology. DMG MORI sets standards here with its products". Also with a view to the future, he adds: "Efficient manufacturing also requires consistent and end-to-end digitization of all processes". The entire manufacturing area including tool management is networked in order to guarantee optimum planning. "We already know during planning which machines are equipped with the right tools, and where anything is missing". Kapplercnc also relies on digitized processes in the service area: "All machine information is available to us in the *my* DMG MORI online portal – technical documentation, for example. And if something has happened, service inquiries are dealt with in a prioritized way". You receive transparent information about the process status via Track & Trace and can reliably plan spare part deliveries.

µPRECISION MACHINES AS A UNIQUE SELLING POINT

Rainer Gottschling realizes that the modern setup of the site and the experienced team are important for successful business development. There are not many companies using a DMC 210 U *µPrecision* or a DMC 340 U *µPrecision*: "They are therefore a unique selling point for us, which allows us to manufacture components to within microns". Kapplercnc has already ordered another DMC 340 U *µPrecision*, also with technology cycles to increase precision.

«

KAPPLER FACTS

+ Founded in 1934
+ Around 150 employees in total at the company headquarters in Birkenfeld
+ Manufacturing of precision components for global key industries such as semiconductor, aerospace and optics

kapplercnc

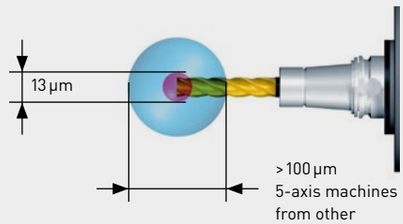
Kappler GmbH & Co. KG
Dammfeldstraße 2
75217 Birkenfeld, Germany
www.kappler-cnc.de

You can find the video on the customer story here:
youtu.be/U_ACYwKIamQ

µPrecision MODEL SERIES

UP TO **80 %** MORE ACCURATE

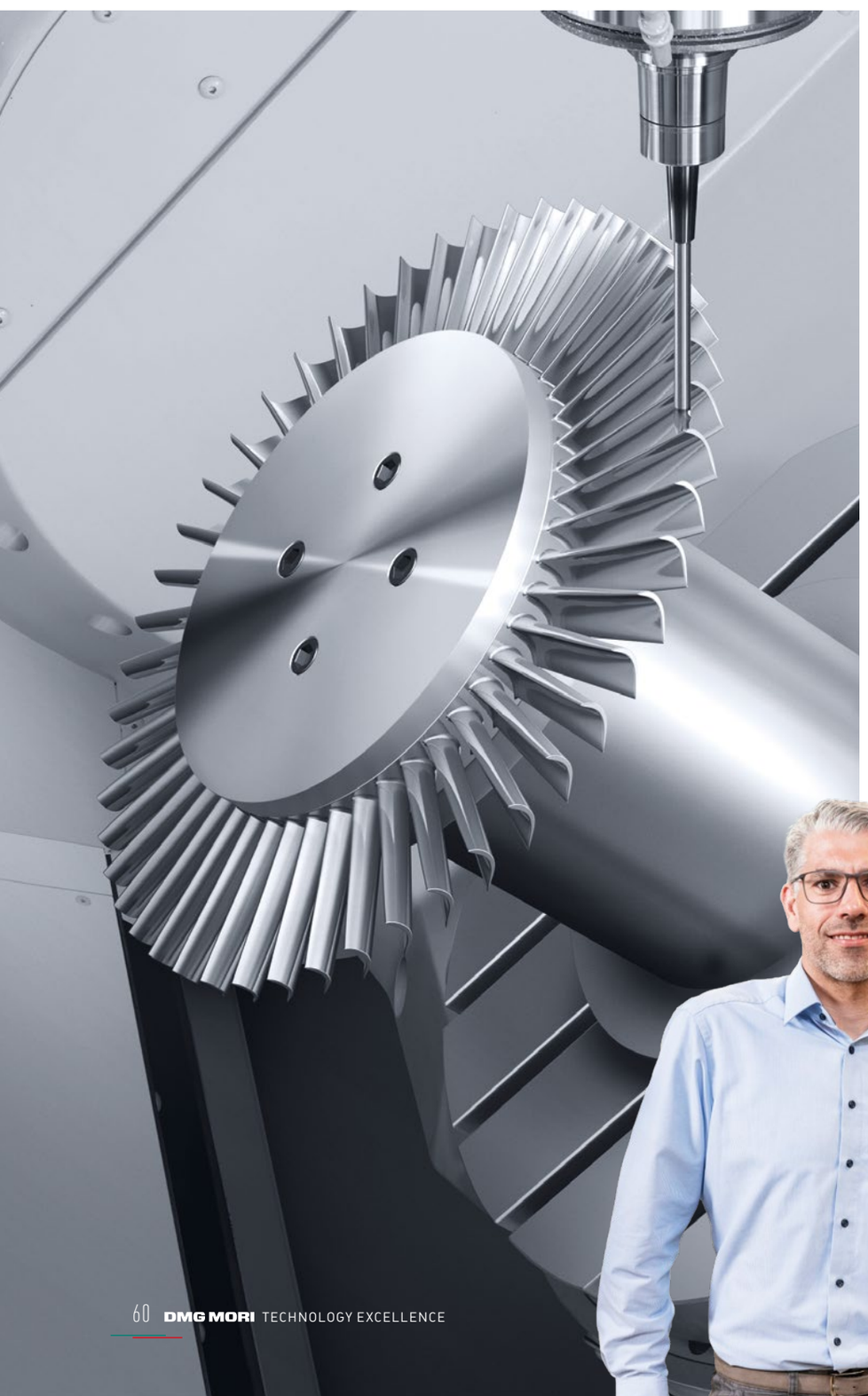
At least 3-times greater accuracy over the entire machining area.



5-axis machines from other manufacturers

		DMU/DMC 80 *µPrecision*	DMU/DMC 125 *µPrecision*	DMU/DMC 160 *µPrecision*	DMU/DMC 210 *µPrecision*	DMU/DMC 270 *µPrecision*	DMU/DMC 340 *µPrecision*
Volumetric accuracy	µm	13	15	20	20	25	30
Max. travel (X)	mm	800	1,250	1,600	2,100	2,700	3,400
Positioning uncertainty (X/Y/Z) in accordance with ISO 230-2	µm	3/3/3	4/3/4	4/4/4	4/4/4	6/6/6	8/9/8
Positioning uncertainty (B/C) in accordance with ISO 230-2	arc-sec	4/4	4/4	4/4	4/4	4/4	4/4

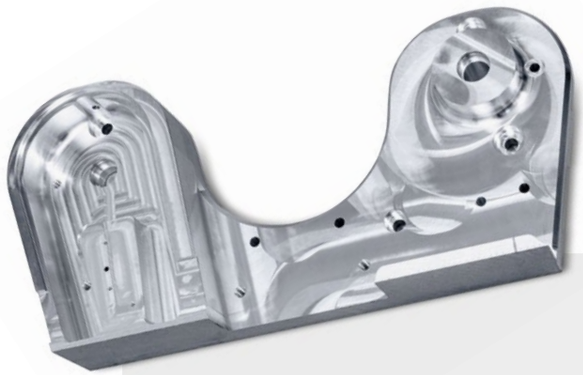
RELIABLE PARTNER
FOR CHALLENGING TASKS



Behrens Feinwerktechnik GmbH is the successor to Opaetz Werkzeugmacherei, which was established in Hamburg in 1913. Following continuous expansion of its manufacturing capability, the company relocated to nearby Rellingen in 1996, where more than 50 employees now manufacture demanding precision components. The company's clients come from general mechanical and systems engineering, medical engineering and also the aerospace industry. For more than 15 years, Behrens has relied on CNC machine tools from DMG MORI for its production – almost half of which is automated: Three NMV 3000 with AWC34 pallet magazine and an NLX 1500 with GX 05 gantry loader. The 5-axis simultaneous machining was also extended with a DMF 200 | 8, which was introduced in 2020 – a traveling column machine with an X-axis travel of 2,000 mm.

Our everyday business is dominated by quality, productivity and flexibility. We therefore rely on machines with automation from DMG MORI.

Philipp Steinke
Managing Director at Behrens Feinwerktechnik GmbH



Precision components for general mechanical and systems engineering – for sewer pipe inspection in this case – are just as much a part of the product range as aerospace components and medical engineering products

Quality, productivity and flexibility
A tour of the production area at Behrens Feinwerktechnik clearly reveals the factors that dominate everyday business: Quality, productivity and flexibility. Quality because the team machines complex components to an accuracy of a few tens of microns. Productivity because it is essential for cost-effective operation and competitive prices for customers. Flexibility because unexpected orders can be received at any time. "We therefore rely on machines with automation from DMG MORI. Particularly in the last year, we had a very stop-go order situation". Says Philipp Steinke, looking back at the business development. He manages the company together with shareholder Jörg Freitag, who took over Behrens Feinwerktechnik in 1988.

MANY YEARS OF EXPERIENCE IS THE GUARANTEE OF OPTIMUM MANUFACTURING PROCESSES

Good training leads to satisfied customers
As a partner to demanding customers, Behrens Feinwerktechnik guarantees these three factors in its advice to and in close collaboration with development and manufacturing staff at the customer. According to Philipp Steinke: "Our employees have many years of experience in providing optimum manufacturing processes and results". In order to ensure that this remains the case, Behrens Feinwerktechnik trains new junior employees at regular intervals (currently eleven). In the company's own training workshop, they first learn all of the basics of conventional machining before being introduced to the actual manufacturing – on modern machining centers and lathes from DMG MORI.

Unmanned shifts thanks to modern automation solutions from DMG MORI
The breadth of manufacturing at Behrens Feinwerktechnik is almost total. In addition to metal cutting procedures, there is also eroding and assembly. However, the core of the production is a diverse range of machines for milling and turning. "As a traditional contract manufacturer, we machine practically any material", explains Philipp Steinke, who started his career at Behrens Feinwerktechnik 15 years ago as a machine operator.

»

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 pallet locations optional**
+ For the **NMV 3000 DCG** or the **CMX 600 V with MAPPS**

Thanks to the gantry loader for workpieces up to ø150×120 mm, Behrens can also fully utilize the NLX 1500 overnight and at the weekend unmanned.

"The exciting thing about the job is the constant variety, always mastering new challenges in production. We succeed in doing this in an excellent way thanks to the good machine and automation solutions from DMG MORI".

In continuous operation for 12 years – NMV 3000 with 34-position pallet magazine

In order to make production more cost-effective, twelve years ago Behrens Feinwerktechnik invested in an NMV 3000 with AWC34. The AWC pallet magazine has room for 34 components with a diameter of up to 350 mm and 300 mm high, and is therefore ideal for the average batch sizes which are a part of everyday business. Two more NMV 3000 machines were installed in subsequent years – also automated with an AWC.

NLX 1500 with GX5 – automated 6-sided complete machining

The NLX 1500 with a GX 05 gantry loader followed in 2018, which loads the machines and removes and deposits the finished parts. The maximum workpiece dimensions of 2 times ø150×120 mm each and a workpiece weight of 5 kg are ideal for our requirements. The magazine of the gantry loader can be equipped with a sufficient number of components to allow the turning center to operate autonomously for several hours. "In this way, we can make full use of the unmanned third shift during the night and at the weekends", adds Philip Steinke. The specification of the NLX 1500 is also beneficial for productivity: "The counter-spindle and the driven tools allow us to machine components to completion in an efficient way, and above all on all six sides.

»

Robo2Go
ENTRY INTO WORKPIECE HANDLING

Available for the NLX 2500.
Other machines on request.

More information at:
robo2go.dmgmori.com

ONE APP FOR STANDARDIZED CONTROL OF ALL Robo2Go MODELS

+ Conversational programming without robotic knowledge
+ Programming window for workpiece teaching in < 15 min

Robo2Go

+ Rapid changeover from chuck to shaft part storage
+ Shafts ø25 – 1,150 mm, chuck components ø25 – 170 mm
+ Load capacity 10, 20 and 35 kg
+ Stacking magazine

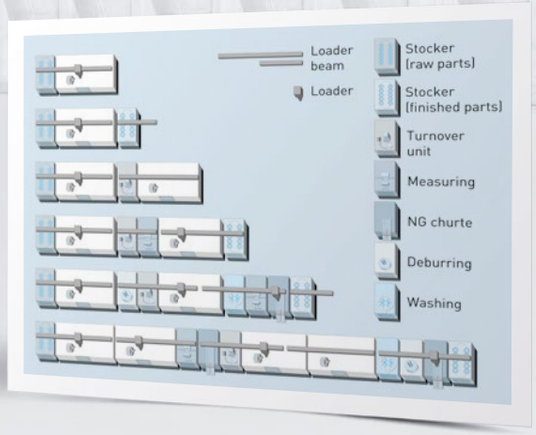
Robo2Go Vision

+ Robust 3D-camera detection, ideal for multi-job function
+ Supply and removal of unfinished and finished parts using pallets
+ Cylindrical chuck parts with ø25 – 175 mm and 20 – 250 mm in length

GX AND GX T

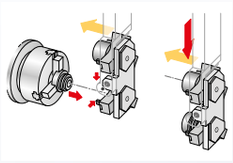
MODULAR GANTRY LOADER SYSTEM

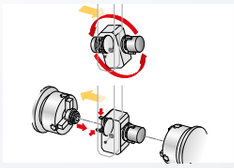
+ Automation of a machine
+ Linking of several machines

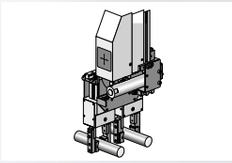


Examples of linkages and modules

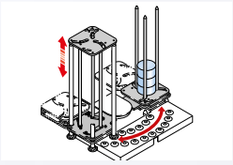
GRIPPERS

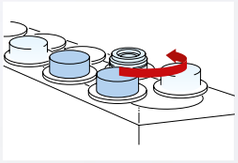

Double gripper for main spindle

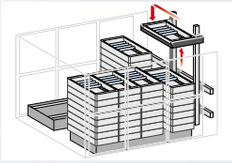

Double gripper for main and counter spindle

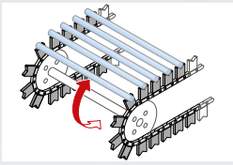

Double gripper for shafts

WORKPIECE STORAGE

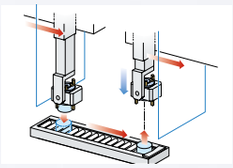

Stacking magazine for round, tubular or multi-sided material

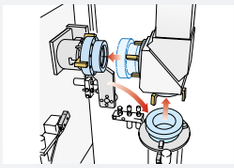

Magazine for irregularly shaped workpieces

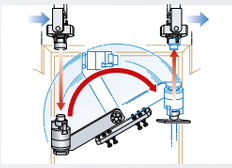

Rack stacking magazine

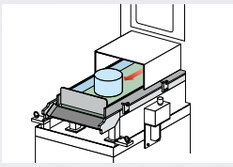

Shaft storage

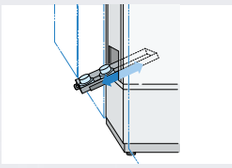
PERIPHERALS

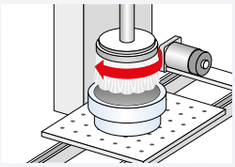

Transfer unit

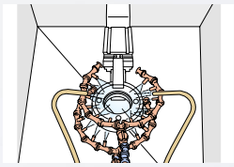

Loading unit

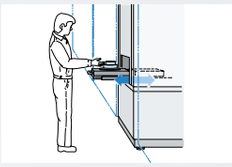

Transfer and tilt device

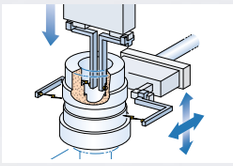

Loading and unloading belt


Workpiece chute


Deburring


Blow down


Quality control


Mechanical measuring


3D measuring

AVAILABLE FOR 12 MODEL SERIES WITH MORE THAN 40 MACHINE TYPES

	GX 3	GX 5	GX 5 T	GX 6	GX 7	GX 10 T	GX 15	GX 15 T	GX 35 T	GX 60 T
Max. Workpiece weight (kg)	2×3	2×5	2×5	2×6	2×7	2×10	2×15	2×15	2×35	2×60
Max. Workpiece size (mm)	ø150×100	ø150×120	ø150×120	ø180×140	ø150×120	ø200×150	ø200×150	ø200×150	ø315×300	ø450×500
Max. Number of pallet stations	14/20/26	14/20/26	14/20/26	10	14/20/26	10/20	10/20	10	15/24/40	12/24/40
Product overview	NRX 2000	NLX 1500, 2000	NZX-S	CLX 350	ALX	NLX 2500	ALX	CTX 2500/700	CTX beta 4A	CTX beta 2000 TC
		NLX 2500/500	NZX 1500/800			NTX 1000 – 3000			CTX beta TC 4A	CTX gamma TC
		NLX 2500/700	NZX 2000/800			NZX 1500, 2000				
						NZX 2500				

Quality control of all precision components

DMF 200 | 8: Precision to within tens of microns over a traverse of 2,000 mm

Behrens Feinwerktechnik experiences the same efficiency in the area of milling. The latest investment has been the DMF 200 | 8 – one of the first models to be delivered by DMG MORI. "We have replaced an older DMF model", says Philipp Steinke.

Development of the machine has been holistic. "The precision is particularly impressive". One of the reasons for this is the rigidity of the traveling column machine. The design has a consistent overhang throughout the entire working area, while a solid base is provided by a one-piece machine bed made from gray cast iron and three linear guideways in the X-axis. The possibility of machining 2,000 mm long components was one argument in favor of the DMF 200 | 8. According to Philipp Steinke, the other argument was the NC rotary table and the B-axis: "This enabled us to create redundancy for our DMU 80 eV0 *linear* for 5-axis simultaneous machining of this component size." Another DMF 200 | 8 innovation that is worth mentioning is the optimized tool change, which takes place behind the work table – quickly, collision-free and reliably, so that use can be made of the entire clamping area. Another advantage for Philipp Steinke: "The table is so wide that we can use it for several workpieces in parallel".

Maximized rigidity thanks to 3 linear guideways in the X-axis

DMF 200 | 8

RELIABLE MILLING PERFORMANCE OVER A 2,000 mm TRAVEL

+ **Reliable milling performance** thanks to consistent overhang
+ **Optimal surfaces and accuracy** thanks to direct drive in the Y-axis and Z-axis and an integrated cooling concept
+ **High flexibility** when machining thanks to the B-axis milling head with ±120° swivel range
+ **Large work area** with travels of X = 2,000 / Y = 800 / Z = 850 mm
+ **Unique and innovative tool change,** fast, collision free and reliably behind the work table

Among other things, precision components for general mechanical and systems engineering are manufactured on the DMF 200|8. Also aerospace components and medical products.

Automation and digitization: Innovative plans for the future

Innovation by installing new high-tech machines and raising productivity by means of flexible automation solutions will continue to be decisive considerations for Behrens Feinwerktechnik in the future. "Because of the pandemic, we suspended several projects and concentrated on ensuring continuity and stability in our everyday business", says Philipp Steinke, referring to the planned introduction of 3D printing and the expansion of digitization. The technical infrastructure for this is already in place. "Nothing therefore stands in the way of digital solutions such as the ones that DMG MORI provides".

The replacement of the first NMV 3000 is significant, since some of the workpieces are getting bigger: "A machining center from the DMU monoBLOCK series is under discussion as a replacement – automated with a PH CELL, of course", says Philipp Steinke. He appreciates DMG MORI as a competent partner in both automation and digitization: "The company has such a diversified portfolio that we can get everything from a single source, and only have a single contact for all matters."

«

BEHRENS FEINWERKTECHNIK FACTS

+ Established in Hamburg in 1919, relocated to Rellingen in 1996
+ About 50 engineers
+ Manufacturing service provider for customers from mechanical and systems engineering, medical engineering and aerospace

BEHRENS FEINWERKTECHNIK GMBH

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Industriestrasse 5
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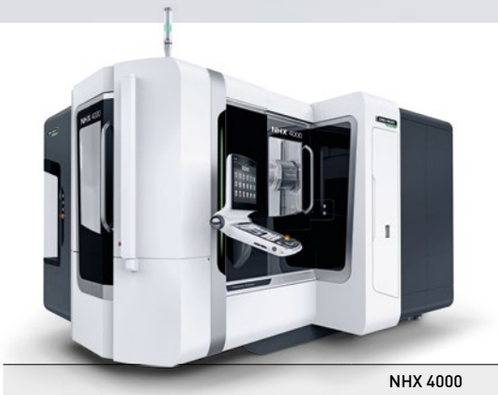
MORE THAN 750 PALLET-CHANGE AUTOMATION PROJECTS IN 10 YEARS

RPS – ROTARY PALLET STORE
(NHX 4000 / 5000)

+ 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. load
+ ø 800 × 1,000 mm max. workpiece dimensions



NHX HIGHLIGHTS

+ **speedMASTER spindles** up to 20,000 rpm or 250 Nm
  powerMASTER spindles up to 16,000 rpm or 1,413 Nm
+ **Chip conveyor with integrated tank and cyclone filter,** and 15 bar coolant supply
+ **Extended hydraulic clamping interface,** as "Auto-Coupler" (from below) and from above, for more automation flexibility

		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 standard	rpm	20,000		12,000			
	Nm	221		807			
Spindle option	rpm	15,000		Fast speed: 16,000 | High performance: 8,000			
	Nm	250		Fast speed: 528 | High performance: 1,413			
Control systems							
CELOS with SIEMENS		•	•	•	•		
CELOS with MAPPS on FANUC		•	•	•	•	•	•

● Available

CPP – COMPACT PALLET POOL

+ Up to 29 pallets
+ Max. 4 machines with 2 setup stations
+ 1,000 × 1,000 mm max. pallet size, 3,000 kg max. load
+ ø2,000 × 1,600 mm max. workpiece dimensions
+ DMG MORI MCC-LPS control computer and MCC-TMS tool management system

LPP – LINEAR PALLET POOL

+ Up to 99 pallets on 2 levels
+ Max. 8 machines with 5 setup stations
+ 1,000 × 1,000 mm max. pallet size, 3,000 kg max. load
+ ø2,000 × 1,600 mm max. workpiece dimensions
+ DMG MORI MCC-LPS control computer and MCC-TMS tool management system

We are always on the look-out for innovative solutions for optimizing our processes and acquiring new markets. We have found the ideal partner in DMG MORI.

Vince Ciccone
President and CEO of Top Grade Molds

TGM TOP GRADE MOLDS

You will find the complete Top Grade Molds customer story here:
https://dmgmori.com/top-grade-molds

MCC-LPS – CONTROL COMPUTER SOFTWARE FOR CPP AND LPP PALLET AUTOMATION

+ **Material stock:** Overview and planning, incl. raw material and finished part documentation
+ **Tool management:** including all tools and comparison lists
+ Fixtures: Overview, planning and documentation
+ **32 clamping areas per pallet** for multiple workpieces on towers
+ **Order prioritization** on the system or PC

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Publisher and responsible for the content: DMG MORI Global Marketing GmbH,
Walter-Gropius-Straße 7, D-80807 Munich, Tel.: +49 (0) 89 24 88 359 00, info@dmgmori.com
Circulation: 300,000 copies. Technical changes, availability and intermediate sale reserved,
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P20210267_0221EN1