CELOS® and DMG MORI Software Solutions.

CELOS®, the app-based control and operating system from DMG MORI, is as easy to use as your smartphone and networks all machines within a manufacturing organisation.
TRENDS AND INNOVATIONS IN 2016

ECOLINE – HIGHEST FUNCTIONALITY, BEST PRICE!

ecoMill V

Compact, efficient, dynamic and precise: the new ecoMill V range

More than 700 machines available immediately!

Browse our online list of immediately available machines, updated daily, and find your dream machine with the right configuration at: cnc-scout.dmgmori.com

View all available products and services: cnc-scout.dmgmori.com

CELOS® and DMG MORI Software Solutions

Perfectly organised processes through the networking of machines within a manufacturing organisation

DMG MORI SLIMline® multi-touch control

CNC Scout – Browse all readily available machines online at a glance.
Additive Manufacturing
Additive Manufacturing of 3D components to finished parts quality 6–7

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Key events – First half of 2016

+ MMTS, Montreal / CAN 16 May – 18 May 2016
+ Innovation Days, Chicago / USA 17 May – 20 May 2016
+ MECANICA, São Paulo / BRA 17 May – 21 May 2016
+ METALLOOBRAZOTKA, Moscow / RU 23 May – 27 May 2016
+ Grand opening, Moscow / RU 23 May 2016
+ BIEMH, Bilbao / ES 30 May – 4 June 2016
+ MACH-TOOL, Pocna / PL 7 June – 10 June 2016
+ Innovation Days, Iga / JP 7 June – 11 June 2016
+ Open house, Bielefeld / DE 14 June – 17 June 2016
+ CIMES, Beijing / PRC 22 June – 26 June 2016
+ Opening, Stipschausen / DE 29 June – 1 July 2016
President Jodai Takanori speaking about his ecoMill V with positioning accuracy of 6 µm.

President Jodai Takanori describes his vision: ‘To minimise throughput times with as few machines as possible. We have a wide range of parts required in low quantities, yet also short lead times. Our objective is the just-in-time Toyota production system.’ The company mainly machines valve seats, components for shock absorbers and gears for the automotive industry, high-precision sintered components for sliding contacts in train pantographs and heavy machinable materials such as carbon. The key factor in improving productivity is set-up. ‘A huge advantage of the ecoMill V is its excellent accessibility, which makes it easy for us to exchange the workholding fixtures. Additionally, the large working area allows us to use multiple clamps for up to 30 workpieces. The machine’s outstanding positioning accuracy of under 6 µm is a crucial factor in the quality of our products. So far we have not had to reject a single part. The spindle load display also helps with precision as we now know exactly when a tool has to be changed. The high-speed spindle rated at up to 12,000 rpm served by the magazine for 30 tools allows us to reach high machining speeds and quickly respond to orders with short delivery times; this greatly improves the competitiveness of the company. Another advantage of the ecoMill V is its beautiful design’, says the president. ‘When customers visit our factory, they are very impressed by the machine and they justifiably get a good feeling about its quality. The chip removal is also optimal and the working area is very easy to keep clean.’

President Jodai Takanori speaking about his ecoMill V with positioning accuracy of 6 µm.

ecoMill V – Maximum precision at an unbeatable price!

- MAXIMUM PERFORMANCE AND EFFICIENCY
  with 12,000 rpm milling spindle (standard)
- MAXIMUM PRECISION
  with directly coupled ball screws
- RAPID TOOL MAGAZINE
  with 30 tools (standard)
- PERFECT ERGONOMICS
  for efficient loading and unloading
- VISIBILITY AND ACCESSIBILITY
  with the large working area and 850 mm table height
- MAXIMUM RELIABILITY
  wear and scratch-resistant surfaces

Sandvik Coromant Tool Kit for the ecoMill V range

Purchase an ECOLINE machine and get a Tool Kit from our technology partner Sandvik Coromant at a special price. The Tool Kit contains tools, tool carriers and inserts so you can get your productions under way as quickly as possible. Thanks to our technology partnership with Sandvik Coromant, you can take advantage of tool packages optimally suited to ECOLINE and personalised advice.
19” DMG MORI SLIMline® multi-touch control – intuitive interface for quick and easy operation.

MAXIMUM RELIABILITY

+ 3D control technology
+ Better view with the 19” multi-touch monitor
+ Improved control and overview of the machine status
+ Panel features a 45° swivel range for more convenient operation
+ DMG MORI SMARTkey®

MORE EFFECTIVE OPERATION

+ Quick and easy access to parameters and user data
+ Management and documentation of job and process data
+ Efficient data management with DXF Import (optional)

MORE OPERATING COMFORT

+ Simplified process for reliable touch control with full ASCII keyboard
+ The latest version of ShopMill
+ Elements optimised for the touchscreen
+ 3D simulation with touch-based functions

19” DMG MORI SLIMline® with MAPPs IV on FANUC control system.

+ MAPPs IV user system with control console and front-end Windows PC
+ 3D machining simulation for easy contour verification
+ CNC operation through use of the external and user storage area
+ Import and release of programs using external PCs
+ File display and note function for accessing operating instructions, drawings and texts

ø 80 × 98 mm
Milling head // Toolmaking
Material: Stainless steel (grade 1.4305)
Machining time: 40 min.

150 × 150 × 70 mm
Demo part // Mechanical engineering
Material: Steel (grade 45)
Machining time: 2 min.

ø 180 × 15 mm
Adjusting ring // Mechanical engineering
Material: Aluminium
Machining time: 19 min. 13 sec.
Additive Manufacturing of 3D components to finished parts quality.

LASERTEC 65 3D – Laser deposition welding and 5-axis milling intelligently combined.
ULTRASONIC

World première:
ULTRASONIC 20 linear – HSC milling at up to 60,000 rpm as well as ULTRASONIC grinding and milling at up to 50,000 rpm and with a CELOS® app.

+ HSC milling at up to 60,000 rpm*
+ ULTRASONIC external / internal cylindrical grinding with turn-mill table rated up to 1,500 rpm*
+ CELOS® with built-in ULTRASONIC app for automatic frequency and amplitude detection and tracking*

* Optional

The new ULTRASONIC 20 linear makes ULTRASONIC grinding, drilling and milling as well as HSC milling possible on one machine.

Save the date:
Opening Stipshausen
29 June – 1 July 2016

LASERTEC 4300 3D – Laser deposition welding with built-in 6-sided turn & mill complete machining of workpieces up to 660 x 1,500 mm and 1,500 kg.
Box ways in all axes and the turret with BMT® technology make it deal for heavy machining.

The right solution for every application – the NLX range with 12 machines.

NEW: Besides the NLX 2500SY | 700, the NLX 2500Y | 700 is now also being built by GILDEMEISTER Italiana S.p.A. in Brembate di Sopra, Bergamo, Italy.

- Chuck components up to ø 460 mm or 366 mm with Y axis, maximum chuck size ø 300 mm (12”)
- Bar machining up to ø 80 mm
- 100 mm Y axis (Y and SY configuration) for eccentric machining
- BMT® turret (built-in motor turret) rated at 10,000 rpm for milling performance similar to that of machining centres and up to 20 tool positions
- BMT60 interface, optionally with VDI-TRIFIX® (12 positions)
- CELOS® with MAPPS on MITSUBISHI

Find out more about the NLX range at: nlx.dmgmori.com
Download the brochure for the NLX range: download.dmgmori.com

NLX RANGE

- Chuck size (inches and mm)
  - 500
  - 700
  - 1,250
  - 1,500
  - 2,000
  - 3,000

NLX 2500SY | 700

- The success story with counter spindle and Y axis.

Machining time: 17 min. 43 sec

NLX 2500SY | 700

- Tensioner // Automotive
  - ø 81 x 147 mm
  - Material: S45C
  - Machining time: 17 min. 43 sec

NLX 2500SY / 700

- The success story with counter spindle and Y axis.

Machining time: 19 min. 10 sec

NLX 2500SY / 700 – 6-sided machining with main and counter spindles and a turret with a 100 mm Y traverse.

From a 2-axis turning machine to complete machining in 6 degrees of freedom with a counter spindle and Y axis, the NLX range has something for every application.

- Box ways with a width of up to 180 mm in all axes with optimal damping characteristics and dynamic stiffness
- Temperature control solution, built-in coolant circulation in the machine bed for improved thermal stability
- BMT® turret (built-in motor turret) at up to 10,000 rpm or 117 Nm for milling performance comparable to that of a machining centre
- Various automated components available, including bar loader and portal loader

NLX RANGE

- Chuck size (inches and mm)
  - 500
  - 700
  - 1,250
  - 1,500
  - 2,000
  - 3,000

NLX 2500SY | 700

- The success story with counter spindle and Y axis.

- 10,000 rpm
- 100 mm Y axis

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Download the brochure for the NLX range: download.dmgmori.com

NLX RANGE

- Chuck size (inches and mm)
  - 500
  - 700
  - 1,250
  - 1,500
  - 2,000
  - 3,000

NLX 2500SY | 700

- The success story with counter spindle and Y axis.

- 10,000 rpm
- 100 mm Y axis
50% higher precision and speed with the high-precision turret and active cooling.

+ Chuck components up to ø 410 mm, chuck up to ø 400 mm (16")
+ and bar machining up to ø 102 mm
+ 6-sided complete machining with the optional counter spindle rated at up to 360 Nm
+ < 10 μm tolerance on diameter
+ < 10 μm thermal stability with active cooling
+ 80 bar coolant pressure at every tool position
+ 50% higher driven tool speed, continuous operation 100% DC with 6,000 rpm
+ 12-position VD40 disc-type turret with 10 / 10 kW, 36 / 28 Nm (40 / 100% DC)
+ Linear drive in the X axis with 1g acceleration, maximum precision and a 5-year warranty
+ CELOS® with Operate on SIEMENS

< 10 μm thermal stability through active cooling of the turret disc and the tool drive.

Gerd Birkenkamp (left), Managing Director of Siefer Trigononal®, speaking about his NLX 4000 | 1500.

Under the Trigononal® brand, Wilhelm Siefer GmbH & Co. KG produces mixing and grinding machines for working with low to high-viscosity products in the form of liquid mixtures or sols in liquids. Since early 2015, an NLX 4000 | 1500 with a BMT® turret for driven tools rated at up to 100 Nm has strengthened the firm’s production capability. ‘We work exclusively with stainless steels and therefore rely on powerful manufacturing technology’, says Managing Director Gerd Birkenkamp. The stability of the NLX machine is important as the basis of excellent, long-term precision on the μm scale. In the same context, he also praises the coolant circulation built into the machine bed and the resulting high thermal stability. Additionally, the decisive productivity factor is the option to carry out turning and milling in one set-up with the Y and C axes, as quantified by Birkenkamp: ‘Complete machining has cut throughput times by at least 60% in some cases.’

The absolute magnetic concept of the SR67A / 27A series guarantees:
+ 200 m/min response speed for high-speed applications
+ High resistance to vibrations and shock for optimal material removal rates. The SR67A’s vibration resistance is 250 m/s² and the shock resistance is 450 m/s²
+ It has the same coefficient of thermal expansion as steel for minimal temperature influence
+ Up to 0.01 μm resolution for highly precise measurements
+ Resistant to moisture, oil mist and dust for high reliability, even in harsh environmental conditions

CTX beta 500 linear and

CTX beta 800 linear –

50% higher precision and speed.

Magnetic absolute length and angle measurement systems are the perfect solution for optimising the performance of machine tools.

With a high response speed of up to 200 m/min, the SR67A/27A linear scales are the perfect solution for highly precise, dynamic machine tools with linear motors. Additionally, their high robustness makes them ideal for heavy machining.
New compactMASTER® turn-mill spindle

120 Nm torque, 200 mm Y axis.

CTX beta 800 TC with the compactMASTER® turn-mill spindle – the valuable advantage over every universal turning machine.

- 100 % universal turning
- 100 % milling: 120 Nm and 200 mm Y axis
- 100 % more tools as standard (24 positions), optional chain magazine for up to 80 positions
- Optimal milling tools with the Direct Drive B axis with ±110° swivel range, steplessly indexable
- Multi-tools – short chip-to-chip times similar to those of a turret machine
- Optimal accessibility, with a working depth of just 350 mm to the spindle centre
- CELOS® with Operate on SIEMENS

Find out more on page 16

Download the brochure for the CTX TC range: download.dmgmori.com

View the CTX beta 800 TC video

Find out more about the CTX TC range at: ctx-tc.dmgmori.com
DMG MORI COMPONENTS

compactMASTER® — Turn-mill spindle with similar milling power to that of a machining centre.

- 530 cm³/min material removal rate*
- Face milling head ø 63 mm // a₀ = 30 mm // a₁ = 10 mm
- Spindle speed: 1,768 rpm (Vc = 350 m/min)
- M20 threads*
- Thread size M20 × 2.5 mm // Spindle speed 606 rpm

*CK 45 // compactMASTER® rated at 120 Nm

<table>
<thead>
<tr>
<th>Size compactMASTER®</th>
<th>CTX beta TC</th>
<th>CTX gamma TC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spindle length</td>
<td>350 mm</td>
<td>450 mm</td>
</tr>
<tr>
<td>Speed</td>
<td>12,000 / 20,000 rpm</td>
<td>12,000 rpm</td>
</tr>
<tr>
<td>Torque</td>
<td>120 Nm</td>
<td>220 Nm</td>
</tr>
</tbody>
</table>

CTX TC – Turn & mill complete machining: From universal machining to production turning with a second tool carrier.

World première: CTX gamma 3000 TC – 800 mm X-axis travel and the new compactMASTER® turn-mill spindle rated at 220 Nm torque.

NTX Turn & mill complete machining

- ø 65 mm (optional) bar machining (ø 52 mm as standard)
- ø 430 mm (150 mm / 6 inches chuck size as standard)

4-sided complete machining with main and counter spindles; maximum productivity with two tool carriers.

NTX 1000 – Production turning with a second tool carrier.

- Direct Drive (DDM® technology) in the B axis for 5-axis simultaneous machining of complex workpieces for the medical, tool, aerospace and automotive industries: ±120° swivel range in the B axis and 100 rpm rapid traverse
- Capto C5 turn & mill spindle rated at up to 20,000 rpm, 12,000 rpm as standard
- Synchronous machining with 5-axis simultaneous spindle
- Bar machining of complex workpieces up to ø 65 mm in diameter, 52 mm as standard; chuck up to 200 mm in diameter
- Workpieces up to 800 mm in length and 430 mm in diameter

CTX beta 800 TC – fully turn-ready as a universal package.

(Incuding chuck, chip conveyor, internal coolant supply, 2 x multi-tools etc.)
NEW: SPRINT 2018 – For machining workpieces up to ø 20 × 600 mm in a footprint of under 2 m².

- 6 linear axes and 2 C axes
- 25 tools on three independent tool carriers for 4-axis machining at the main spindle
  - 4 driven tool positions for the main spindle (radial)
  - 2 stationary deep-hole drilling tool positions for the main spindle (frontal)
  - 4 driven tool positions for the counter spindle (axial and/or radial)
- Long workpieces measuring up to 600 mm are discharged through the counter spindle*
- SWISSTYPEkit* for short and long part turning on one machine, set-up time of less than 30 minutes
- 20 % shorter tool change times with the quick tool-change system*
- High pressure coolant* up to 120 bar
- FANUC 32i-B with 10.4” colour display

* Optional

SPRINT 2018 | 8
6 linear axes and 25 tools on 3 independent tool carriers.

Delivery times starting at just two weeks!*
BURGMAIER TECHNOLOGIES GMBH + CO. KG

‘The SPRINT 65 allowed us to improve our process reliability and cut our previous machining times by 50%.’

BURGMAIER has specialised in the manufacturing of precision turning components for the automotive industry as well as the hydraulic and electronics sectors for over 80 years. It employs more than 750 personnel at four locations in Germany, France and Slovakia. In the field of turning, BURGMAIER has worked closely with DMG MORI for many years. When placing an order for eight SPRINT 20 machines, it also decided to invest in a SPRINT 65. ‘That allowed us to successfully avoid a short-term production bottleneck,’ recalls COO Gunnar Deichmann.

With the SPRINT 65, BURGMAIER manufactures injector components for a common rail injector for HGVs straight from bar, which eliminates the idle times previously caused by tool changes. ‘This also improves our process reliability, and the machining precision is extremely high,’ explains fellow manager Johann Bernhard. The tolerance is reliably 0.02 mm, whilst flatness and parallelism are an impressive 0.004 mm and 0.008 mm. With these turrets, a swivelling B axis and 36 special tools, the SPRINT 65 is immensely productive. The experience of the high-precision turners and the modern CNC technology from DMG MORI have cut throughout times for this process by 50%. Gunnar Deichmann summarises: ‘For large batches of 10,000 parts, this is an enormous gain.’

CTV  Production turning

For over 100 years, SPECK PUMPEN Walter Speck GmbH & Co. KG in Roth has manufactured pumps and pumping systems for industrial applications. Customers in the medical technology, chemical and plastics industries, for example, count on the quality and reliability of these specialised products. Whereas CNC technology from DMG MORI has been dominant in manufacturing since the turn of the century, automated systems from DMG MORI Systems have also been playing a significant role since 2010. DMG MORI Systems has optimised the production of motor bearing assemblies, for example, by integrating a CTV 160 and a DMC 635 V. In 2015 an almost identical system – a MILLTAP 700 with a DMC 635 V – was added.

‘The output of the two systems is enormous’, remarks Dieter Meier, Head of Mechanical Production. Every year, SPECK manufactures more than 250,000 die-cast aluminium bearing assemblies.

BURGMAIER TECHNOLOGIES GMBH + CO. KG

Managing Director Gianluca Marchetti (left) and Corrado Breveni from DMG MORI Italia (right).

M.T. S.R.L.

‘We can now produce workpieces with roundness of 0.5 µm and surfaces of such quality that they might have been ground.’

Founded as a contract manufacturer for highly complex machine components in 1972, M.T. S.R.L. has continuously expanded its range of services. Today, the company, based in Marignano, Italy, produces a wide range of driven and stationary tool carriers. In order to expand its production capacity even further, in 2015 Managing Director Gianluca Marchetti invested in a WASINO automated turning machine: ‘The highly precise WASINO G100i/480 (formerly G-07) is ideal for batch sizes from 50 to 1,500 components.’ He believes that the range is the perfect addition to the turning machines offered by DMG MORI.

BURGMAIER Technologies GmbH + Co. KG

Managing Director Gianluca Marchetti (left) and Corrado Breveni from DMG MORI Italia (right).
Christian Thönes  
Chairman of the Executive Board  
DMG MORI AKTIENGESELLSCHAFT, Bielefeld

‘With CELOS® and our DMG MORI Software Solutions we are accompanying our customers on the path to digital production.’

What does Industry 4.0 mean to DMG MORI? For us, Industry 4.0 means supporting our customers with their digital transformations by providing holistic solutions. The value to the user is always at the heart of our solutions. This is demonstrated by examples such as those of Porsche Motorsport and Schaeffler Technologies in this edition.

How does DMG MORI support its customers? One central component is CELOS® with its 16 apps. Job, process and machine data can be managed, documented and visualised both on the control system and on the PC. CELOS® also exchanges information with higher-level software systems, thereby building a bridge between the IT landscape and production.

So nothing will work without software soon? A lot works better with software! This is shown by our DMG MORI Software Solutions such as the DMG MORI process chain and the DMG MORI Virtual Machine. Supported by a digital simulation of the real production process, maximum process reliability and product quality are guaranteed before the first cut is made.

Another example is the suite of 24 DMG MORI technology cycles. With conversational programming, users can create the NC program up to 60% faster. Additionally, we provide our customers with the new i4.0 sensor package for optimised data handling, improved precision and better process reliability.

CELOS® networks the organisation and planning of Porsche with the production capacity of DMG MORI.

DMG MORI Software Solutions for digital production.

CELOS® networks the organisation and planning of Porsche with the production capacity of DMG MORI.

1. ORDER
   - Order / CAD data from Porsche
   - The developers at Porsche send CAD data for the component to the Porsche Motorsport CNC Competence Center.

2. PROCESS PLANNING
   - DMG MORI Software Solutions and CELOS® apps for job preparation and process planning.

1. CAD DATA
   + The developers at Porsche send CAD data for the component to the Porsche Motorsport CNC Competence Center.

2. CAD-CAM / SIMULATION
   - DMG MORI process chain
   - Programmer 3D turning
   - DMG MORI Virtual Machine

CELOS® PC VERSION
   - Job Manager
   - Job Scheduler
   - Tech Calculator
   - Documents

PORSCHE MOTORSPORT CNC COMPETENCE CENTER IN SEEBACH
   + The focus: long-term technology transfers
   + Five DMG MORI personnel are working in two-shift operations to produce Porsche components
   + The current machine installed: CTX beta 800 TC with CELOS®
   + The current machine installed: HSC 70 linear with CELOS®
   + The current machine installed: DMU 60 eVo FD with CELOS®

The video on the Porsche Motorsport CNC Competence Center Seebach

You can find more information on the technology partnership with Porsche at microsite.dmgmori.com
A successful partnership enters the third round: DMG MORI is once again supporting the Porsche LMP1 team as it competes for podium finishes at the 2016 FIA World Endurance Championship (WEC). As a leader in innovation, DMG MORI supplies the Porsche team with the most cutting-edge manufacturing technology. In the Porsche Motorsport CNC Competence Center at DECKEL MAHO in Seebach, DMG MORI combines decades of machining expertise with the latest software.

**CELOS® – Taking the lead with consistent process organisation**

By late 2015, DMG MORI had manufactured more than 60 different components with a total quantity of over 2,300 individual parts for the Porsche team. The parts range from complex housings for pumps and electrical motors to intricate attachments for the innovative braking system. The developers in the Porsche LMP1 team supply the necessary CAD data for these components. From then on, the machining experts in Seebach take charge of the entire process ending in the finished workpiece.

For DMG MORI and the Porsche team, CELOS® has proven to be a cornerstone of their partnership. All machine tools in the Motorsport CNC Competence Center are equipped with CELOS®. The team also has access to the PC version of CELOS®.

The PC version of CELOS® serves as centralised planning and management software. The individual orders are completely detached from the machines by a control station. The Job Manager compiles NC programs, setup plans and tools into a single job package. As a result, no paper technical drawings or documentation are to be found at the Porsche Motorsport CNC Competence Center. The Job Scheduler then plans the jobs in detail and assigns them to one specific machine. Using the CELOS® control console, the user can then view the current status as well as the effects of last-minute changes. In addition to its planning and management tools, as a control console CELOS® can retrieve data from all connected machine tools in real time. The stored data can then be used to carry out operational analyses in order to optimise production in the short and medium terms. The networking of the machines in combination with the continuous recording of real-time data is an important step towards Industry 4.0.

With CELOS®, the Porsche Motorsport CNC Competence Center of DMG MORI manufactures the highest quality components in perfectly organised processes.
24 exclusive DMG MORI technology cycles

Software Solutions to make complex machining processes an effortless reality – conversational programming.

MPC 2.0 – Machine Protection Control
+ Shutdown in case of critical vibration conditions
+ Vibration sensors on the milling spindle
+ NEW: Cutting force monitoring for drilling and threading
+ NEW: Imbalance display at idle speed
+ NEW: Upgrade for all milling and mill-turn machines with MPC Version 1.0

Easy Tool Monitoring 2.0 – tool monitoring system
+ Prevention of damage through controlled stoppage of the spindles and axis feeds in the event of tool breakage or overload
+ Immediate feed stop: Spindle stops in one second (tool retraction from workpiece)
+ Sensor-free automated learning of load limits
+ For turning, milling and drilling operations

Multi-thread cycle 2.0
+ Creating large movements such as for special threads which cannot be produced by simple thread cutting
+ Free definition of contours, pitches and thread angles
+ On-point position – position-based thread generation

Download the brochure with all 24 DMG MORI technology cycles:
download.dmgmori.com
NC program conversion

Use legacy programs on new machines! Save time and let us convert your programs now!

+ New DMG MORI machines can immediately work effectively
+ Programs are quickly available
+ Cycles installed on the legacy machine are supported
+ Programs can be designed for special machines; special features are taken into account
+ Additional ramp-up support available from DMG MORI Academy trainers (e.g. for setting up workpieces)
+ Time-saving service, no additional personnel required to re-write programs
+ Ideal for new machines with CELOS® by DMG MORI

Additional ramp-up support available from DMG MORI Academy trainers (e.g. for setting up workpieces)

The shortest possible production start-up with the conversion of more than 500 legacy programs!

When replacing an old turning machine with a new, more powerful CTX beta 800 4A, it would have been necessary to completely rewrite all existing programs for the new machine type. The NC program conversation service from DMG MORI was the perfect solution. Within just one week, all 535 legacy programs were adapted for the new, specific machine concept and converted into the new control format.

Your DMG MORI representative:
Jörg Harings
Tel.: +49 (0) 52 05 / 74 25 03
joerg.harings@dmgmori.com

ZAHORANSKY Formenbau GmbH
Bebelstraße 11a, D-79108 Freiburg
info@zahoransky.com, www.zahoransky.com

'Using 1:1 simulation in the DMG MORI Virtual Machine, we were able to shorten our set-up time by 30%.'

The DMG MORI Virtual Machine is a 1:1 simulation of the DMC 160 H duoBLOCK®, including the actual control system.
Ready for the next industrial revolution.

CELOS®, the app-based control and operating system from DMG MORI, is as easy to use as your smartphone and networks all machines within a manufacturing organisation.

CELOS® by DMG MORI is a holistic, app-based control interface with a unique multi-touch screen for all new high-tech DMG MORI machines. Thanks to app-based structuring, CELOS® is as easy to use as your smartphone. With the unique multi-touch display, CELOS® apps facilitate the consistent management, documentation and visualisation of order, process and machine data. 16 apps help the operator prepare, optimise and process production jobs without any errors. The CELOS® app Condition Analyzer serves as a platform for visualising, analysing and predicting the status of all machines.

CELOS®, the app-based control and operating system from DMG MORI, is as easy to use as your smartphone and networks all machines within a manufacturing organisation.

CELOS® INFO HOTLINE
We are happy to help with any queries and provide assistance with operating CELOS®.
Tel.: +49 (0) 83 63 / 89 51 00
Email: celos@dmgmori.com

View the video on CELOS®
Find out more about CELOS® at:
celos.dmgmori.com
Download the CELOS® brochure:
download.dmgmori.com
Last year, DMG MORI presented an Industry 4.0 project developed in collaboration with its technology partners. Based on the DMC 80 FD duoBLOCK®, DMG MORI presented a machine tool equipped with more than 60 sensors that transmitted digitised information on components from the sensors to the cloud for the purposes of data collection, storage and analysis. The objective was constant status monitoring within the machine. The app-based control and operating system CELOS® supports the interaction between human and machine.

This generates benefits for users in two ways. The Condition Analyzer visualises the process parameters in CELOS®, allowing prompt power and status analyses to be carried out on the machine. Additionally, the recorded data are compiled within a cloud architecture and analysed with special algorithms.

Schaeffler Technologies in Höchstadt an der Aisch is working out how to convert the data into practical machining knowledge. A DMG MORI pilot machine has been in ongoing operation there since late October 2015. Schaeffler considered the opportunities highly diverse. They range from better management of the machining process, e.g. in order to focus more on tool wear, to lower energy or lubricant consumption. Likewise, on the basis of empirically determined ‘behaviour patterns’, the transferred status data can be used to make qualified predictions about potential damage to the spindle.

The first step has been taken towards the future of machining and the results are very promising. However, it is still too early for a definitive evaluation. However, Schaeffler expects to produce valid findings before the end of the year. ‘The important thing is that we have started and will gradually learn how Industry 4.0 works in practice from a real production facility’, says Martin Schreiber, Head of Production Machines at Schaeffler Technologies AG & Co. KG.
The benchmark in 5-axis machining.

- **powerMASTER** – Motor spindle with 1,000 Nm torque,
- 77 kW and Spindle Growth Sensor (SGS) compensates for spindle growth to ensure maximum precision
- The highest flexibility and shortest machining times with the new B axis with 20% higher stiffness and integrated cable carrier
- Large workpieces of max. 950 mm diameter and 1,450 mm height and a max. load of 1,500 kg
- 5X torqueMASTER – 1,300 Nm, 37 kW, SK50 / HSK-A100 and up to 8,000 rpm
- Powerful speedMASTER spindle as standard rated at 15,000 rpm, 35 kW and 130 Nm (40% DC)
- Rapid, innovative wheel magazine with a tool change time of 0.5 second and up to 453 tools in spite of its minimal footprint

**DMU 80 P duoBLOCK**

30% lower energy consumption.

E.g. up to 80 bar as standard with the new, efficient, frequency-controlled high-pressure pump.
Grinding technology cycle for mill-turn machines.

- NEW: The integrated acoustic sensor in the spindle detects the initial contact between the grinding wheel and workpiece.
- For internal, external and face grinding.
- Dressing cycles for dressing the grinding wheel.
- Unrivalled surface quality with built-in grinding technology.
- Optimal profitability in production as only one set-up is necessary.

More on DMG MORI technology cycles on page 16.

The right solution for every application – the duoBLOCK® range with the world premiere 4th generation DMU 160 P duoBLOCK® for large workpieces measuring up to 1,600 mm.

### DMG MORI TECHNOLOGY CYCLES

<table>
<thead>
<tr>
<th>Load (kg)</th>
<th>X traverse (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4,500</td>
<td>1,600</td>
</tr>
<tr>
<td>2,800</td>
<td>1,600</td>
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<td>2,000</td>
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<td>1,500</td>
<td>1,600</td>
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<tr>
<td>800</td>
<td>1,600</td>
</tr>
<tr>
<td>1,250</td>
<td>800</td>
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<tr>
<td>80</td>
<td>800</td>
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</table>

DMU 50 – the entry point into 5-axis machining.

A GLOBAL PRODUCTION CONCEPT – IN THE MARKET, FOR THE MARKET
Local production ensures short delivery times and a holistically high standard of quality.

![DMU 50 - Entry Point Into 5-Axis Machining](image)

- Powerful NC swivelling rotary table for 5-axis simultaneous machining with a high degree of stiffness.
- Heavy loads up to 100 kg.
- High-performance inline spindle rated at 14,000 rpm as standard, optionally 18,000 rpm.
- Digital drives with 30 m/min rapid traverse as standard.
- Tool magazine can be populated during machining with up to 60 tools.
- CELOS® by DMG MORI with SIEMENS and 21.5" ERGOline® Control with multi-touch monitor.
- HEIDENHAIN iTNC 530 with 19" ERGOline® control console.

![NC Rotary Table Swivel Range](image)
PORTAL  5-axis universal milling machines

**MJM METALWORKING MANGNER GMBH**

‘With 5-axis simultaneous machining on the DMU 340 P, I can meet all of the quality requirements of my customers whilst reducing the throughput times!’

MJM Mangner Metallverarbeitung GmbH

MJM started with one used machine in 1997. Today, the family-run company has several factory units in which more than 100 highly qualified experts provide a holistic range of services in both sheet metal working and in mechanical production. MJM has positioned itself as a service provider to major players in the mechanical engineering, rail and transportation and pharmaceutical industries. In terms of mechanical production, MJM relies on a total of 30 machining centres and turning machines from DMG MORI. With its latest investments including two DMU 210 P and two DMU 340 P machines, MJM has entered a brand new field of business as a supplier to the mould making industry. The maximum traverses are 3,400 × 3,400 × 1,600 mm and the maximum table load is 16 t. The DMU 340 P and DMU 210 P meet more machining requirements than just enormous component sizes. ‘If you want to make a name for yourself as a supplier in the field of mould making, you have to deliver the best quality’, explains Jürgen Mangner, founder and owner of MJM. With the portal machines from DMG MORI, the service provider is able to meet the high precision standards of its customers. ‘5-axis simultaneous machining with the B axis is another good example of efficiency.’ It is ultimately a question of reducing lead times for customers whilst keeping the machining results the same. ‘To optimise the utilisation of the machines, we let workpieces with long machining times run overnight and at the weekend.’

**DMU 210 P world première**

**2nd generation with 5X torqueMASTER® for maximum cutting performance.**

- Expanded swivel range of 250° and optimised milling head interference contour
- Maximum long-term precision with cooled linear guideways and active spindle growth compensation
- 80 % higher torque with 1,800 Nm from the 5X torqueMASTER®
- Innovative wheel magazine for up to 243 tools (SK50 / HSK-A100) with a minimal footprint
- The widest range of spindles on the market

<table>
<thead>
<tr>
<th>THERMAL CONTROL</th>
</tr>
</thead>
<tbody>
<tr>
<td>+ Cooled drive motors</td>
</tr>
<tr>
<td>+ Cooled ball screws</td>
</tr>
<tr>
<td>+ Cooled linear guideways</td>
</tr>
<tr>
<td>+ Cooled gears in the rotary axes</td>
</tr>
<tr>
<td>+ Sensor-based spindle compensation</td>
</tr>
<tr>
<td>+ Cooled machine bed</td>
</tr>
<tr>
<td>+ Optional: Machine bed temperature control</td>
</tr>
</tbody>
</table>

Jürgen Mangner, the owner of MJM, is impressed by the precision of the portal machines from DMG MORI.
World premiere DMU 600 G linear: The new high-gantry large machine with a table load of up to 150 t.

- High-gantry design with a maximum table load of 150 tonnes
- Direct Drive technology in all axes for unrivalled surface quality and highest dynamics (linear motors: X, Y, Z axes; torque motors: A, C rotary axes)
- Temperature control – Extensive cooling for maximum temperature stability, ensuring consistently high precision
- Maximum stiffness – with FEM-optimised machine structural components and EN-GJS-600-3 (GGG60)

World premiere DIXI 125: < 15 µm volumetric precision on the component.

- Maximum positioning accuracy of up to 3 µm in the linear axes
- Maximum precision thanks to selected components and scraped contact surfaces on all geometrically relevant components
- Temperature control for all machine components that generate heat
- Maximum stiffness for optimal milling performance (GGG60 cast parts)
KRONES AG

Exceptional machine availability through holistic service.

FLTR: Thomas Gruber, Head of Machines, Georg Hofmeister, Head of Blowmoulds Management, Timo Potratz, Production Technology.

Krones AG specialises in process, filling and packaging technology. The company manufactures the highest quality products in order to meet the standards of its customers. It has been in a service partnership with DMG MORI for many years. Thomas Gruber, Head of Machines, describes the partnership: ‘It is based on extremely transparent dealings with one another. We focus on developing solutions.’ One priority is a machine availability rate of at least 95%.

Krones minimises the risk of downtime through regular maintenance. When purchasing new machines, Krones has DMG MORI train its personnel to maintain the machines independently. However, if a stoppage does occur, the production facility benefits from the quick response times of DMG MORI service technicians and the rapid delivery of spare parts. ‘The free DMG MORI service hotline also supports our personnel’, says Timo Potratz, Head of Production Technology.

10 years

On average DMG MORI service technicians have 10 years of experience with DMG MORI machines.

**INSPECTION – THE FIRST STEP TOWARDS TOP PERFORMANCE**

With our manufacturer’s inspection, you always know where you are. Our service professionals provide a detailed status report after every inspection.

**MAINTENANCE – MAINTENANCE BY THE MANUFACTURER FOR MAXIMUM AVAILABILITY**

Maintenance by the manufacturer to boost your productivity and reduce your operating costs. Our specialists perform machine status-relevant maintenance according to a checklist.

**HIGHLIGHTS**

+ Check on media supply including pneumatics, hydraulics, cooling and ventilation, central lubrication.
+ Depending on the machine: inspection of covers and windows, main and axis drives, tool changer and magazine, etc.
+ Optional: Replacement/installation of selected wear parts at a fixed price.

Contact your local service team for more detailed information: www.dmgmori.com

**MAINTENANCE KITS – LOW-PRICE ORIGINAL SPARE PARTS IN A COMPLETE PACKAGE**

Reliably maintain your machines independently. Compiled by our experts and coordinated perfectly for each machine type! Your advantage - everything in one package at a reduced price.

**HIGHLIGHTS**

+ More than 200 different maintenance kits are available, perfectly tailored to each machine type.
+ Ensuring machine availability.
+ All important wear parts in one kit.
+ Protection against expensive subsequent damage.
+ Save up to 25% with an attractive package price.

Contact your local service team for more information, descriptions and prices for our maintenance kits: www.dmgmori.com

DMG MORI MANUFACTURER SERVICE

You can count on it!

DMG MORI 24 / 7 Service Hotline. Available to you around the clock.

Find out more at www.dmgmori.com

DMG MORI service – The decisive advantage!
The DMG MORI original manufacturer service is a flexible, high-quality service that accurately meets all of your requirements. From prevention to tailored service products.

You’re always in safe hands with service from DMG MORI. Today and tomorrow.
SPARE PARTS

Strong logistics network – top-quality service with a global presence.

We won’t keep you waiting: All orders are processed centrally and spare parts are dispatched from the nearest Spare Parts Centre. We use the global network of all our DMG MORI warehouses – for rapid delivery times.

More than 2,500 certified DMG MORI service professionals worldwide provide the fastest possible customer support for more than 300,000 installed machines.

Top equipment

Your DMG MORI benefits: Inspection and maintenance with manufacturer know-how, high-tech measuring equipment and high-precision instruments.

SPINDLE SERVICE – SPINDLE MAINTENANCE KIT

Take preventive steps and maintain your own spindle. The handy spindle maintenance case contains everything you need for this task.

HIGHLIGHTS

+ Perfectly matched to the relevant tool holding system
+ Freely selectable content from the following: Mechanical or digital drawbar force gauge, radial run-out mandrel, dial gauge with magnetic stand, depth gauge
+ Professional support with motor spindle maintenance
+ All components in one system
+ Machine availability and productivity ensured
+ System tailored individually to your needs

TRAINING – YOUR CRUCIAL ADVANTAGE

Application training can boost your productivity, e.g. with shorter programming and set-up times.

HIGHLIGHTS

+ Modular and practical training in how to program, set up and operate your DMG MORI machines
+ Innovative courses, modern teaching equipment
+ Training in small groups, directly on the machine
+ Highly qualified instructors with methodical and didactic certification
+ Training specially tailored to meet your needs at our modern training centres or on-site
+ On-line training in-depth knowledge

View the video on DMG MORI spare parts.

See an overview of courses at the DMG MORI Academy here: training.dmgmori.com

Find out more about LifeCycle Services at lifecycle.services.dmgmori.com

HIGHLIGHTS

+ Global logistics network covers all markets
+ Over € 200 million of spare parts in stock and an availability rate of over 95 %
+ More than 280,000 different items in stock
+ Original spare parts straight from the manufacturer
+ Wide range of spare parts also available for older machines dating back to 1970
+ Order from anywhere in the world via our 24/7 Service Hotline
+ New and replacement parts available
HAIMER, world market leader in tool shrinking and balancing technology, is a family run, medium-sized company located in Igenhausen, Bavaria near Augsburg, Germany. HAIMER has designed, produced and sold innovative, high-precision products for the metal cutting industry for nearly 40 years.

More than 350 of the 500 employees worldwide are working at HAIMER’s sole production facility in Igenhausen in combination with the most modern of machines that utilize a high level of automation. As the European market leader in the area of tool holding technology, with a daily capacity of approx. 2,000 tool holders, keeping the technological edge of the products is very important. Because of this, every year between 8 to 10% of the revenue is invested into research and development. The daily drive to be better perfectly fits with the corporate philosophy: Quality Wins.

HAIMER’s product offering includes tool holders, balancing machines, shrink fit machines, 3D measuring devices and most recently solid carbide end mills – all made in Igenhausen.

In order to make intensive tests on the HAIMER cutting tools and to develop the right milling strategy with the customers, HAIMER invested into a new Applications Center with three new DMG MORI machining centers. On a HSC 70 linear, a DMU 80 P duoBLOCK and a DMC 1150 V, customer requirements out of various industries can be simulated and training as well as test-cuts can be carried out. With this investment the location Igenhausen has been extended to a Center of Excellence for Tool Holding & Milling.

Managing Director and President of the Haimer Group, Andreas Haimer, is excited about the partnership with DMG MORI: "It is a perfect synergy for the customer! High-performance machine tools require high precision tool holding technology, in order to transfer precision and power from the spindle to the cutting edge. The partnership is absolutely profitable for all parties."

Increased productivity in tool presetting.

Be it a hammer mill, pellet mill or mixer, Van Aarsen, based in the Dutch town of Panheel, has been one of the world’s leading providers of agricultural feed machines since 1949. After its positive experience with machine tools from DMG MORI, the company opted for another product from the leader in machine tool innovation for tool presetting: "Compared to models from other providers and given its excellent equipment, the UNO 20/70 autofocus is the most attractive in terms of price", explains Jack Coumans, Purchasing Manager. "The 400 mm diameter and 700 mm measuring length are ideal for our wide range of tools. The FEM-optimised, thermally stable, cast iron construction also produces highly accurate measurements.

One highlight of the entry-level system from DMG MORI Microset is the autofocus. It reliably focuses on the cutting edges – precisely and automatically. Van Aarsen benefits from this function especially when the tools are complex, as the autofocus can even automatically calibrate several cutting edges in a row. Given the quality standards of Van Aarsen and the number of tools used, Jack Coumans draws a clear conclusion: Overall, the UNO 20/70 autofocus guarantees maximum precision as well as a considerable increase in productivity in tool presetting.

Quality made in Germany – 100% designed and made by HAIMER

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ONE HIGHLIGHTS UNO AUTOFOCUS
+
+ Automatic focusing of the cutting edge to be measured
+ Best suited for tools with multiple cutting edges
+ SR50 autofocus spindle
+ Can be operated manually

View the DMG MORI Microset video
Find out more about DMG MORI Microset at:
microset.dmgmori.com
Download the tool presetting brochure:
download.dmgmori.com
Based on its long experience and certified research laboratories, Eni, leader in the Italian industrial lubricants market, has developed high tech metalworking products:

- Aquamet - coolants
- Aster - mineral based neat cutting oils
- Metalcut - mineral based and vegetable biodegradable cutting oils

The partnership with DMG MORI calls for the use of Eni lubricants, greases and cutting oils on all group’s machine tools and encourages the development of new technological solutions for improving the customer’s production and manufacturing processes.

Eni Refining & Marketing Chemicals commercial structure is available to identify the most suitable solutions for all lubrication needs in European countries.

Eni Refining & Marketing and Chemicals
telephone +39 06 5988.1 eni.com

YOUR CONTACT

Thomas Trump
Managing Director, DMG MORI Used Machines GmbH
Tel.: +49 (0) 81 71 / 8 17 - 80
usedmachines@dmgmori.com

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usedmachines.dmgmori.com

‘Thanks to the immediate availability of the used machines, we were able to expand our production capacity in the shortest possible time.’

ANFOTEC Antiriebstechnologie GmbH was founded in 2000 and has become established as a high-quality manufacturer of injection moulding machines including drive technology in the fields of mechanical engineering, measurement technology and semiconductor processing. ANFOTEC meets the high requirements on its production using CNC technology from DMG MORI. Four of the nine models – including a DMU 200 P and a DMP 260 – originated from the portfolio of DMG MORI Used Machines. Christian Hast, Managing Director of ANFOTEC, explains: ‘We are aware of the longevity of the machines. That is why used models are an attractive way of expanding production capacity. New machining centres from DMG MORI are equipped to be future-proof. Used models also benefit from that’, says Christian Hast. The performance therefore meets the quality standards of ANFOTEC – the company is certified to ISO 9001. He also sees the rapid delivery as a major advantage: ‘Most of the products and services of DMG MORI Used Machines are suitable solutions that are in stock which, unlike new machine orders, can be installed within the shortest possible time.’

ANFOTEC Antiriebstechnologie GmbH
Landwehr 17, D-59964 Medebach
www.anfotec.de

ANFOTEC

Managing Director Christian Hast is impressed by the high quality in particular.

Four of nine high-tech machines were supplied by DMG MORI.

‘Thanks to the immediate availability of the used machines, we were able to expand our production capacity in the shortest possible time.’

ANFOTEC ANTRIEBSTECHNOLOGIE GMBH

Managing Director Christian Hast is impressed by the high quality in particular.

Eni lubricants and solutions for high-tech metalworking

technology comes alive

Eni Refining & Marketing and Chemicals
cutting fluids and industrial lubricants

Based on its long experience and certified research laboratories, Eni, leader in the Italian industrial lubricants market, has developed high tech metalworking products:

- Aquamet - coolants
- Aster - mineral based neat cutting oils
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www.Ingersoll-Rand.de
CONTROL TOWER FOR IMPROVED SUPPLY CHAIN TRANSPARENCY

Control towers are a hotly debated subject in the logistics industry. Essentially, they serve to increase the transparency of complex supply chains in all fields of business.

Complex supply chains require quick, factual communication. This complexity is brought about by intercontinental or global supply chains, major dependencies, a high degree of outsourcing in connection with supply chain activities, and different requirements on the part of the customer. The more complex the supply chain, the greater the benefit for the customer. If all relevant data can be pooled at an information node and evaluated, companies with fragmented supply chains in particular will benefit from the concept of a Control Tower. This is because it sheds light on key information such as delivery date and status, fluctuations in usage and raw material supply, to name but a few aspects.

Modular and scalable

A Control Tower can be scaled to suit your requirements. However, a holistic focus on a Control Tower is only wise in the fields of 3PL and 4PL (third-party logistics provider with its own assets and fourth-party logistics provider without its own assets) if, in particular, supply chains with different routes and requirements have to be merged. A Control Tower can also be modular and used to monitor invoices (audit & pay), for example, or even evaluate suppliers. In order for everyday business to continue uninterrupted, a Control Tower should be implemented across several phases and its focus should be balanced. Its focus can range from the basic services of a logistical service provider, the additional services of a 3PL company and the services of an LLP (lead logistics provider); a combination of 3PL and 4PL skills, e.g. with its own HGVs and warehouses as well as the expertise required to manage complex supply chains) to a 4PL company, which coordinates the logistical processes of a company without contributing its own assets. Be it a medium-sized company or group, if the outsourcing of logistical processes is a relevant issue then a Control Tower is a sensible option.

Gondrand | ATEGE already has Control Tower solutions in place for DMG MORI, namely for the procurement and distribution logistics in Seebach and for the distribution logistics in Bielefeld. We are focusing on concentrating our processes on one logistical service provider which renders its services from a single source. Streamlined management structures are favourable even with Control Tower solutions. Additional Control Tower concepts are currently in development for DMG MORI in order to sustainably spur on the optimisation of its supply chain.

We have found the greatest room for improvement in the fields of production efficiency, supply chain transparency, logistical service monitoring and transportation cost control. The optimisation of logistical processes and the pooling of logistical activities between DMG MORI and Gondrand | ATEGE has enormous potential to benefit everyone involved, from the supplier to the end customer.

Reliability & Availability - Worldwide

THK provides original technology in the highest quality for smooth and accurate movement.

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For more information, please visit www.gondrand-logistics.com

You are investing in your future. We are here to support you.

When you make your investments, place your trust in a partner that can offer you financing solutions and supplementary services from a single source.

We work with DMG MORI to support you in a number of countries around the world. Our experts are well-informed and have comprehensive knowledge of the DMG MORI products.

Discuss your project with us: +49 6172 88-2104
industrial@deutsche-leasing.com, www.deutsche-leasing.com