

Full liners for Medical

Consulting, machine, automation, programming, service and support for quality management and certification issues



Overview

Four segments

DMQP

Dental

Additive Manufacturing

Integrated Digitization

DMG MORI MEDICAL EXCELLENCE CENTER

We support you during all stages



DIGITIZATION & SERVICE

- + DMG MORI Connectivity in standard
- + DMG MORI NETservice
- + myDMG MORI Customer Portal for service optimization
- + TULIP



DMQP & PARTNER

All topics related to the machine (e.g. tooling, clamping ...) and integrated from the start



MACHINING & TURN KEY

- + Turning & milling
- + LASERTEC SLM
- + ULTRASONIC
- + Automation

EARLY INTEGRATION

DMG MORI MEDICAL EXCELLENCE CENTER

Consulting, process & technology development as well as the consideration of normative topics

→ we live a holistical approach



OF OUR CUSTOMERS

STANDARD PROCESS

Machine, time study, quote, order, delivery, ...



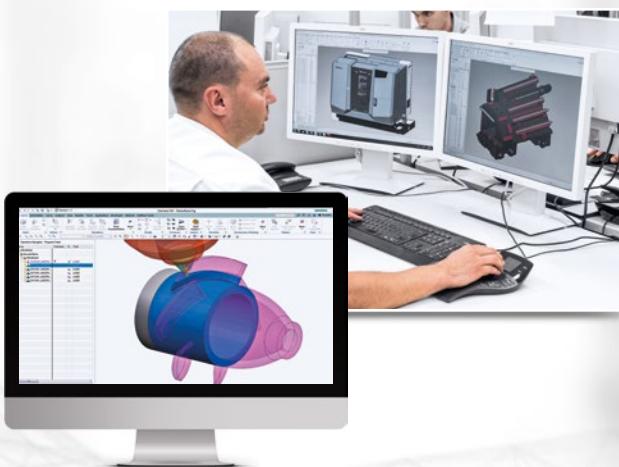
MARKET & PARTS

- + Implants
- + Prostheses
- + Instruments
- + Devices



REGULATION & CERTIFICATION

- + Consulting for market barriers, ISO13485, FDA or the new MDR [Medical Device Regulation]



COMPLETE PROCESS CHAIN

- + Machining method
- + Simulation
- + CAM (NX/ESPRIT)
- + Greenfield projects
- + Brown-Field

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DMG MORI MEDICAL EXCELLENCE CENTER

Expertise in the medical sector – four segments

IMPLANTS



Filigree components and screws,
joints and bone plates

More from page..... 12

PROSTHESES



Hand, knee, lower leg
and foot prostheses

More from page..... 20



*We support our customers holistically and right from the start:
From the first planning, support with certification questions,
programming and production, up to quality management.
And this customer-specific.*



BEST-IN-CLASS MEDICAL

INSTRUMENTS



Scissors, forceps, cloth clamps,
guides, navigation

More from page..... 22

DEVICES



Focus on large devices

More from page..... 24

DENTAL

More than just dental crowns

More from page..... 28



ADDITIVE MANUFACTURING

Two integrated process chains
for powder bed machining

More from page..... 30

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Medical technology – a sector with innovation and growth potential

Demographic development and rising healthcare expenditure caused by a higher standard of living mean that medical technology experts are certifying extraordinarily high potential for growth.

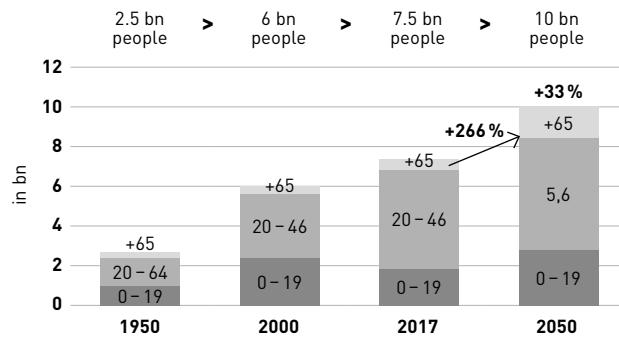
MARKET DRIVERS OF THE MEDICAL INDUSTRY

Rising healthcare expenditure caused by:

- + 33 % increase in the global population*
- + 266 % increase in the number of people aged 65 and above*

*Comparing 2017 to 2050

Source: Own diagram based on: Avicenne Research & Analysis 2017, United Nations – World Population Prospects, The 2012 Revision, several data 2014 – 2017



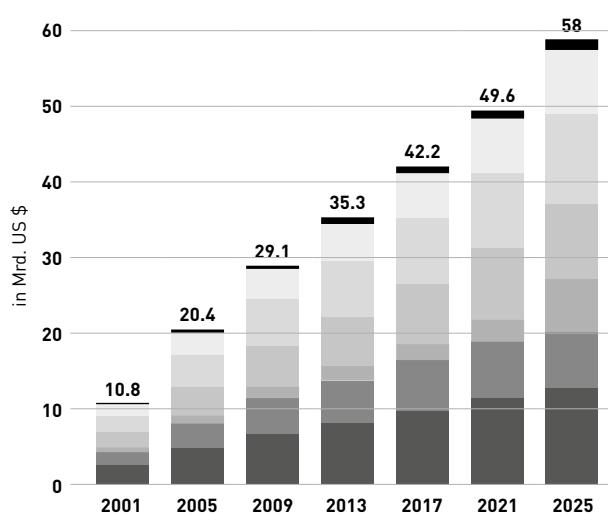
PRODUCTION OF ORTHOPEDIC TECHNOLOGY WORLDWIDE

2019 vs. 2025

- Orthobiology: 5.2%
- Spine: 2.9%
- Trauma and CMF*: 4.4%
- Extremities: 14.9%
- Hips: 1.5%
- Knees: 3.2%

*Craniomaxillofacial = oral and maxillofacial surgery

Source: Own diagram based on Avicenne – The Worldwide Orthopedic Contract Manufacturing Market Report 2019 – 2025



Development and consulting for and with our customers

- + Interdisciplinary experts advise our customers right from the start of potential projects with regard to topics like turning, milling, ULTRASONIC, automation and software
- + General transfer of expertise with other Technology Excellence Centers, e.g. with aerospace experts, for special requirements encountered in mill & turn applications involving large workpieces for tomographs, or with experts working in the additive manufacturing sector
- + Further decentralized Medical locations in China/Shanghai, USA/Chicago as well as Germany/Wernau

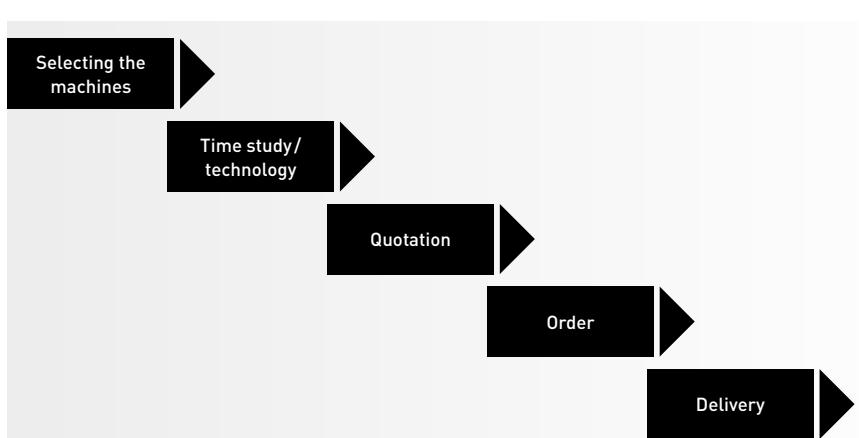


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GETTING OUR CUSTOMERS INVOLVED AT AN EARLY STAGE

- + Greenfield consulting
- + Process development
- + Consulting on regulatory issues
- + Turnkey/automation solutions
- + Machining new materials, e.g. developing machining strategies for SMAs (shape memory alloys)
- + Support with topics in the field of digitization

DMG MORI MEDICAL EXCELLENCE CENTER STANDARD PROCESS



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DMG MORI MEDICAL EXCELLENCE CENTER

DMG MORI Medical Consulting – Your entry into the medical business

INTEGRATED TEAM APPROACH

SUPPORT BY DMG MORI

Support for ISO13485
company certification

Support for introduction
of QM system

Training program for
operation/management

Authorized In-House
product portfolio
(constistof bone plates
and bone screws)

Support for customizing
ERP system

Technical
specifications

Manufacturing technology
(machines, tools, periphery)

OPERATIONS

MANAGEMENT

MARKETING,
SALES &
QUOTES

REGULATORY
AFFAIRS

PRODUCTION
PLANNING

SUPPLY
MANAGEMENT

OPERATOR



MACHINES & AUTOMATION

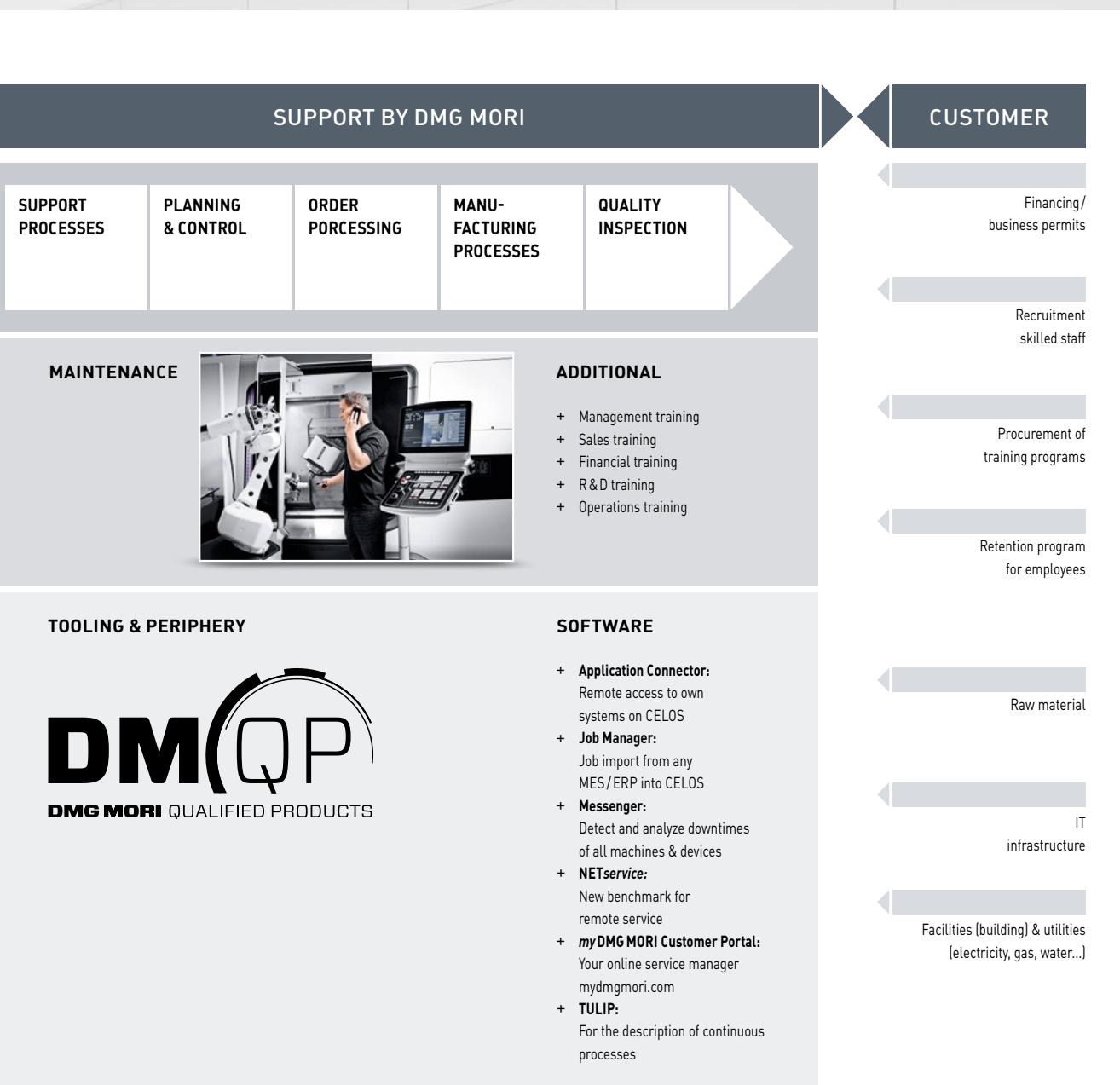




Strong regulations and comprehensive documentation due to the MDR (Medical Device regulations) are market barriers which DMG MORI Medical Consultancy tries to solve together with our customers.

With the help of transparent and reliable processes regarding to existing laws and standards in the field of medical technology, we are supporting in each phase: from the development, tests, documentation, registration up to certifications.

Marcus Krüger
Key Account Manager Medical



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DMG MORI MEDICAL EXCELLENCE CENTER

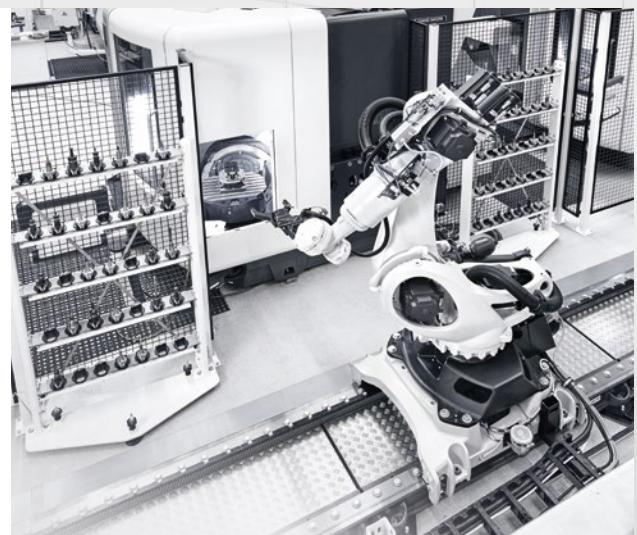
Your requirement – our solution

At our Medical Excellence Center in Seebach, we provide our customers the **experience gained from hundreds of successfully implemented medical projects**. Together with our customers, we develop integrated technology solutions, define effective automation processes for the very best quality and autonomy and safeguard the processes with digitalized workflows.

We are unique – as a complete provider of turning, milling, automation and software products, plus new technologies such as additive manufacturing, we offer solutions for all workpieces and requirements from a single source.

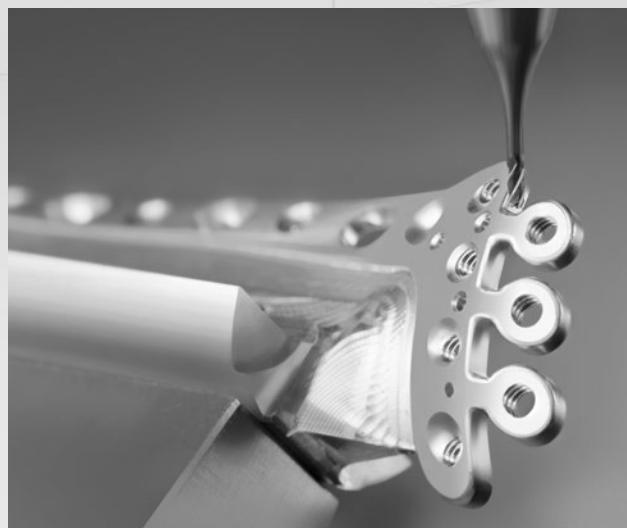
PRODUCTION FROM A BATCH SIZE OF 1 UP TO MASS PRODUCTION

- + **Flexible automation for a batch size of 1,**
e.g. for just-in-time production of custom-made patient implants → Production cell comprising one or more machines
- + **Automation for mass production,**
e.g. for standardized components such as screws
→ MULTISPRINT – SWISSTYPE



CUTTING – NEW MATERIALS

- + **Degradable Mg alloys**
→ e.g. DMP 70 with fire extinguishing system and two-stage flame detector
- + **High-strength plastics, stainless steel and titanium**
→ speedMASTER spindles up to 30,000 rpm or HSC spindles up to 60,000 rpm
- + **Hard-brittle materials** (e.g. ceramics) and composites
→ ULTRASONIC machining
- + **SMAs (shape memory alloys) or polymers**
→ Developing reliable machining strategies





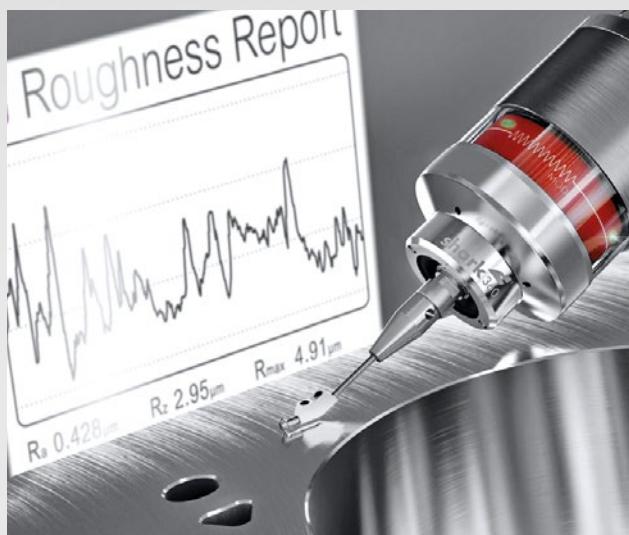
OPEN CONNECTIVITY

- + **Connecting the machines to the customer's MES** (manufacturing execution system)
→ DMG MORI IoTConnector as a bidirectional interface
→ Support e.g. for OPC UA, for sending and receiving data with a customized UDI interface
- + **Continuous documentation** of each workpiece
→ Barcode scanner – data is collected by means of the IoTConnector directly at the customer's MES system



DIGITAL AND AUTOMATED PROCESSES

- + **Integrated process chain** – from planning and CAD/CAM programming to production
→ CAD/CAM programming, e.g. NX CAM
→ Automatic transmission thanks to CELOS
- + **Traceability of the entire production process** from each individual workpiece
→ Automatic blank recognition via QR code
- + **Increased process reliability**
→ Camera-based component recognition
- + **TULIP**
→ Holistic process description



QUALITY MANAGEMENT

- + **Machine, technology and automation** from a single source
→ Digital twin for green button process
- + **100 % good parts** or automatic ejection of faulty parts
→ Adaptive in-process measurement, e.g. CMM workpiece measurement or surface quality using CELOS APP Surface Analyzer

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› Implants

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DMG MORI MEDICAL – FOUR SEGMENTS

Implants – filigree components and screws

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DMG MORI
#1
WORLDWIDE
FOR IMPLANTS

SHORT TURNING

Dental implant
 $\varnothing 6 \times 11$ mm, titanium
SPRINT 20 | 8: 160 sec.



Lamina hook
 $\varnothing 24 \times 20$ mm, titanium
SPRINT 20 | 8: 280 sec.



Basic dental implant
 $\varnothing 7 \times 12$ mm, titanium
SPRINT 20 | 8: 105 sec.



LONG TURNING WITH SWISSTYPEkit

Bone screw
 $\varnothing 4 \times 20$ mm, titanium
SPRINT 20 | 8: 110 sec.



Monoaxial screw
 $\varnothing 16 \times 70$ mm, titanium
SPRINT 20 | 8: 410 sec.



Fixator screw
 $\varnothing 4 \times 120$ mm, titanium
SPRINT 20 | 8: 380 sec.





Machining of implants for surgical fixation of bones made of bioresorbable materials such as magnesium.

We at SYNTELLIX Hannover have been using machines from DMG MORI for the successful processing of medical components for years.

Dr. Eng. Jan-Marten Seitz
SYNTELLIX AG



SPRINT 20 / SPRINT 32

- + Automatic lathes for workpieces up to Ø 20 or Ø 32 mm
- + SWISSTYPEkit for short and long turning on one machine:
 - SPRINT 20: extended spindle stroke from 60 to 180 mm
 - SPRINT 32: extended spindle stroke from 100 to 240 mm
- + <2m² installation surface for the SPRINT 20, SPRINT 32 <2.8 m² (without chip conveyor, ICS, etc.)
- + Automation via bar loader (optional)
- + Perfect for machining of titanium, steel magnesium
- + Technology on smallest place



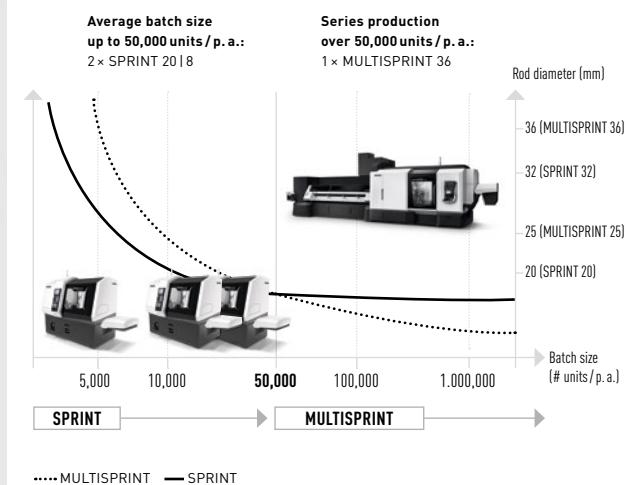
THREAD WHIRLING FOR THE SPRINT

- + Patented unit for external thread whirling with direct drive
- + Machining up to a diameter of 15 mm, adjustable angle ±15°
- + Cooled direct drive with 8 Nm torque and 2 kW power (10% ED), speed range 1,500 to 4,000 min

SPRINT OR MULTISPRINT – ALWAYS THE RIGHT MACHINE FOR SERIES PRODUCTION

Example of a bone screw

- + 8x70 mm, titanium
- + Machining time:
 - SPRINT 20 | 8: 210 sec.
 - MULTISPRINT 36: 45 sec.
- + 30 % less space required for a MULTISPRINT 36 compared to 2x SPRINT 20 | 8 (21.9 vs. 31.7 m² incl. bar loader, chip conveyor, etc.)
- + Use of the same cutting tool technology on SPRINT and MULTISPRINT



Overview

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- › Implants

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DMG MORI MEDICAL – FOUR SEGMENTS

Implants – joints and bone plates

**SIX-SIDED
COMPLETE
MACHINING
OF COMPLEX
IMPLANTS**



Hip joint implant
ø 40 × 136 mm, titanium
NTX 1000: 42 min.

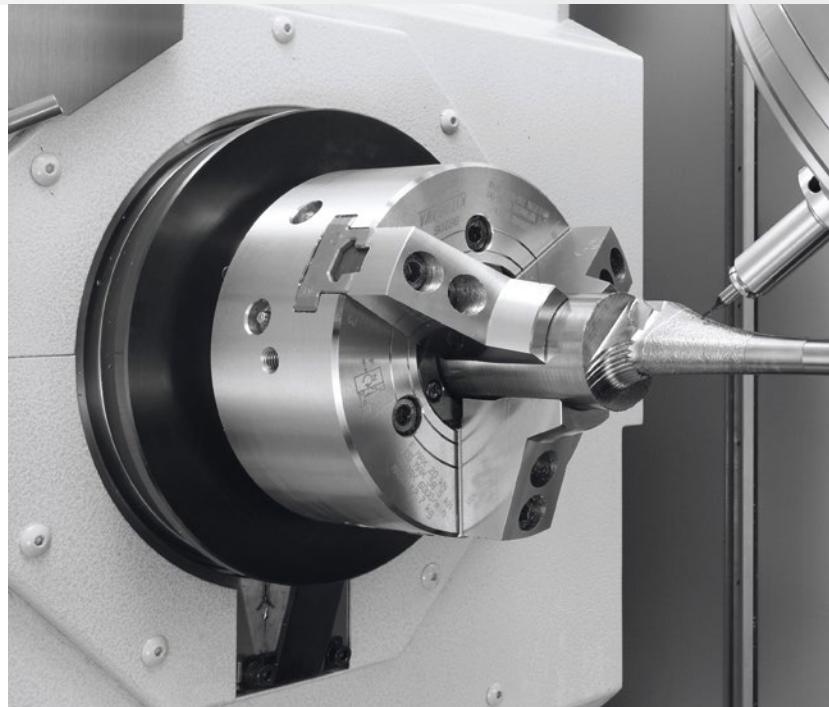


Acetabulum
ø 52 × 40 mm, titanium
NTX 1000: 280 sec..

DMG MORI TECHNOLOGY CYCLES

Polygon / oval turning

- + Simple machining of non-circular parts
- + Intuitive user interface for polygon or oval turning
- + Machining on main or counter spindle can be combined





DMU 60 eVo

- + **Five-axis universal machining center** with up to 1g acceleration
- + **Swivel rotary table** for machining of negative angles down to -20°
- + **20,000 rpm speedMASTER spindle** with 36-month warranty without any limit on the number of operating hours as standard, optional HSC spindles up to 60,000 rpm

DMP SERIES

- + **Five-axis simultaneous machining** through direct drive table up to 100 kg* (optional)
- + **15,000 rpm inline spindle** with 78 Nm as standard, optional 24,000 rpm to 12 Nm or 20 Nm (BT 30, SK 30)
- + **5 µm positioning accuracy** thanks to direct measuring systems from MAGNESCALE
- + Up to **2 g acceleration** for the shortest possible chip-to-chip time of 1.5 sec.
- + **Automation** as WH 3 Cell from the left, right or front
- + **Special machine specification** available for machining with cutting oil

*Only for DMP 70



ATC 2.0 – Application Tuning Cycle

- + Prozessorientiertes Anpassen der Vorschubgeschwindigkeit in Relation zur Tischbeladung
- + Minimierung der Bearbeitungszeit bei Maximierung der relevanten Bauteilqualität

DMP 70 – MEDICAL-OPTIONS

- + Inline spindle with 24,000 rpm and 40 Nm
- + Swivel rotary table for 5-axis simultaneous machining
- + DMG MORI Technology Cycles 3D quickSET and ATC – Application Tuning Cycle
- + toolSTAR tool magazine with 25 pockets
- + Chip conveyor and compact ICS 40 bar with paper type filter
- + Tool measurement and measuring probe
- + Oil processing package incl. fire extinguishing system



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Four segments

- › Implants

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DMG MORI MEDICAL – DMP 35

DMP 35 with WH 3 Cell – AUTOMATED 6-SIDED COMPLETE MACHINING



Industries such as the medical sector have longed for this:

With the new DMP 35, DMG MORI is offering the most powerful machine in its class, with a minimal footprint of just 3.15 m².

Fabian Suckert
Managing Director
DECKEL MAHO Seebach



ONLY 1.2 m²
ADDITIONAL
SPACE REQUIRED
FOR WH 3

PROCESS SEQUENCE

1. Raw material is picked up from the workpiece carrier (neutral cycle time)
2. Raw material is oriented in the alignment station of the WH 3 Cell (neutral cycle time)
3. Semi-finished part is picked up from the fixture by the 2nd gripper
4. Raw material is deposited in the location freed up by the semi-finished part
5. Finished part is removed
6. Semi-finished part is deposited in the location freed up by the finished part
7. Finished part is placed in workpiece carrier



1



"Crazy" tools with internal cooling channels and a diameter of 0.2 to 8mm.

For BT30/SK30 and BBT30 and also HSK40.



TECHNOLOGY PARTNER FOR TOOLS

DMG MORI included Swiss toolmaker Mikron Tool as a partner in its Qualified Products Program in 2019.

Mikron Tool has extended the DMQP portfolio to include high-precision tools for micro-machining hard-to-machine materials such as stainless and heat-resistant alloys, titanium alloys or cobalt chrome. The core application areas for Mikron tools with a diameter of 0.2 to 8mm include the medical sector and the watchmaking industry as well as the automotive and aerospace sectors.

MIKRON TOOL SA AGNO FACTS

- + Founded in 1998 as a spin-off of the in-house Cutting Tools department of Mikron SA Agno
- + "CrazyDrill" was introduced as the world's fastest small drill in 1999.
- + In 2013 Mikron Tool set a milestone in milling technology with the launch of the "CrazyMill Cool" micro milling cutters: Thanks to internal cooling, hard-to-machine materials such as titanium or cobalt-chrome can be machined up to 20 times faster

MIKRON TOOL

Mikron Switzerland AG, Agno, Division Tool
Via Campagna 1, 6982 Agno, Switzerland
www.mikrontool.com



6-SIDED COMPLETE MACHINING

- + From raw material to finished part in one end-to-end, automated process chain
- + Automated complete machining of a component in a minimal footprint of 4.3m² (incl. WH 3 Cell)
- + Increased autonomy by means of flexible workpiece handling of WH 3 Cell
- + Integrated process covering different components from different industries
- + New, intuitive program entry for simple, fast setup of the WH 3 Cell

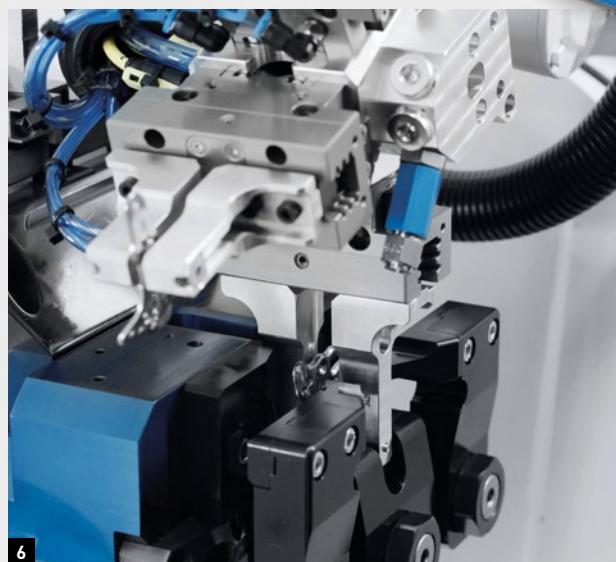


Radius bone plate

55×43×10 mm
DMU 35: 44 Min.



4



6



CUSTOMER STORY – GÜNTER STOFFEL MEDICAL ENGINEERING GMBH

<1mm PROCESS OPTIMIZATION WITH THE DMG MORI MEDICAL EXCELLENCE CENTER



DMP 70 WITH WH 3 CELL

FLEXIBLE AND COMPACT AUTO-MATION SOLUTION

HIGHLIGHTS

- + 5-axis simultaneous machining with a direct drive table and with a component weight of up to 100 kg (optional)
- + inlineMASTER SPINDLE with 15,000 rpm and 78 Nm in standard, 24,000 rpm up to 40 Nm optionally available (BT 30, SK 30)
- + Highest positioning accuracy based on direct absolute path measuring systems from MAGNESCALE
- + Up to 1.8 g acceleration for the shortest possible chip-to-chip time of 1.5 sec
- + Integration of automation from the left, right and the front of the machine

The successful development of Günter Stoffel Medizintechnik GmbH originated in 1971 from a sideline business of its founder: after his working day as a tool maker, Günter Stoffel worked late into the night producing round-handled instruments that quickly became popular in the medical engineering sector. The company is now in its second generation and has 20 employees that manufacture high-quality microsurgical and endoscopic instruments under the brand name insto – Instruments Stoffel. In order to meet the high quality standards and delivery requirements of its customers – including many industry giants – in 2020 Günter Stoffel Medizintechnik invested in two 5-axis simultaneous machining centers from DMG MORI, a DMU 50 3rd Generation and a DMP 70 that thanks to a WH 3 Cell workpiece handling system enables highly productive and autonomous manufacturing.

5-axis machining of medical instruments of <1mm diameter and 0.2 mm bores

You need a very strong magnifying glass or better a microscope to even see the workpieces at Günter Stoffel Medizintechnik. "The instruments are as small as 0.8 mm and bore diameters are sometimes 0.2 mm", explains Dieter Stoffel, Managing Director and son of the founder. 5-axis machining is used. "Tiny biopsy

forceps for endoscopic interventions, for example, are created in this way." In view of the special requirements, the machining experts are involved early on in the development phase. "Our aim is customer-oriented cooperation from development to the first sample and on through to the finished product and serial production", says Dieter Stoffel.

"The chips are often larger than our components."

DMP 70: 1,8 g ACCELERATION AND 1.5 SEC. CHIP-TO-CHIP TIME

DMU 50 3rd Generation and DMP 70: 5-axis simultaneous machining of precision instruments to within microns. The production of insto surgical instruments requires both an awareness of quality and a high level of efficiency. "If we are to remain competitive, we have to review our processes constantly and continuously increase productivity", says Dieter Stoffel. The two 5-axis simultaneous machining centers from DMG MORI allowed significant process optimization: "We can operate far more economically with these machines than we could with the 5-axis alternatives we used up to now." The high level of precision of the



machining centers quickly convinced him, because the tolerance of many work-pieces is within one thousandth of a millimeter. "The compact dimensions of the DMU 50 3rd Generation and DMP 70 were a decisive factor for the purchase, as well as the fast and competent consultations with DMG MORI."

Process optimization with the **DMG MORI Medical Excellence Center**

The DMP 70 in particular – a high-speed machining center with 1.8 g acceleration and chip-to-chip times of just 1.5 seconds – impressed Dieter Stoffel: "Together with the team at the DMG MORI Medical Excellence Center and the DMQP partner Mikron Tool, we designed innovative manufacturing processes that reduced our throughput times to a minimum. In addition, we jointly developed new approaches to automation." All instruments are milled from the solid. Various stainless steel and titanium alloys are used. "The great challenge is to keep the extreme accuracies of the small work-pieces permanently under control."



Günter Stoffel Medizintechnik has the automated production solution in autonomous operation for up to 24 hours.



Our instruments will continue to be among the best in the world in the future, not least thanks to the sustainable manufacturing technologies and automation solutions from DMG MORI.

Dieter Stoffel
Managing Director
Günter Stoffel Medizintechnik GmbH

GÜNTER STOFFEL MEDIZINTECHNIK FACTS

- + Founded in Wurmlingen in 1971
- + 20 skilled workers
- + Production of high-quality instruments for microsurgery


G. Stoffel Medizintechnik GmbH

Günter Stoffel Medizintechnik GmbH
Kantstraße 37
78573 Wurmlingen, Germany
www.insto.de



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- › Prothesen

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DMG MORI MEDICAL – FOUR SEGMENTS

Prostheses – hand, knee, lower leg and foot prostheses



CTX beta 1250 TC 4A

- + Turn & Mill machining center for **six-sided complete machining**
- + **compactMASTER turn & mill spindle** with 12,000 rpm (20,000 rpm optional) and 36-month warranty without any limit on the number of operating hours as standard
- + **Five-axis simultaneous machining** thanks to DirectDrive B-axis with $\pm 120^\circ$ swivel range
- + Four-axis machining thanks to **second tool carrier as lower turret**
- + **Automation via bar loader** for workpieces up to $\varnothing 102$ mm



Leg prosthesis component
 $\varnothing 52 \times 65$ mm, aluminum
NTX 2000: 8 min. 18 sec.



DMG MORI technology cycle: 3D quickSET – turning

- + Measurement and correction of the position of rotary and swivel axes (C4/C3/B)
- + Sag compensation possible
- + Reliable recalibration of the machine prior to high-precision machining

< 5 µm
CIRCULAR
ACCURACY

DMU 50 3rd Generation

- + Five-axis universal machining center for workpieces up to Ø 630 × 500 mm and 300 kg
- + Swivel rotary table for machining of negative angles down to -20°
- + 15,000 rpm speedMASTER spindle with 36-month warranty without any limit on the number of operating hours as standard, optional speedMASTER spindles up to 20,000 rpm or 200 Nm
- + Automation as pallet handling PH Cell 300



Lower leg prosthesis
310 × 130 × 120 mm, titanium
DMU 50 3rd Generation: 110 min.

Foot core for lower leg prosthesis
150 × 150 × 50 mm, titanium
DMP 70: 2 h 5 min.

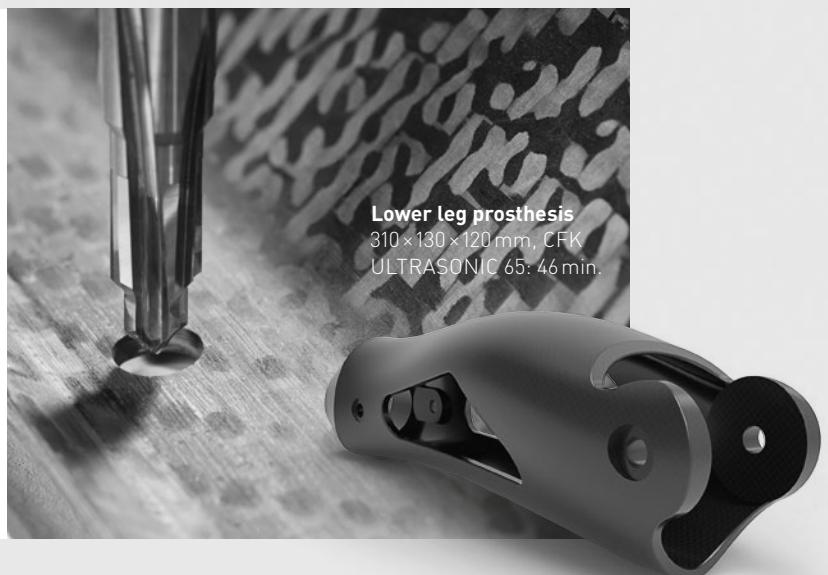
DMG MORI technology cycle MPC 2.0 – machine protection control

- + In-process vibration monitoring
- + Rapid machine shutdown in the event of a crash
- + Manual retraction even on a tilted machining plane
- + **NEW:** Torque monitoring



ULTRASONIC-INTEGRATION FÜR DIE PROZESSSICHERE COMPOSITE-BEARBEITUNG

- + 40% geringere Prozesskräfte und 100% höhere Schnittgeschwindigkeit durch ULTRASONIC Überlagerung der Schnittrichtung
- + Ideal für das **Besäumen und Bohren** von Composite Werkstoffen mit sauberen Kanten ohne Faserausriß und Delamination
- + **ULTRASONIC-Integration** in alle 5-Achs-Maschinen von DMG MORI, z.B. DMU, DMU eVo, DMF, monoBLOCK, duoBLOCK, Portal und Gantry



Lower leg prosthesis
310 × 130 × 120 mm, CFK
ULTRASONIC 65: 46 min.

Overview

Four segments

- › Instrumente

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DMG MORI MEDICAL – FOUR SEGMENTS

Instruments – scissors, forceps, cloth clamps, guides, navigation

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DMG MORI technology cycle:
3D quickSET – milling

- + Tool kit for checking and correcting the kinematic accuracy of four and five-axis machine configurations
- + All head variants and table axes

THREE MACHINING PHILOSOPHIES

Always the right solution

SEQUENTIAL MACHINING

Optimum use of machinery with minimal requirements

- + Premachining incl. the connecting surfaces
- + The tips are reworked on five axes
 - Premachining: 7 min.
 - Five-axis machining: 3 min. 47 sec.



DMX 60 U

- + The entry into the 5-axis world, machining workpieces up to Ø 630 × 450 mm and 300 kg
- + Automation as pallet handling PH 150

COMPLETE MACHINING MILLING

Batch sizes are completely machined without intermediate handling – QM/quality optimization

- + Complete machining, incl. the tips on one machine
 - Five-axis complete machining: 9 min. 39 sec.



DMU 50 3rd Generation

- + Five-axis universal machining center for workpieces up to Ø 630 × 500 mm and 300 kg
- + Automation as workpiece handling WH Cell

COMPLETE MACHINING TURN & MILL

60% lower costs for bar material

- + Six-sided complete machining, incl. machining of all freeform surfaces
 - Five-axis complete machining: 9 min. 31 sec.



CTX beta 450 TC

- + Turn & Mill machining center for six-sided complete machining
- + Automation as workpiece handling:
 - Robo2Go workpieces from Ø 25 to Ø 170 mm
 - Bar loader for workpieces up to Ø 102 mm



DMG MORI technology cycle Five-axis simultaneous machining

- + Free-form surfaces due to five-axis interpolation on the main and counter spindles
- + Turning and milling with interpolating B-axis
- + With ATC turning for increased machine dynamics
- + Look-ahead function for a continuous process



Bone rasp for femoral head prosthesis

135 × 12.7 × 36 mm, X40CrMoV5-1
CTX beta 800 TC: approx. 145 min.



Forceps segment
205 × 15 × 40 mm,
X8CrNiS 18-9

Overview

Four segments

› Devices

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DMG MORI MEDICAL – FOUR SEGMENTS

Devices – focus on large devices





CT Gantry (computer tomograph)
Ø 1,400 × 450 mm, titanium



DMC FD duoBLOCK AND PORTAL MACHINES

- + Ideal for bearings, housings and transmission rings for computer tomographs or formers for magnetic resonance systems
- + Milling/turning complete machining centers for workpieces up to:
 - DMC 125 FD duoBLOCK: Ø 1,250 mm
 - DMC 160 FD duoBLOCK: Ø 1,600 mm
 - DMC 210 FD: Ø 2,500 mm
 - DMC 270 FD: Ø 3,400 mm
 - DMC 340 FD: Ø 3,900 mm
- + Milling/turning table with **DirectDrive technology**
- + More than 20 years of experience with milling/turning machines, more than 1,000 installed machines (technology know-how from the aerospace sector, particularly casings and rotatives) & rotierende Bauteile

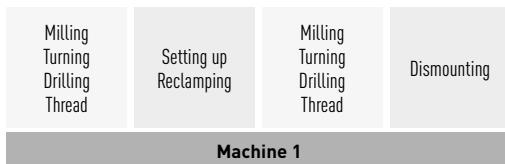
DMG MORI technology cycle: Grinding – milling

- + Milling, turning and grinding in a single setup
- + Best surface qualities up to $R_a < 0.4 \mu\text{m}$
- + Grinding cycles for interior, exterior and face grinding, plus truing cycles
- + Achievable tolerances
 - Surface quality $< 0.4 \mu\text{m}$
 - Circularity $< 5 \mu\text{m}$
 - Quality 5 with diameter $< 120 \text{ mm}$
 - Quality 4 with diameter $> 120 \text{ mm}$



MILLING,
TURNING AND
GRINDING
**ON ONE
MACHINE**

DMU FD | DMC FD MACHINES – COMPLETE MACHINING PROCESS



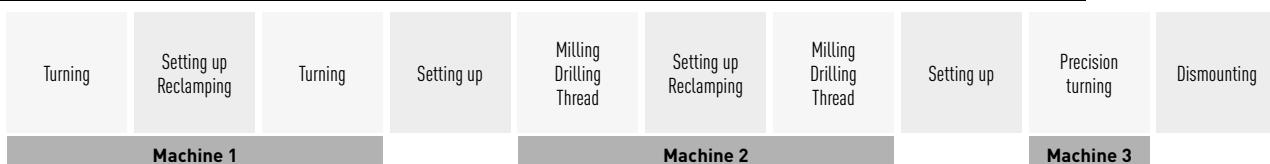
Complete machining process:

- + One machine
- + Four machining steps
- + 300 % more productivity

Conventional machining process:

- + Three machines
- + Ten machining steps

SINGLE-PURPOSE MACHINES – CONVENTIONAL MACHINING PROCESS



1 2 3 4 5 6 7 8 9 10



The alliance for success in the field of medical technology

>120
technology partners

>4,000
DMQP products

Online configurable



1. MILLING

- + Oil mist separator
- + Clamping devices
- + Software (CAD/CAM)



2. HANDLING

- + Handling
- + Chip conveyor
- + Standard automation



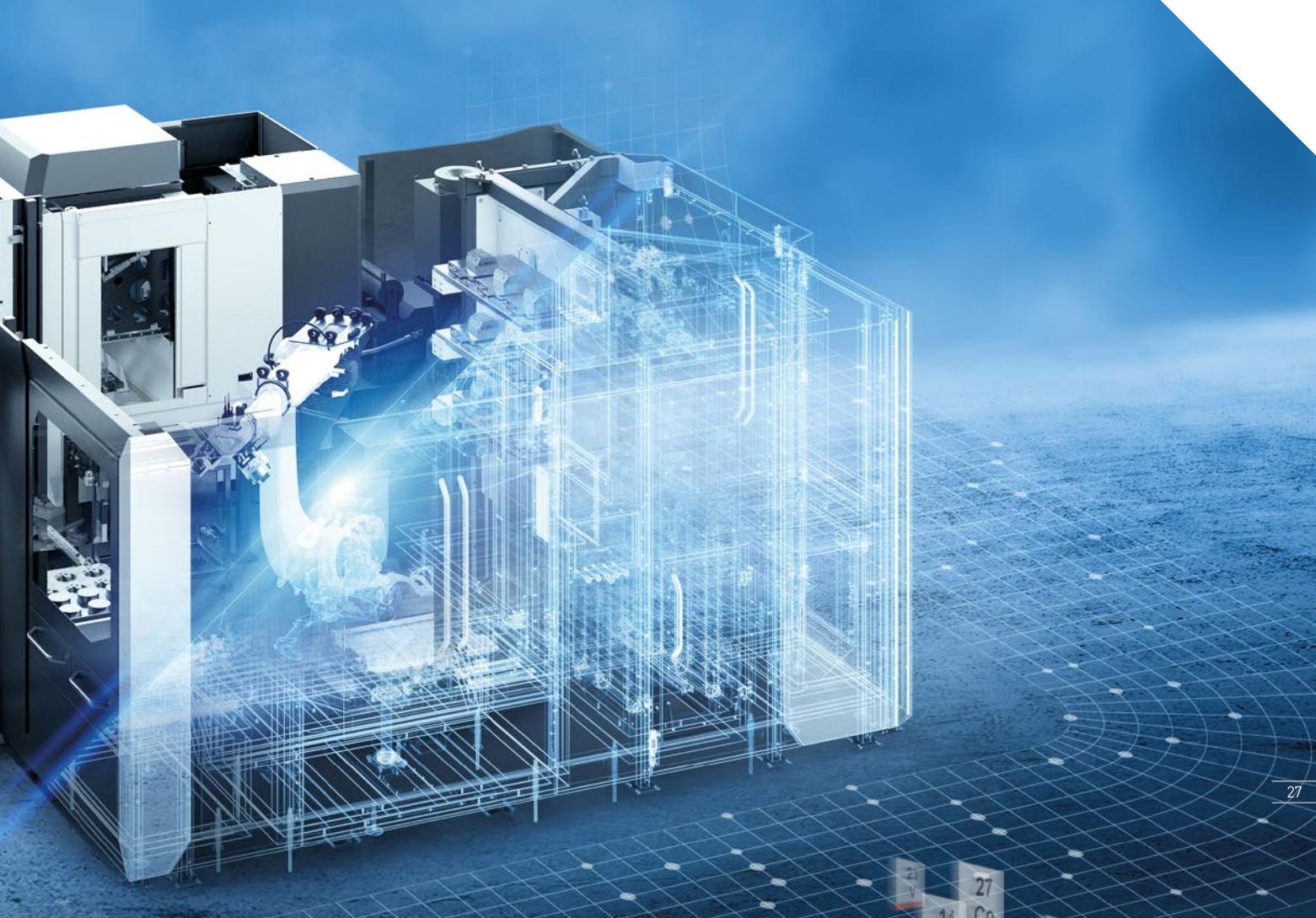
Your contact person

Christoph Grosch

Head of DMQP

GILDEMEISTER Beteiligungen GmbH

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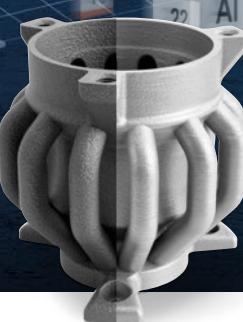
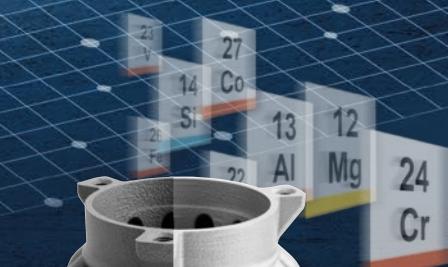
3. MEASURING

- + Touch probe
- + Tool measuring
- + Tool preset



4. MONITORING

- + Sensors
- + Signal lamps
- + Working area camera



5. AM MATERIALS

- + AM powder
- + AM powder parameters
- + Unpack

DMG MORI MEDICAL – DENTAL

Dental – more than just dental crowns

DMU 20 *linear* / ULTRASONIC 20 *linear*

- + Precise production of implant-supported designs in all standard dental materials
- + Special DMG MORI dental blank holder for vibration-reduced production of titanium and CoCr alloys
- + Swivel ranges of the A-axis kinematics from -15 to +130° for complete machining of implant frameworks in a single setup
- + Production of inlays, onlays, veneers and crowns in lithium disilicate with ULTRASONIC technology
→ Minimization of chipping and micro-cracks, as well as thin preparation lines
- + Tool wear and tool breakage detection, incl. automatic program recoil and integration of sister tools
- + Fully automated production on <6m²
→ HSC 20 *linear* or ULTRASONIC 20 *linear*
with 99-fold pallet handling (max. 10 kg handling weight)



Additive manufacturing:
Dental crowns / bridges

HSC materials
Cobalt chrome
Titanium



Dental crowns / bridges

HSC materials
Wax, acrylic
ZrO ₂ [pressed]
PMMA
Cobalt chrome
Titanium



Supra constructions

HSC materials
Wax, acrylic
ZrO ₂ [pressed]
PMMA
Cobalt chrome
Titanium

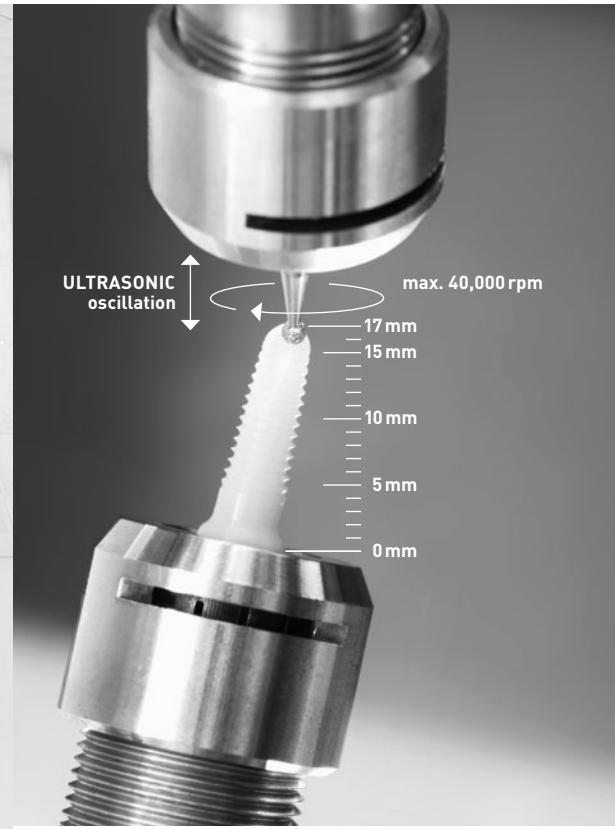


Bars

HSC materials
Wax, acrylic
ZrO ₂ [pressed]
Cobalt chrome
Titanium

ULTRASONIC materials
ZrO ₂ [cast]

ULTRASONIC materials
ZrO ₂ [cast]



HSC / MILLING

- + **Highly dynamic five-axis milling machining** of high-end dental prostheses and implants with max. 60,000 rpm
→ e.g. white ZrO₂, PMMA, titanium and CrCo

ULTRASONIC

- + **Overlay of tool rotation** with an additional oscillating movement for economical hardmachining with diamond tools
→ e.g. glass ceramics and cast ZrO₂

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Inlays, onlays

HSC materials
ZrO ₂ (pressed)
PMMA
Cobalt chrome
Titanium



Abutments

HSC materials
Wax, acrylic
ZrO ₂ (pressed)
Cobalt chrome
Titanium



Implants

HSC materials
ZrO ₂ (pressed)
Titanium



Special indications

HSC materials
Metal-free palatal plates
Promysan occlusal splints
CrCo, titanium abutment posts
ZrO ₂ , CrCo, titanium telescopes

ULTRASONIC materials
Glass ceramics
ZrO ₂ (cast)

ULTRASONIC materials
ZrO ₂ (cast)

ULTRASONIC materials
ZrO ₂ (cast)

ULTRASONIC materials
ZrO ₂ (cast) abutment posts
ZrO ₂ (cast) telescopes

DMG MORI – ADDITIVE MANUFACTURING

ADDITIVE MANUFACTURING



- + **High-precision build-up** of 3D components with layer thicknesses of 20 to 100 µm
- + **Optimized gas flow control** for the best component quality with minimal argon consumption
- + **Maximum occupational safety** due to closed material cycle and integrated powder preparation
- + Replaceable **powder module rePLUG** for contamination-free material changeover <2 h
- + **CELOS:** Integrated software solution from CAM programming with the RDesigner through to machine control

SELECTIVE LASER MELTING (SLM)



CELOS

SLM

ADDITIVE
MANUFACTURING
IN THE POWDER BED
Component size
max. 300×300×300 mm

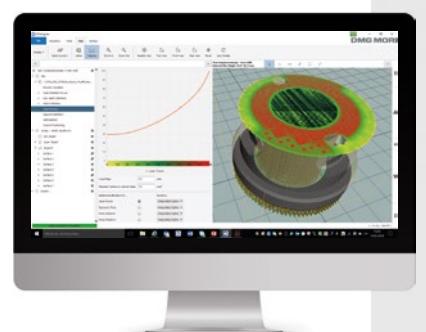


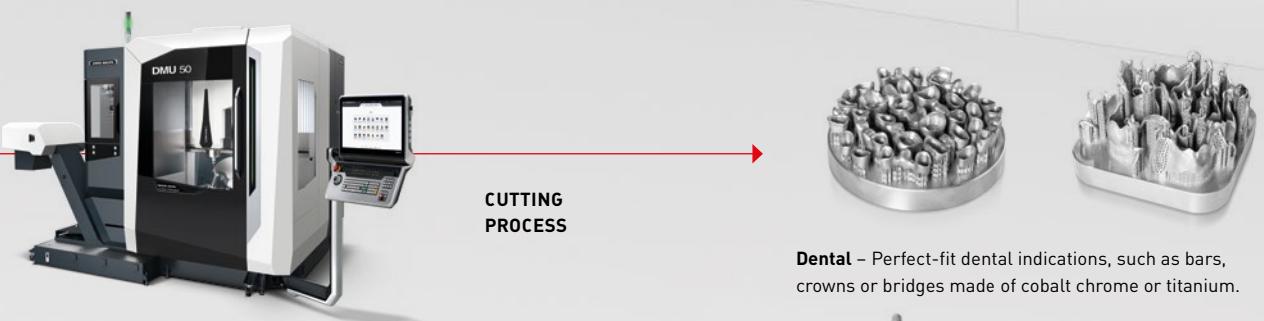
SLM
CUTTING
PROCESS



CELOS: INTEGRATED SOFTWARE SOLUTION FROM CAM PROGRAMMING THROUGH TO MACHINE CONTROL

- + **Intuitive machine operation** thanks to touchscreen and app-based control
- + **RDesigner** – CAM programming directly at the machine:
 - Start with pure CAD model (STL)
 - Orientation/positioning
 - Support, slicing, hatching, copying
 - Generation of the process control file
- + **HEAT calculation:** Patented prediction of mass distribution and automatic adjustment of all laser parameters for the best component quality
- + **Monitoring tools:** Camera-based monitoring of the build-up and coating quality





NEW: OPTOMET – INNOVATIVE AND INTEGRATED SOFTWARE SOLUTION

- + **Automatic calculation** of process parameters for new and existing materials in a matter of minutes
- + **20% lower material costs** – improved usability of already recycled powder without loss of quality
- + **Pre-calculation** of mechanical properties for selected materials thanks to integrated material database
- + **Adjustment of the process parameters to:**
 - Changed layer thicknesses, changed requirements (density, tensile strengths, etc.)
 - New powder suppliers/powder properties (e.g. recycling powder)
- + **Optional:** rePLUG reSEARCH – the powder module specifically developed for material development with OPTOMET





We reserve the right to make technical changes.
The machines illustrated herein may include options, accessories and control variants.