DMU 600 P
DMU 600 FD
DMU 600 Gantry

UNIVERSAL AND HSC MACHINES FOR 5-SIDE/5-AXIS MACHINING OF LARGE WORKPIECES

XXL MILLING MACHINES
DMU 600 P/FD AND DMU 600 Gantry

The new benchmark in 5-axis machining

5-axis machines in highly stable portal and gantry design generate maximum precision with the highest dynamics. Besides drilling and milling work, the mill-turn machines also allow turning in the same set-up. Large traverses and high table loads up to 150t make this possible. The dual-table configuration allows set up during machining for maximum productivity.

AEROSPACE
Integral component

MECHANICAL ENGINEERING
Spiral bevel gear

DIE & MOLD
Bumper mould

ENERGY TECHNOLOGY
Pelton wheel
DIE & MOLD
Aluminium mould tool for a vehicle hood;
Dimensions
2,000 x 2,200 x 450 mm
THE XXL RANGE FOR ALL SIZES AND APPLICATIONS!

Gigantic!

Large machines designed intelligently – dynamic machining of large parts up to 40 t:
The DMU 600 P, together with the universal machines of the 210, 270 and 340 series, forms a uniquely successful range of portal machines for large workpieces. The DMU 600 Gantry with its high gantry design is dedicated to the dynamic and precise 5-axis machining e.g. in Die & mold and Aerospace applications.

PORTAL MACHINE
DMU 600 P

with a traverse starting from 6 m is able to machine workpieces weighing up to 40 tonnes

+ Portal design for maximum precision and dynamics up to 3 m/s²
+ Bed and column made from EN-GJS-600-3 (GGG60) cast iron with high static temperature stability and damping characteristics
+ Outstanding cutting power with up to 2,024 Nm

DMU 600 P

+ Modular concept based on the proven portal design
+ In spite of the high maximum load, it features rapid traverse and feed speeds up to 30 m/min in the X/Y/Z axes
+ Rack and pinion drive in the X/Y axes, ball screws in the Z/W axes
+ Constant high precision with a water-cooled machine structure and drive elements
+ Vertically adjustable crossbeam (W axis) optionally available
HIGH-GANTRY MACHINE
DMU 600 Gantry

* Ram in the Z axis with strokes up to 2,000 mm
* Y axis crossbeam with 3,500 mm and optional 4,500 mm traverse
* The X axis, 6,000 mm as standard, can be freely extended
* Constant high precision with a water-cooled machine structure and drive elements; optimised ThermoShield technologies
* Long-term accuracy due to wear-free contactless drives. 5 years warranty on linear motors

Designed for highly dynamic milling processes with highest demands on dynamics, contour accuracy and surface finish

* Direct Drive technology for best surface quality and highest dynamics (linear drives: X-,Y-axis; Torque drives: in A/C, B/C rotary axes)
* Large closed-loop control spectrum and free from gear meshing frequencies
* Fewer contouring errors compared to rack and pinion drive technology (approx. 30 % fewer)
* Up to 50 % faster machining while maintaining higher contour accuracy
True greatness knows no limits!

Guaranteed high stiffness and stability due to the use of cast iron with large Masses. Highest temperature stability and precision are ensured by extensive cooling measures. The entire feed drive is cooled, which guarantees higher workpiece accuracy.

Maximum stiffness and high temperature stability

+ Portal fixed to the foundation and bolted to machine bed
+ Optimised machine concept based on FEM and modal analysis in portal design
+ Large dimensions with high temperature stability
+ Machine bed, column and crossbeam from EN-GJS-600-3 (GGG60) with excellent damping characteristics
All relevant heat sources are liquid-cooled

- All drive motors
- Additional cooling of the X axis drive
- Interchangeable heads, swivel axes including main drive (cooling of structure, drives and components)
- Z axis: Ball screw and bearing
- Ram guideways
- Customized cooling to suit ambient conditions
- Modern machine enclosure to insulate the machine structure from external temperature influences
- Structural cooling of the ram

Compensation of the main heat sources
DMU 600 Gantry

Unique precision with linear motors!

Designed and built for the best surface quality and the highest dynamics with innovative, contactless linear motor drive technology. The machine structure has been optimised for static and dynamic stiffness and guarantees consistent temperature stability through comprehensive temperature control of the structure, components and guideways. Energy-efficient consumption with efficient cooling technology and on-demand accumulator activation.

Consistently high precision with temperature stability of the machine structure

- **Cooled feed axes**: Precision cooler for primary components, cooling bands for secondary components
- **Ball screw drives with core cooling** in the Z-axis
- **Cooled linear guideways** in the X/Y/Z axes
- **Cooled main spindle**, including sensor-based spindle compensation
- **Optional TTC (temperature thermal control) package**: ThermoShield, coolant temperature control and structural cooling
- **Geometric stability with structural cooling**, prevents components from warping as a result of temperature gradients
- **Energy-efficient coolant units**
  - Optional connection to on-site/customer-site cooling circuit Applications and parts
  - Structural cooling of the ram
The world’s most modern XXL machine production plant:
The XXL Centre at DECKEL MAHO in Pfronten.

**Temperature control**
+ Consistently high precision with a liquid-cooled machine structure and drive component

**Machine structure**
+ Maximum static and dynamic stiffness with FEM-optimised machine structure from EN-GJS-600-3 (GGG60)
  - Crossbeam
  - X axis beds
  - Ram
  - Y/Z slide
  - Table
Legendary technology made contemporary: The dynamic linear drive by DMG MORI meets the highest demands in surface quality and productivity.

DMU 600 Gantry

Linear motors

+ Optimal surface quality with contact-free drive components
+ Positioning accuracy and contour accuracy
+ High uptime thanks to maintenance-free motors
+ Years of experience with linear drives

Consistent dynamic meets the highest standards

+ Direct connection to the machine structure without transmission elements
+ Very high surface quality due to absence of gear meshing frequencies from the drive train
+ Closed-loop control spectrum
+ Improved axis parameters compared to conventional drive technology

<table>
<thead>
<tr>
<th>Linear drive</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jerk</td>
<td>Three times higher than with rack and pinion drive</td>
</tr>
<tr>
<td>Path acceleration</td>
<td>Two times higher than with rack and pinion drive</td>
</tr>
<tr>
<td>Kv factor</td>
<td>Three times higher than with rack and pinion drive</td>
</tr>
<tr>
<td>Axis speed</td>
<td>45 (30 with rack and pinion drive)</td>
</tr>
<tr>
<td>Positioning accuracy</td>
<td>2-times higher than with rack and pinion drive</td>
</tr>
</tbody>
</table>

Maximum precision and optimal contouring accuracy

+ High long-term accuracy due to contactless wear-free linear drive. 5-year warranty on linear motors
+ Optimal drive stiffness with linear motors
+ Positioning/circularity [µm]: Two times higher than with rack and pinion drive

Applications and parts

Machine and technology

→ DMU 600 Gantry

Control technology

Technical data
DIE & MOLD

Press tool made of tool steel for the side body part of a Jaguar
DMU 600 P

Large components up to 40 t, travels up to 18 m and movable cross beam

+ Modular concept based on proven portal elements
+ Portal design for maximum precision and dynamics up to 3 m/s²
+ Single-piece EN-GJS-600-3 (GGG60) cast iron substructure/bed
+ Portal attached to foundation and bolted to machine bed for maximum stiffness
+ Ram with FEM optimized cross section, up to 1,500 mm travel and up to 2,024 Nm
+ Workpiece weight up to 40 tonnes
+ Rack and pinion drive in the X/Y axes, ball screws in the Z/W axes
+ Short installation times due to user-friendly design of individual modules
## Modules of the DMU 600 P

### Portal, crossbeam, X slide

- **Basic construction with W axis**
- **Milling head changer**
  - 3 – 6 stations

### Z axis ram and interchangeable milling heads

- **Z axis ram for interchangeable milling heads**
- **Interchangeable heads**

### Tables

- **Rigid table 5,000 × 2,800 mm**
- **Dual-table configuration**
  - *Option
- **Mill/furn table**
  - ø 3,200 mm

### Tool magazines

- **Wheel magazine with up to 303 tools**
- **Chain magazine with up to 180 tools**

### Technical Specifications

<table>
<thead>
<tr>
<th></th>
<th>DMU 600 P</th>
<th>DMU 600 FD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Travel X/Y/Z</td>
<td>6,000/4,200 (4,800)/1,250 (1,500)</td>
<td>6,000/4,200 (4,800)/1,250 (1,500)</td>
</tr>
<tr>
<td>W axis</td>
<td>1,600 (2,000)</td>
<td>1,600 (2,000)</td>
</tr>
<tr>
<td>Table size</td>
<td>5,000 × 2,800</td>
<td>5,000 × 2,800 / ø 3,200</td>
</tr>
<tr>
<td>Maximum table load</td>
<td>25,000 (40,000)</td>
<td>25,000 (35,000)</td>
</tr>
<tr>
<td>Maximum workpiece dimensions</td>
<td>mm</td>
<td>mm</td>
</tr>
</tbody>
</table>

*Optional
**Passage without interchangeable milling heads
DMU 600 Gantry

**Maximum precision and dynamics**

- **Modular concept** based on proven XXL modules
- High-gantry design for **unbeatable dynamics**
- Single-piece EN-GJS-600-3 (GGG60) casting for Y crossbeam and X traverse
- Foundation/side walls made of special concrete
- Available with a permanently mounted milling head or with interchangeable milling heads
- Ram with optimised interference contour with up to 2,000 mm travel and 2,204 Nm
- Clamping plates in different widths and lengths for workpieces up to 150 t
- Machine concept ideal for wet and dry machining
- **Contact-less linear drives** in X- and Y-axis with 5 years warranty and 45 m/min axis speed
- C axis with Direct Drive integrated into the ram optionally available as an axis with endless rotation
MODULES OF THE DMU 600 Gantry

**Chain-type tool magazine and head changing stations**

- Chain magazine with 30°/60°/120°/180° tools
- Changing station for milling heads, 2–5 pockets

**Z axis ram and interchangeable milling heads**

- Z = 1,500 (1,750/2,000)
- SK50/HSK100 and HSK63
- Milling head
- Interchangeable heads

**Tables**

- Clamping plate 3 × 5 m
- Option
- Clamping plate 4 × 5 m

**Portal, crossbeam**

- X = 6,000 mm
- Y = 3,500 mm
- Z = 1,500 mm
- Portal
- Crossbeam Y = 4,500 mm

**DMU 600 Gantry**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Travel X/Y/Z</td>
<td>mm</td>
</tr>
<tr>
<td>Table size</td>
<td>mm²</td>
</tr>
<tr>
<td>Point load</td>
<td>kg/m²</td>
</tr>
<tr>
<td>Load</td>
<td>kg</td>
</tr>
<tr>
<td>Maximum workpiece dimensions</td>
<td>mm</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>6,000/3,500 (4,500)/1,750 (2,000)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5,000</td>
<td>3,000</td>
</tr>
<tr>
<td>15,000</td>
<td>150,000</td>
</tr>
</tbody>
</table>

*Option **Passage without interchangeable milling heads
5-Axis-machining with individual interchangeable milling heads

Due to the high long-term accuracy of their stable portal and gantry design, optimal accessibility of their working areas and set-up stations through the large doors and their fully enclosed working areas, the machines in the 600 series are the benchmark for 5-sided to 5-axis simultaneous machining.

3-axis machining up to 5-axis simultaneous machining

- Mounting of interchangeable milling heads via ram (Z-axis)
- Integrated C-axis, swivel range +/- 300° (optional 360° endless rotation)
- Vertical milling head with gears for 3-axis rough machining with 2,024 (2,500**) Nm torque
- Angular milling heads with gearbox drive in different lengths
- B axis head for simultaneous 5-axis milling
  - Gearbox head with 2,024 Nm
  - Built-in 28,000 rpm motor spindle with 38 Nm torque
  - or 12,000 rpm motor spindle with 300 Nm torque
- A axis motor spindle head for simultaneous 5-axis milling of angles up to ~30°
  - Integrated 28,000 min⁻¹ motor spindle or
  - 12,000 min⁻¹ motor spindle with 430 Nm

Z AXIS RAM FOR INTERCHANGEABLE MILLING HEADS

Built-in C axis with Direct Drive technology as standard, selective with ±185° or as an endless rotating axis n x 360°.
Head changing station with storage stations

+ Optional interface for interchangeable milling heads on the gantry with 2 storage positions, portal 3 as standard
+ Can be modularly expanded to have up to five (gantry) or six (portal) stations
+ Optimal use of space with positions under the crossbeam (gantry) or on the side of the longitudinal axis (portal)
+ Optimum protection against contamination (no interference contour in the working area)

INTERCHANGEABLE AT ALL TIMES DUE TO THE MASTER HEAD PRINCIPLE

<table>
<thead>
<tr>
<th>Technical data</th>
<th>powerMASTER</th>
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<th>powerMASTER</th>
<th>powerMASTER</th>
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</thead>
<tbody>
<tr>
<td>Speed rpm</td>
<td>3,000</td>
<td>6,000</td>
<td>12,000</td>
<td>15,000</td>
<td>16,000</td>
</tr>
<tr>
<td>Torque (40% /100% DC) Nm</td>
<td>– / 700</td>
<td>2,024 / 1,455</td>
<td>430 / 300</td>
<td>145 / 120</td>
<td>404 / 280</td>
</tr>
<tr>
<td>Power (40% /100% DC) kW</td>
<td>– / 53</td>
<td>74 / 53</td>
<td>52 / 42</td>
<td>45 / 45</td>
<td>52 / 42</td>
</tr>
<tr>
<td>Tool holder</td>
<td>SK50 / HSK-A100</td>
<td>HSK-A100</td>
<td>HSK-A63</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Milling head

- B-axis direct drive

Interchangeable milling heads

Vertical motorspindle head

- Vertical gearbox spindle head

- B-axis motorspindle head

- B-axis gearbox spindle head

- A-axis motorspindle

Angular head 90°

• available – not available

Additional motorspindles and milling heads on request
DMU 600 P/FD AND DMU 600 Gantry

Gear milling – with standard tools on standard machines

The gear cutting software DMG MORI gearMILL facilitates the complete machining of a wide range of gear types on the machines in the Portal series. Gears up to ø 5,000 mm can be produced efficiently.

Software package for various gear cutting operations

**Spur gear package**
+ External teeth: Straight, angular, double helical

**Bevel spur gear package**
+ Angle $\neq 90^\circ$: Spiral, straight
+ Worm gear package ZA/ZN/ZI flank profile

THE HIGHEST FLEXIBILITY AND SHORTEST MACHINING TIMES

+ Standard tools
+ Standard machines
+ No complex conversion work
+ Soft and hard machining on one machine
+ Complete machining on one machine with milling, drilling and turning in one set-up
+ Electronic balancing on the machine (FD range)
+ Gear wheels up to ø 5,000 mm

HIGHLIGHTS

+ Enter the gear-cutting parameters
+ Calculate the tooth space geometry
+ Optimise the tooth root geometry
+ Customised contact pattern modelling
+ Generation of 5-axis milling programs
+ Machine simulation
+ **Design module**: Tooth space geometry calculation program
+ **Measurement module**: Measurement data generator
+ **CAM module**: Semi-automatic CNC program generation
+ **Training module**: Basic courses, individual courses, training on site, ramp-up support
Twenty years of turn-mill technology with over 1,000 sold machines

- Complete machining with milling and turning in one set-up
- Most powerful mill-turn (FD) table with direct drive in its class with 50,000 Nm and 185 kW
- Lower unit production costs thanks to faster machining; lower logistics expenses thanks to the absence of idle periods and fewer operations
- Exclusive DMG MORI mill-turn cycles: Complex machining easy realized
- Higher precision thanks to the absence of set-up work
- Less investment and lower space requirements with the use of just one machine
- Oil mist filter and shatter-proof safety glass panels as standard
- Combination tool measurement for milling and turning tools
- Heavy workpieces up to 35,000 kg and maximum workpiece diameter of 5,000 mm
- Automatic balancing cycle
- Max. speed 170 min⁻¹ (20,000 kg) and 120 min⁻¹ (35,000 kg)

DMU 600 FD – FULL MACHINING PROCESS

<table>
<thead>
<tr>
<th>Milling</th>
<th>Turning</th>
<th>Boring</th>
<th>Tapping</th>
<th>Set-up</th>
<th>Reclamp</th>
<th>Milling</th>
<th>Turning</th>
<th>Boring</th>
<th>Tapping</th>
<th>Unclamp</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Machine 1</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Full machining process:</th>
<th>Conventional machining process:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 machine</td>
<td>3 machines</td>
</tr>
<tr>
<td>4 machining steps</td>
<td>10 machining steps</td>
</tr>
<tr>
<td>300% higher productivity</td>
<td></td>
</tr>
</tbody>
</table>

SINGLE-PURPOSE MACHINES – CONVENTIONAL MACHINING PROCESS

<table>
<thead>
<tr>
<th>Turning</th>
<th>Set-up</th>
<th>Reclamp</th>
<th>Turning</th>
<th>Set-up</th>
<th>Milling</th>
<th>Boring</th>
<th>Tapping</th>
<th>Set-up</th>
<th>Milling</th>
<th>Boring</th>
<th>Tapping</th>
<th>Set-up</th>
<th>Precision</th>
<th>Unclamp</th>
</tr>
</thead>
<tbody>
<tr>
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<td></td>
<td></td>
</tr>
<tr>
<td>Machine 1</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
<td>9</td>
<td>10</td>
<td></td>
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</tbody>
</table>
DMU 600 P/FD AND DMU 600 Gantry

Innovative tool handling

Tool magazines

<table>
<thead>
<tr>
<th>Toolholder</th>
<th>DMU 600 P/FD</th>
<th>DMU 600 Gantry</th>
</tr>
</thead>
<tbody>
<tr>
<td>HSK-A63</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chain magazine, 30 pockets</td>
<td>–</td>
<td>●</td>
</tr>
<tr>
<td>Chain magazine, 60 pockets</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Chain magazine, 120 pockets</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Chain magazine, 180 pockets</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>SK50 (HSK-A100)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chain magazine, 30 pockets</td>
<td>–</td>
<td>●</td>
</tr>
<tr>
<td>Chain magazine, 60 pockets</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Chain magazine, 120 pockets</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Chain magazine, 180 pockets</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Wheel magazine, 63/123/183/243/303 pockets</td>
<td>●</td>
<td>–</td>
</tr>
</tbody>
</table>

Interchangeable milling heads

| Station for interchangeable milling heads, standard | 3 | – |
| Station for interchangeable milling heads, optional | 6 | 2-5 |

Magazine types

<table>
<thead>
<tr>
<th>Toolholder</th>
<th>Chain magazine</th>
<th>Wheel magazine</th>
</tr>
</thead>
<tbody>
<tr>
<td>Toolholder</td>
<td>HSK-A63/SK50 [HSK-A100]</td>
<td>SK50 [HSK-A100]</td>
</tr>
<tr>
<td>Measurements (occupied adjacent pockets) mm</td>
<td>ø 110</td>
<td>ø 110</td>
</tr>
<tr>
<td>Measurements (free adjacent pockets) mm</td>
<td>ø 250</td>
<td>ø 250</td>
</tr>
<tr>
<td>Boring bar measurements mm</td>
<td>ø 250 × 400</td>
<td>ø 250 × 400</td>
</tr>
<tr>
<td>Tool length mm</td>
<td>650</td>
<td>900</td>
</tr>
<tr>
<td>Weight kg</td>
<td>15/30</td>
<td>30 (40)</td>
</tr>
<tr>
<td>Chip-to-chip time (HSK) sec.</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Number of tools</td>
<td>30/60/120/180</td>
<td>63/123/183/243/303</td>
</tr>
</tbody>
</table>

WHEEL MAGAZINE

+ Max. 303 tools
+ Tools up to 80 kg
+ Tools up to 900mm length
CHAIN MAGAZINE WITH TOOL CHANGE SYSTEM

- 30 – 180 tools
- Tool length 650 mm
- Tool diameter 110 mm (250 mm with free adjacent pockets)
- Tool magazine with 4-position gripper for SK50/HSK100 and HSK63 interfaces
Spindles for special materials and applications

**Motor spindle rated at 30,000 rpm / 124 kW / 62 Nm (40 % DC)**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Workpiece material</td>
<td>AL 7050</td>
</tr>
<tr>
<td>Material removal rate</td>
<td>10,600 cm³/min</td>
</tr>
<tr>
<td>Tool</td>
<td>Milling head ø32 mm (3 cutting edges)</td>
</tr>
<tr>
<td>Spindle speed</td>
<td>30,000 rpm (Vc = 3,000 m/min)</td>
</tr>
<tr>
<td>Feed</td>
<td>23,000 mm/min (Fz = 0.26 mm)</td>
</tr>
<tr>
<td>Depth/width of cut</td>
<td>18 / 25 mm</td>
</tr>
</tbody>
</table>

**Vertical head drive 6,000 rpm / 74 kW / 2,024 Nm (40 % DC)**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Workpiece material</td>
<td>Steel (Ck45)</td>
</tr>
<tr>
<td>Material removal rate</td>
<td>1,800 cm³/min</td>
</tr>
<tr>
<td>Tool</td>
<td>Milling head ø160 mm (16 cutting edges)</td>
</tr>
<tr>
<td>Spindle speed</td>
<td>500 rpm (Vc = 250 m/min)</td>
</tr>
<tr>
<td>Feed</td>
<td>3,000 mm/min (Fz = 0.4 mm)</td>
</tr>
<tr>
<td>Depth/width of cut</td>
<td>6 / 100 mm</td>
</tr>
</tbody>
</table>

**powerMASTER rated at 12,000 rpm / 52 kW / 430 Nm (40 % DC)**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Workpiece material</td>
<td>Steel (Ck45)</td>
</tr>
<tr>
<td>Material removal rate</td>
<td>864 cm³/min</td>
</tr>
<tr>
<td>Tool</td>
<td>Milling head ø160 mm (9 cutting edges)</td>
</tr>
<tr>
<td>Spindle speed</td>
<td>1,000 min (Vc = 500 m/min)</td>
</tr>
<tr>
<td>Feed</td>
<td>1,800 mm/min (Fz = 0.2 mm)</td>
</tr>
<tr>
<td>Depth/width of cut</td>
<td>4 / 120 mm</td>
</tr>
</tbody>
</table>
Example applications

Machining a cable drum
5-sided machining, NC-controlled B axis with gear-driven spindle, roughing and finishing; no post-processing work required

<table>
<thead>
<tr>
<th>Industry</th>
<th>Spindle speed</th>
<th>Tool</th>
<th>Power</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mechanical engineering</td>
<td>12,000 rpm</td>
<td>Angle milling head ø125 mm</td>
<td>52 kW</td>
</tr>
<tr>
<td>Material</td>
<td>Torque</td>
<td>S 235 JR (ST37)</td>
<td>430 Nm</td>
</tr>
</tbody>
</table>

Complete machining of a cylinder block
5-sided machining, NC-controlled B axis with gear-driven spindle and use of special heads

<table>
<thead>
<tr>
<th>Industry</th>
<th>Spindle speed</th>
<th>Tool</th>
<th>Power</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy technology</td>
<td>6,000 rpm</td>
<td>Boring bar ø340 mm</td>
<td>74 kW</td>
</tr>
<tr>
<td>Material</td>
<td>Torque</td>
<td>EN-GJL-250 (GG25)</td>
<td>2,024 Nm</td>
</tr>
</tbody>
</table>

Rough machining of a compressor case
5-sided machining, NC-controlled B axis with gear-driven spindle

<table>
<thead>
<tr>
<th>Industry</th>
<th>Spindle speed</th>
<th>Tool</th>
<th>Power</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy technology</td>
<td>6,000 rpm</td>
<td>Face milling cutter ø100 mm</td>
<td>74 kW</td>
</tr>
<tr>
<td>Material</td>
<td>Torque</td>
<td>EN-GJS-400-15 (GGG40)</td>
<td>2,024 Nm</td>
</tr>
</tbody>
</table>

Machining a 210 series machine bed
3-axis machining with a straight attachment unit, complete machining in one set-up

<table>
<thead>
<tr>
<th>Industry</th>
<th>Spindle speed</th>
<th>Tool</th>
<th>Power</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mechanical Engineering</td>
<td>6,000 rpm</td>
<td>Milling cutter ø100 mm</td>
<td>74 kW</td>
</tr>
<tr>
<td>Material</td>
<td>Torque</td>
<td>EN-GJS-600-3 (GGG60)</td>
<td>2,024 Nm</td>
</tr>
</tbody>
</table>

Finishing of a mould insert
Bearbeitungsfokus: 3 + 2-axis machining with NC-controlled B axis with motor spindle for finishing, complete machining in one set-up

<table>
<thead>
<tr>
<th>Industry</th>
<th>Spindle speed</th>
<th>Tool</th>
<th>Power</th>
</tr>
</thead>
<tbody>
<tr>
<td>Die &amp; Mold</td>
<td>28,000 rpm</td>
<td>Ball nose cutter ø2 mm</td>
<td>35 kW</td>
</tr>
<tr>
<td>Material</td>
<td>Torque</td>
<td>40CRMnNiMo8-6-4</td>
<td>48 Nm</td>
</tr>
</tbody>
</table>
Power charts

Main drive/vertical gearbox head
6,000 rpm / 74 kW / 2,024 Nm

B-axis with gearbox spindle
6,000 rpm / 74 kW / 1,500 Nm

Motor spindle HSK-A63
28,000 rpm / 124 kW / 62 Nm

B-axis with gearbox spindle
6,000 rpm / 74 kW / 1,500 Nm

Motor spindle HSK-A63
28,000 rpm / 124 kW / 62 Nm

Power charts
The DMU 600 P/FD as a multi-table version enables 5-axis complete machining of large parts up to 75 t and 18 m.
Also suitable for maintime parallel setup of workpieces
Exclusive, optionally available DMG MORI technology cycles

3D quickSET
Quick and easy for maximum precision
+ Tool kit for checking and correcting the kinematic precision of 4 and 5-axis machine configurations
+ All head variants and all table axes

L-MEASURING PACKAGE
Enhanced measuring options with an L-Measuring probe
+ Measurement of pockets and grooves
+ Measurement in hard-to-reach areas
+ Measurement of individual points
+ Package with manual and automatic calibration

INTERPOLATION TURNING
Machining of faces and recesses without a turn-mill table
+ The machining process takes place in a circular movement around or within the workpiece
+ The spindle is perpendicular to the direction of movement

GRINDING
Machining with the highest surface precision
+ Grinding on a universal milling machine
+ For internal, external and face grinding
+ Dressing cycles for dressing the grinding wheel

MPC 2.0 – MACHINE PROTECTION CONTROL
Protecting machines with an emergency shut-off function
+ Vibration sensors on the milling spindle
+ Emergency shut-off with teach function
+ Process monitoring by means of a bar graph
+ Milling spindle bearing diagnostics

ATC – APPLICATION TUNING CYCLE
Process optimisation at the push of a button
+ Process-oriented feed drive tuning
+ Minimised machining time with maximised component quality, even taking into account the workpiece weight

EFFICIENT PRODUCTION PACKAGE
Safe and efficient production – optimisation of the production potential
+ Extended milling strategies
+ Simple programming of recurring machining steps
+ Safe retraction from all potential collisions
+ Reduced programming times
+ Reduction of errors caused by program crashes

Applications and parts
Machine and technology
Control technology
› DMG MORI technology cycles
Technical data
High-end CNCs for safe machining and maximum precision

Together with SIEMENS 840D solutionline, the Portal series is equipped with the new ERGO\textit{line} Control with a 21.5\textdegree{} monitor and CELOS. The 19\textdegree{} ERGO\textit{line} panel is available for the HEIDENHAIN TNC 640. Optionally, various exclusive software cycles such as ATC, MPC, 3D quickSET and DMG MORI Virtual Machine are available, which are able to directly influence either workpiece quality or process optimisation.
SMARTkey
Personalized authorization of the operator: Individually adapted access rights to the control system and the machine.

CELOS ON THE ERGOline CONTROL WITH 21,5” MULTI-TOUCH SCREEN

Standardized
Simple machine operation for all new high-tech machines made by DMG MORI.

End-to-end
End-to-end administration, documentation and visualization of order, process and machine data.

Open
Direct data import from MES and ERP systems. Integration of any external program and web contents.

Measurable
With the DMG MORI MESSENGER all status information of the linked machines and devices is available at a glance. Regular and automated reports boost transparency in production.

Future-proof
Simple PLC-independent CELOS update to the latest version from every existing version. The data is reliably migrated and all functions supported by the PLC will then be available to the full extent.
CELOS – From the idea to the finished product

CELOS offers a standardized user interface for all new high-tech DMG MORI machines. CELOS APPs enable end-to-end administration, documentation and visualization of order, process and machine data. This also simplifies, standardizes and automates machine operation. Standard APPs support the machine operator during preparation, optimization and systematic processing of production orders.

CELOS APPs – 3 EXAMPLES

**JOB MANAGER**

Systematic planning, administration and preparation of orders.

- Machine-based creation and configuration of new orders
- Structured saving of all production-relevant data and documents
- Automatic order data import with the help of the job import function

**APPLICATION CONNECTOR**

Your application directly on the machine.

- Integration of own systems (e.g. MES, ERP) and access to Intranet/Internet directly on the CELOS machine
- Creation of up to 20 own connections as CELOS APPs on the CELOS user interface
- Simple remote control (RDP or VNC) or web connections directly from CELOS

**MESSENGER**

Current status data from networked machines and devices in production at a glance.

- DMG MORI Monitoring for all machines and devices in production networked via DMG MORI Connectivity
- Automatically generated one-page reports
- Maximum flexibility thanks to the creation of customized dashboards
# Technical data

## Working area

<table>
<thead>
<tr>
<th>X/Y/Z Axis</th>
<th>mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>W Axis</td>
<td></td>
</tr>
</tbody>
</table>

## Portal passage

<table>
<thead>
<tr>
<th>Horizontal</th>
<th>mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vertical</td>
<td>mm</td>
</tr>
</tbody>
</table>

## Distance from spindle nose to table centre

<table>
<thead>
<tr>
<th>Horizontal milling head</th>
<th>mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vertical milling head</td>
<td>mm</td>
</tr>
</tbody>
</table>

## Table type

<table>
<thead>
<tr>
<th>Table size</th>
<th>mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum table load</td>
<td>kg</td>
</tr>
<tr>
<td>Mill-turn table (milling/turning)</td>
<td>rpm</td>
</tr>
<tr>
<td>Table size</td>
<td>mm</td>
</tr>
<tr>
<td>Maximum table load</td>
<td>kg/m²</td>
</tr>
</tbody>
</table>

## 5-axis options

Interchangeable milling head as an NC-controlled B axis

Milling head B-axis direct drive

Swivel range [0 = vertical/180 = horizontal] Degrees

Rapid traverse and feed rpm

Interchangeable milling head as an NC-controlled A axis

Swivel range [0 = vertical/−90 = horizontal] Degrees

Rapid traverse and feed rate rpm

Ram with integrated C axis

Turning range | Rapid traverse and feed Degrees | rpm

## Main drive

Interchangeable milling head with integrated motor spindle rpm

Power (40/100 % DC) | Torque (40/100 % DC) kW | Nm

Integrated gear-driven spindle for accepting interchangeable milling heads rpm

Power (100 % DC) | Torque (100 % DC) kW | Nm

5SK50 tool change system – tool magazine

Linear axes (X/Y/Z/W) m/min

Pmax (X/Y/Z) – VDI DGQ 3441/ISO 230-2 µm

## Control system

CELOS with SIEMENS 840D solutionline

CELOS with HEIDENHAIN TNC 640
<table>
<thead>
<tr>
<th>DMU 600 P</th>
<th>DMU 600 FD</th>
<th>DMU 600 Gantry</th>
</tr>
</thead>
<tbody>
<tr>
<td>6,000 × 4,200 (4,800)² × 1,250 (1,500)²</td>
<td>6,000 × 4,200 (4,800)² × 1,250 (1,500)²</td>
<td>6,000 (n × 1,000)² × 3,600 (4,500)² × 1,500 (1,750)²</td>
</tr>
<tr>
<td>1,600 (2,000)²</td>
<td>1,600 (2,000)²</td>
<td>–</td>
</tr>
<tr>
<td>3,500</td>
<td>3,500</td>
<td>4,700 (5,700)²</td>
</tr>
<tr>
<td>2,600 (3,000)²</td>
<td>2,600 (3,000)²</td>
<td>2,500 (2,750/3,000)²</td>
</tr>
</tbody>
</table>

### Working area

<table>
<thead>
<tr>
<th>DMU 600 P</th>
<th>DMU 600 FD</th>
<th>DMU 600 Gantry</th>
</tr>
</thead>
<tbody>
<tr>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
</tbody>
</table>

### Mill-turn table

<table>
<thead>
<tr>
<th>Table type</th>
<th>Table size mm</th>
<th>Maximum table load kg</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rigid table</td>
<td>5,000 × 2,800</td>
<td>25,000 (40,000)</td>
</tr>
<tr>
<td>Mill-turn table</td>
<td>ø 3,200 integrated into 5,000 × 2,800</td>
<td>25,000 (35,000)</td>
</tr>
<tr>
<td>Rigid table</td>
<td>–</td>
<td>170</td>
</tr>
<tr>
<td>–</td>
<td>–</td>
<td>5,000 × 3,000</td>
</tr>
<tr>
<td>–</td>
<td>–</td>
<td>15,000</td>
</tr>
</tbody>
</table>

### Interchangeable milling head

<table>
<thead>
<tr>
<th>Swivel range (0 = vertical / 180 = horizontal) Degrees</th>
<th>Rapid traverse and feed rpm</th>
</tr>
</thead>
<tbody>
<tr>
<td>±180</td>
<td>30</td>
</tr>
<tr>
<td>–120/ +135</td>
<td>30</td>
</tr>
<tr>
<td>–120/ +135</td>
<td>30</td>
</tr>
</tbody>
</table>

### Spindle

<table>
<thead>
<tr>
<th>Spindle type</th>
<th>Power (100 % DC)</th>
<th>Torque (100 % DC) kW</th>
<th>Torque (100 % DC) Nm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard</td>
<td>53 (60)</td>
<td>1,445 (2,500)</td>
<td>53</td>
</tr>
</tbody>
</table>

### Control system

<table>
<thead>
<tr>
<th>Control system</th>
<th>•</th>
<th>•</th>
<th>•</th>
</tr>
</thead>
<tbody>
<tr>
<td>DMU 600 P</td>
<td>DMU 600 FD</td>
<td>DMU 600 Gantry</td>
<td></td>
</tr>
<tr>
<td>DMU 600 P</td>
<td>DMU 600 FD</td>
<td>DMU 600 Gantry</td>
<td></td>
</tr>
</tbody>
</table>
### Options

#### Table options
- **Mill-turn (FD) table**
  - DMU 600 P: —
  - DMU 600 FD: ★
  - DMU 600 Gantry: —

#### Slide
- Ram with integrated C axis, infinite 360° rotation
  - DMU 600 P: ★
  - DMU 600 FD: ★
  - DMU 600 Gantry: ★

#### Toolholder
- **HSK-A63/BT 40/CAT 40**
  - DMU 600 P: —
  - DMU 600 FD: —
  - DMU 600 Gantry: ★
- **HSK-A100/BT 50/CAT 50**
  - DMU 600 P: —
  - DMU 600 FD: ★
  - DMU 600 Gantry: ★

#### Automation / measurement / monitoring
- **3D quickSET**
  - DMU 600 P: ★
  - DMU 600 FD: ★
  - DMU 600 Gantry: ★
- **Wireless measuring sensor**
  - DMU 600 P: ★
  - DMU 600 FD: ★
  - DMU 600 Gantry: ★
- **Blum laser tool measurement in the working area, NT hybrid**
  - DMU 600 P: ★
  - DMU 600 FD: ★
  - DMU 600 Gantry: ★
- **Mechanical tool breakage monitor**
  - DMU 600 P: ★
  - DMU 600 FD: ★
  - DMU 600 Gantry: ★
- **Combined tool measurement in the working area, laser system for milling tools, 3D scanner for turning tools**
  - DMU 600 P: —
  - DMU 600 FD: —
  - DMU 600 Gantry: —
- **Quad-colour signal lights**
  - DMU 600 P: ★
  - DMU 600 FD: ★
  - DMU 600 Gantry: ★

#### Coolants / chip disposal
- **Protective cabin**
  - DMU 600 P: ★
  - DMU 600 FD: ★
  - DMU 600 Gantry: ★
- **Production package with 2,500-litre coolant unit, paper band filter, 40-bar internal coolant supply**
  - DMU 600 P: ★
  - DMU 600 FD: ★
  - DMU 600 Gantry: ★
- **Internal coolant supply, 80-bar, frequency-controlled**
  - DMU 600 P: ★
  - DMU 600 FD: ★
  - DMU 600 Gantry: ★
- **Coolant temperature control for internal coolant supply unit**
  - DMU 600 P: ★
  - DMU 600 FD: ★
  - DMU 600 Gantry: ★
- **Spray gun with 1-bar pump, 40 litres per minute**
  - DMU 600 P: ★
  - DMU 600 FD: ★
  - DMU 600 Gantry: ★
- **Minimum quantity lubrication through the spindle centre internally and through nozzles externally**
  - DMU 600 P: ★
  - DMU 600 FD: ★
  - DMU 600 Gantry: ★
- **Oil and emulsion mist deposition equipment**
  - DMU 600 P: ★
  - DMU 600 FD: ★
  - DMU 600 Gantry: ★
- **Air blast cooling through the spindle centre**
  - DMU 600 P: ★
  - DMU 600 FD: ★
  - DMU 600 Gantry: ★

#### Optional TNC 640 control systems
- **Application Tuning Cycle ATC**
  - DMU 600 P: ★
  - DMU 600 FD: ★
  - DMU 600 Gantry: ★
- **Electronic handwheel TNC 640**
  - DMU 600 P: ★
  - DMU 600 FD: ★
  - DMU 600 Gantry: ★
- **Control console for tool magazine loading station**
  - DMU 600 P: ★
  - DMU 600 FD: ★
  - DMU 600 Gantry: ★
- **ACC – Active Chatter Control**
  - DMU 600 P: ★
  - DMU 600 FD: ★
  - DMU 600 Gantry: ★

#### Optional SIEMENS 840D solutionline
- **Electronic SIEMENS 840D handwheel**
  - DMU 600 P: ★
  - DMU 600 FD: ★
  - DMU 600 Gantry: ★
- **Control console for tool magazine loading station**
  - DMU 600 P: ★
  - DMU 600 FD: ★
  - DMU 600 Gantry: ★
- **DECKEL MAHO MDynamics package**
  - DMU 600 P: ★
  - DMU 600 FD: ★
  - DMU 600 Gantry: ★

#### General options
- **Remote camera system**
  - DMU 600 P: —
  - DMU 600 FD: —
  - DMU 600 Gantry: —
- **Shatter-proof safety glass viewing panel**
  - DMU 600 P: ★
  - DMU 600 FD: ★
  - DMU 600 Gantry: ★
- **Operating mode 4 “Processor monitoring in production”**
  - DMU 600 P: ★
  - DMU 600 FD: ★
  - DMU 600 Gantry: ★

*Standard • Option – not available*
High-efficiency pumps and accumulators

Frequency-controlled coolant pump

The high-pressure coolant pump requires 22% of the energy used during the machining process (representative figure). This energy heats up the coolant which has to be cooled with additional energy.

**Facts**
- Needs-based pressure generates the most efficient use of coolant
- The pressure can be lowered for small tools, as high pressure does not increase the quantity of coolant flowing through the tool

**Conventional technology**
- Pressure reduction with proportional valve technology does not save any energy as the pump continues to run at its nominal rating

**Advantage of DMG MORI**
- Speed-regulated high-pressure pumps which only work with the necessary power

Efficient machine cooling

- DMG MORI uses efficient cooling devices which only generate the necessary cooling power
- The average power of such an accumulator falls by 30 – 50% during production (representative range)

The larger the cooling power of an accumulator, the more energy is saved.
- KFW subsidy: Reinvestment: 30 % energy saved compared to existing systems
- New investment: 15% energy saved compared to the industry average

Typical saving of approximately 2 kW from a 10 kW cooling system

7,200 kWh* or € 2,000 per year

*24 hours per day, 300 days per year € 0.14 per kWh
**DMU 600 P/FD AND DMU 600 Gantry**

**Floor plans**

**DMU 600 P with complete cover**

Side view

**DMU 600 P with complete cover and chain magazine with 120 pockets**

Top view

Footprint of 165.9 m²

Maximum (dependent on the chosen equipment)
DMU 600 Gantry with complete cover

Side view

DMU 600 Gantry with complete cover and chain magazine with 180 pockets

Top view

Footprint of 154.2 m²

Maximum (dependent on the chosen equipment)
DMG MORI Service – fast and reliable!

“Our service commitment will meet your expectations with the highest quality of service!”

Top quality at fair prices. It’s a promise!

Spare Parts: 96% global availability

Spindle Service with Fair Price Guarantee

Training: Professional training at highest standards

Service Products: Our protective shield for your DMG MORI machine

For further information please contact your local DMG MORI office.