

5-axis large machines

# DMU P/FD and DMC U/FD portal series

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DMU 210/270/340 P

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DMU 210/270/340 FD

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DMC 210/270/340 U

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DMC 210/270/340 FD

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## Mechanical engineering

- 1: Crossbeam
- 2: Machine bed

DMU P/FD and DMC U/FD portal series

# The portal series from DECKEL MAHO – more than 1,000 machines installed.

These 5-axis machines with a highly stable portal design offer maximum precision and highest dynamics. In addition to drilling and milling, the turn-mill machines can also carry out turning operations in the same set-up. Long travels up to 3,400 mm and high maximum table load capacities up to 16 tonnes provide exceptional machining flexibility. A pallet changer for the DMC machines facilitates set-up during machining for maximum productivity.



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- 1: Landing gear support beam
- 2: V16 diesel engine crankcase



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## Gear manufacturing

- 3: Planetary gear carrier
- 4: Spiral bevel gear

## Tool and mould making

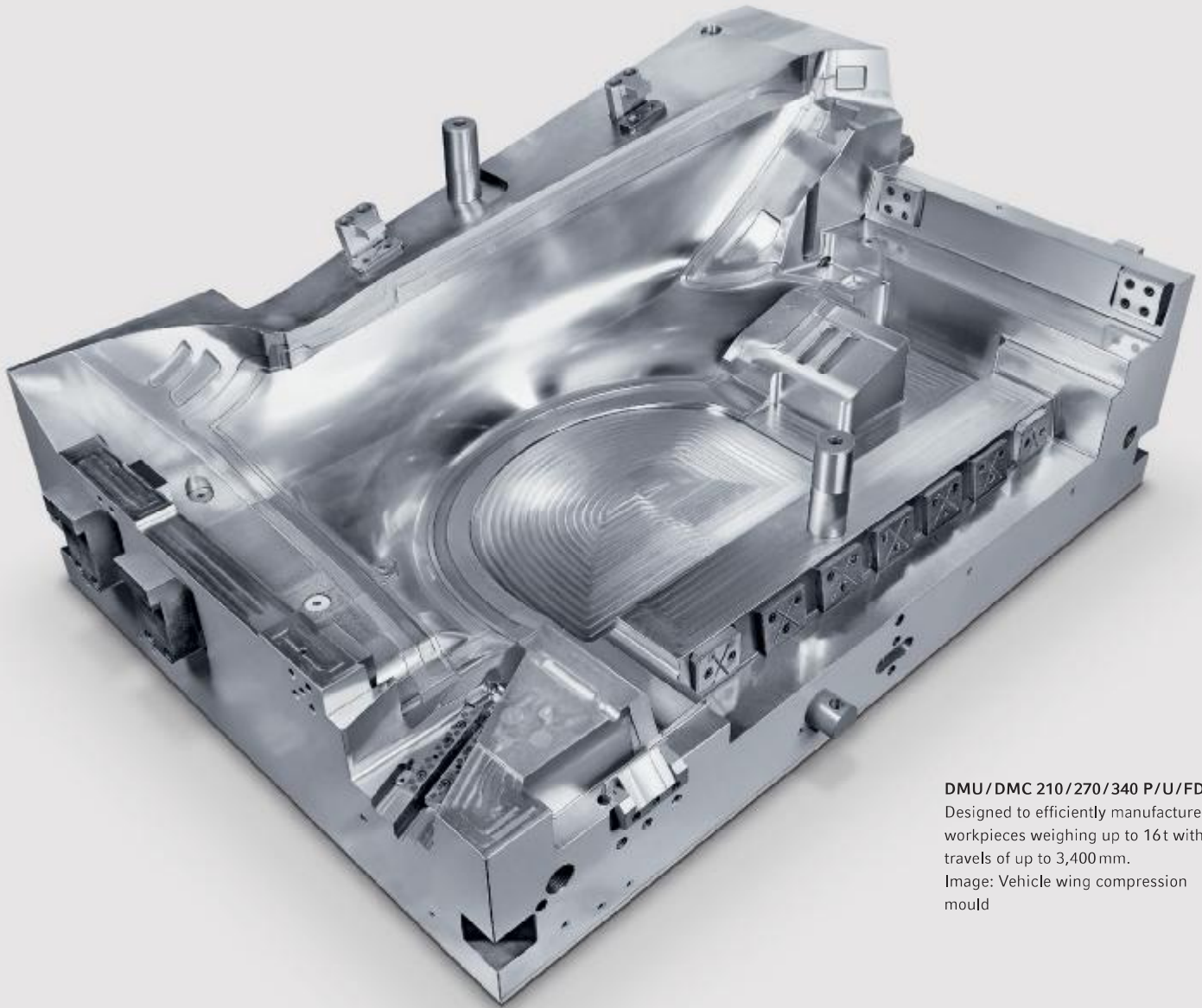
- 5: Bumper press tool
- 6: Bumper mould insert

## Energy technology

- 7: Pelton wheel
- 8: Bearing housing

## Aerospace

- 9: HP compressor housing
- 10: Integral component



**DMU/DMC 210/270/340 P/U/FD:**  
 Designed to efficiently manufacture workpieces weighing up to 16t with travels of up to 3,400 mm.  
 Image: Vehicle wing compression mould

**Note:** The results of machining and performance trials listed in this catalogue are to be taken as examples. The results may vary slightly depending on the environment and cutting conditions.

**Machine and Technology**

- DMU P: 5-axis machines without a pallet changer
- DMC U: 5-axis machines without a pallet changer

Control Technology

Technical Data

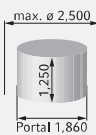
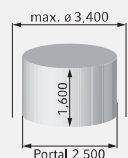
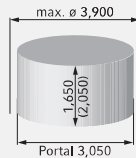
DMU P portal range

# Large components weighing up to 16t, large working area, minimal footprint.

Large travels ranging from 2,100×2,100×1,250 mm up to 3,400×3,400×1,600 mm, a high maximum table load of up to 16 tonnes and innovative machining options such as 5-sided / 5-axis milling and turning in one set-up are just some of the factors behind efficient operation. This concept is rounded off by the optimal accessibility of the working area, a wide range of spindle variants and other process-optimising options.

04



|                              |    | DMU 210 P   | DMU 270 P  | DMU 340 P   |
|------------------------------|----|---|--|---|
| Travel X / Y / Z             | mm | 2,100 / 2,100 / 1,250   | 2,700 / 2,700 / 1,600  | 3,400 / 3,400 / 1,600 (2,000)*  |
| Table size                   | mm | ø 1,700   | ø 2,200  | ø 2,600 × 2,200   |
| Maximum load                 | kg | 8,000 (10,000)*   | 12,000   | 16,000  |
| Maximum workpiece dimensions | mm |  |  |  |



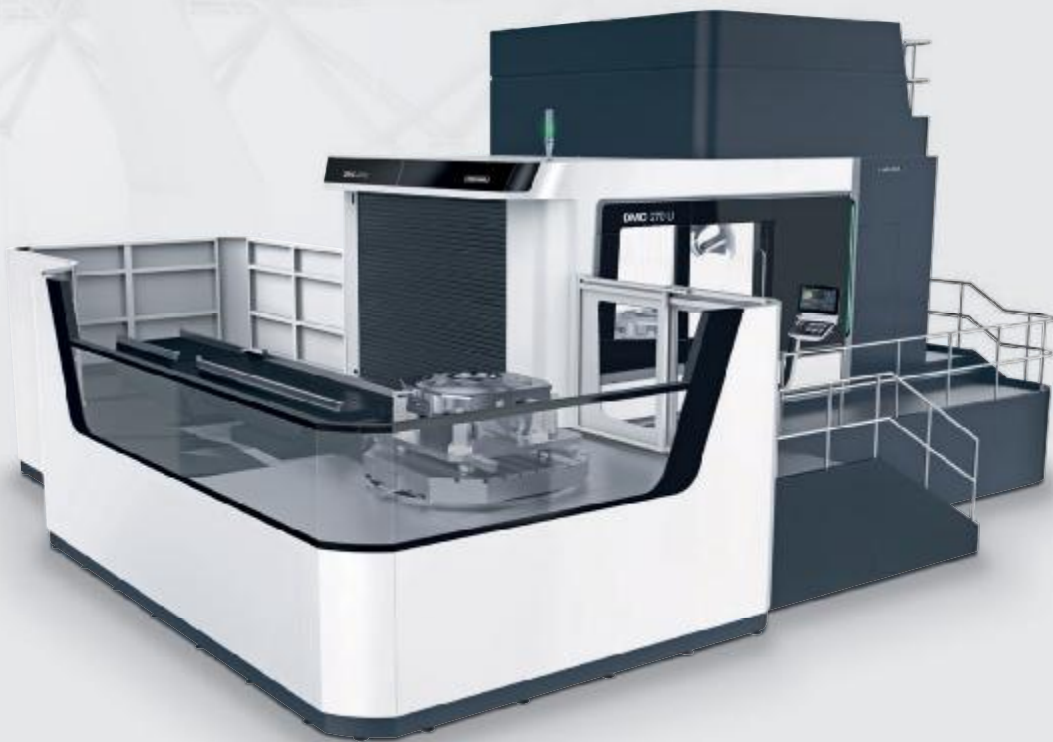
1: Even higher productivity with the automatic pallet changer, up to five pallets in the system with RS 5 rotary storage on the DMC 210 U / FD



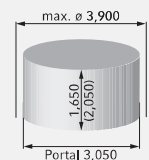
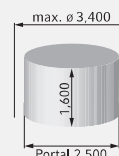
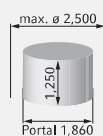
### DMC U portal range

# For machining large components with maximum flexibility and productivity.

A rapid and compact pallet changer in combination with the high flexibility of 5-axis universal machines deliver efficient production. Additional features promoting cost-effectiveness include a maximum pallet load of 10,000 kg, set-up during machining, more extensive automation options, optimal accessibility to the working area, a set-up station and maintenance equipment.



|                              |    | <b>DMC 210 U</b>      | <b>DMC 270 U</b>      | <b>DMC 340 U</b>               |
|------------------------------|----|-----------------------|-----------------------|--------------------------------|
| Travel X / Y / Z             | mm | 2,100 / 2,100 / 1,250 | 2,700 / 2,700 / 1,600 | 3,400 / 3,400 / 1,600 (2,000)* |
| Table size                   | mm | 1,600 × 1,400         | 2,000 × 2,000         | 2,500 × 2,000                  |
| Maximum load                 | kg | 6,000                 | 9,000                 | 10,000                         |
| Maximum workpiece dimensions | mm |                       |                       |                                |



- Turn-mill technology:  
DMU FD / DMC FD

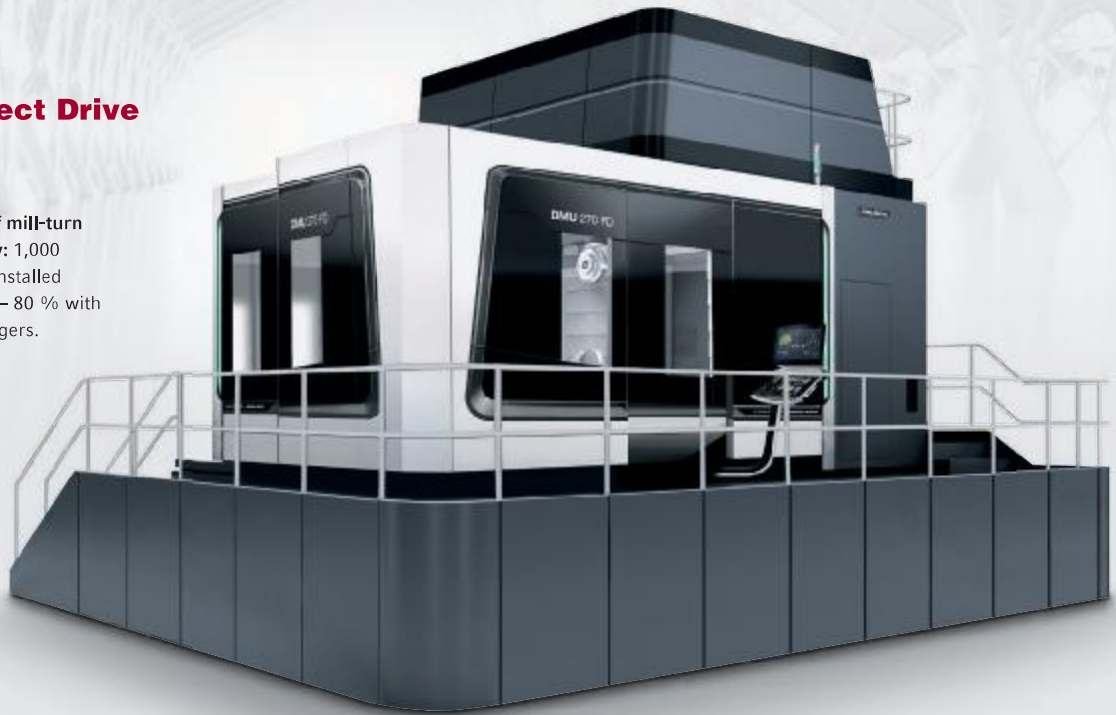
## DMU FD and DMC FD portal series

# Complete machining of large components.

5-sided and/or 5-axis simultaneous machining, including turning, in one set-up. The combination of milling and turning guarantees maximum precision and shorter machining times. The innovative applications are supported by numerous helpful options and features in both the software and hardware.

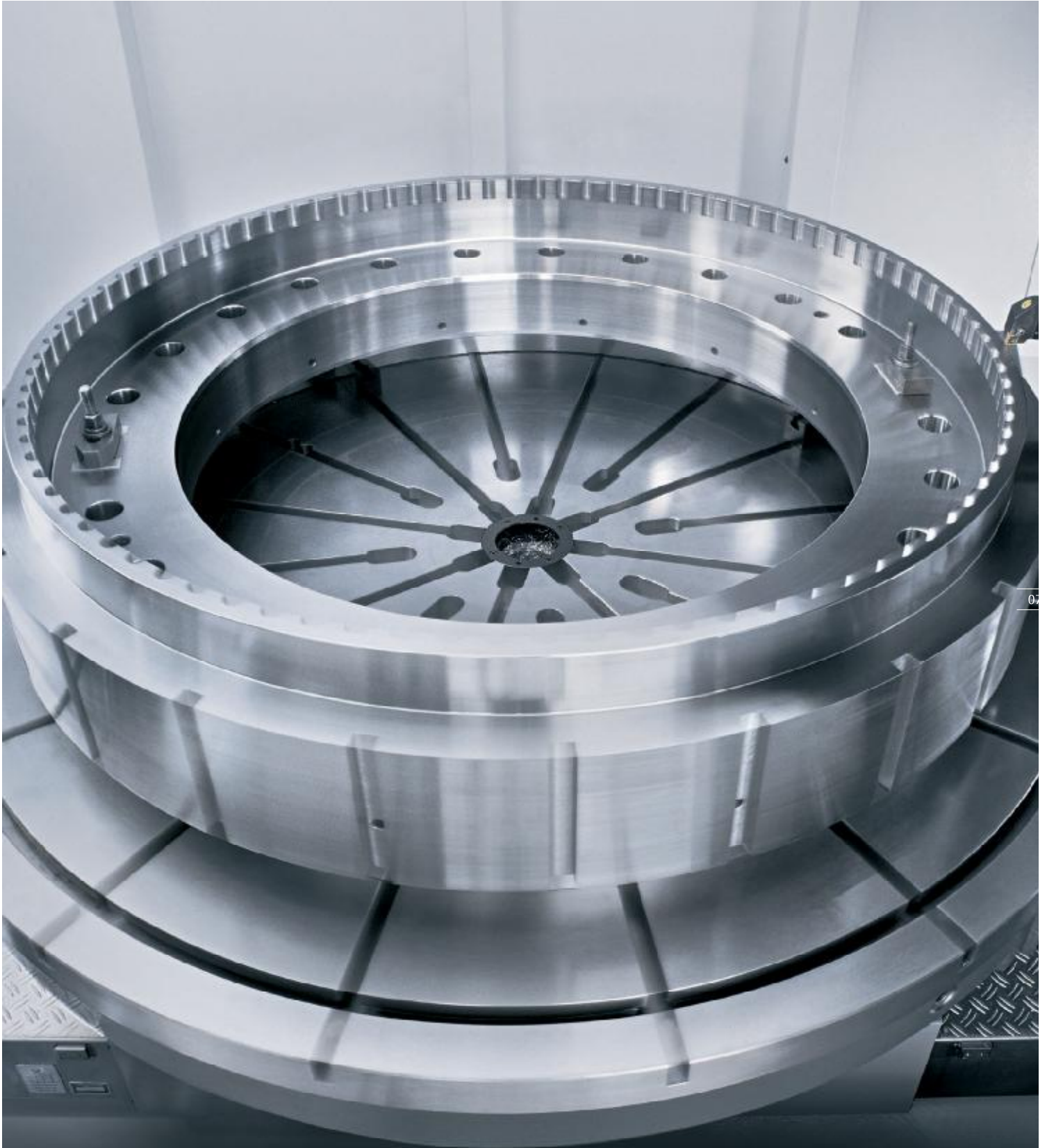


**18 years of mill-turn technology:** 1,000 machines installed worldwide – 80 % with pallet changers.



|                              |    | DMU / DMC 210 FD      | DMU / DMC 270 FD      | DMU / DMC 340 FD               |
|------------------------------|----|-----------------------|-----------------------|--------------------------------|
| Travel X / Y / Z             | mm | 2,100 / 2,100 / 1,250 | 2,700 / 2,700 / 1,600 | 3,400 / 3,400 / 1,600 (2,000)* |
| Table size                   | mm | ø 1,850               | ø 2,200               | ø 2,500                        |
| Maximum load                 | kg | 5,000 / 4,000         | 7,000 / 6,000         | 7,000 / 6,000                  |
| Maximum workpiece dimensions | mm |                       |                       |                                |

Mill-turn table with Direct Drive technology  
for speeds up to 250 rpm // Turning a marine  
gear coupling.

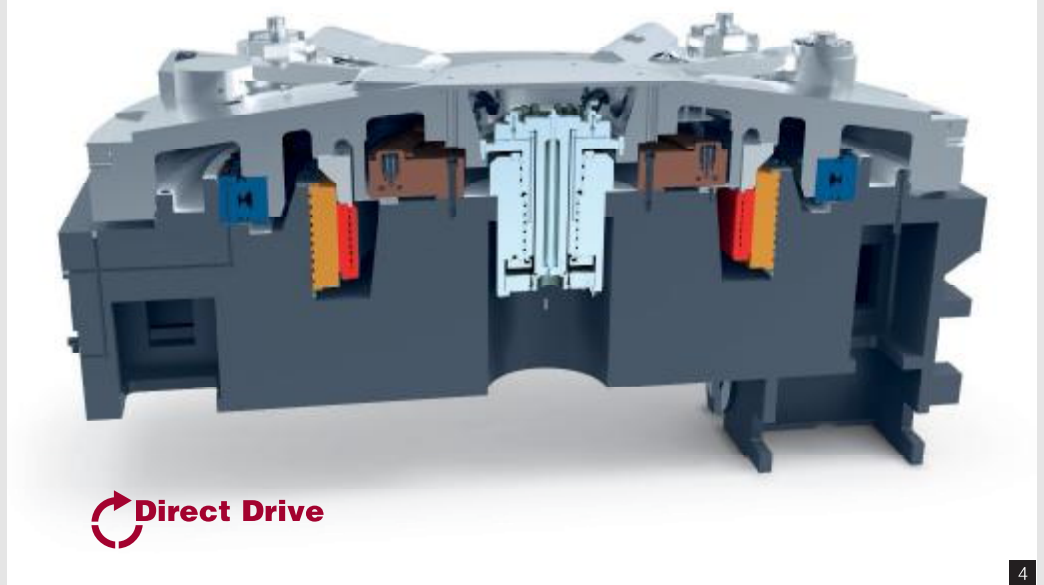
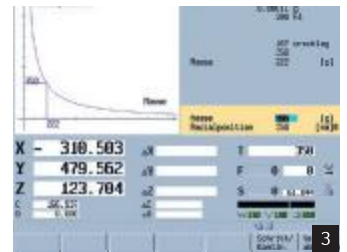


**Mill-turn tables**

|                        |                   | DMU / DMC 210 FD | DMU / DMC 270 FD | DMU / DMC 340 FD |
|------------------------|-------------------|------------------|------------------|------------------|
| Torque                 | Nm                | 8,600            | 11,000           | 10,200           |
| Detent torque          | Nm                | 13,500           | 15,000           | 20,000           |
| Maximum speed          | rpm               | 250              | 200              | 120              |
| Mass moment of inertia | kg/m <sup>2</sup> | 2,900/2,300      | 9,000/7,000      | 8,800/6,800      |

**Machine and Technology**

- Turn-mill technology:  
DMU FD / DMC FD



1–2: Horizontal or vertical milling head positioning, even during turning  
 3: Easy electronic balancing with SIEMENS 840D solutionline FD  
 4: Mill-turn table with direct drive (image: DMU 340 FD)

## Exclusive mill-turn cycles

- + Detect, control and monitor **imbalances**
- + **Automatic speed adjustment** based on component vibration
- + **Measurement cycles for (laser) measuring sensors:** Calibrate the measuring sensor in the working area, measure recesses etc.; store, display and transfer measurement data
- + **Tilted turning** with A- and B-axes
- + **Pivoting of long tools** into the workpiece
- + **Grinding cycles**, e.g. for calibrating the dressing station and dressing the grinding wheel
- + **Standard mill-turn cycles such** as grooving / undercutting, chip breaking and thread cutting, use of multi-edged tools (up to nine) and milling / turning tool measurement

### DMU mill-turn / DMC mill-turn machines – complete machining process

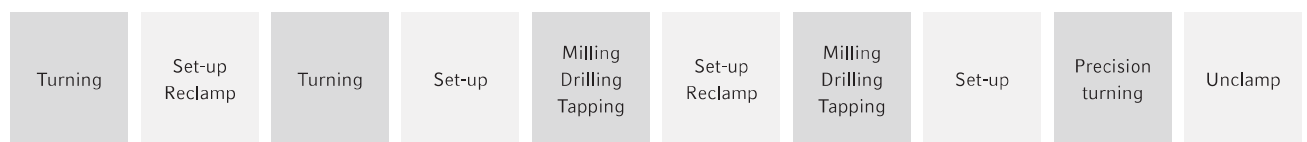


Machine 1

**Complete machining process:**  
 1 machine  
 4 production steps  
 300 % higher productivity

**Conventional machining process:**  
 3 machines  
 10 production steps

### Single-purpose machines – conventional machining process



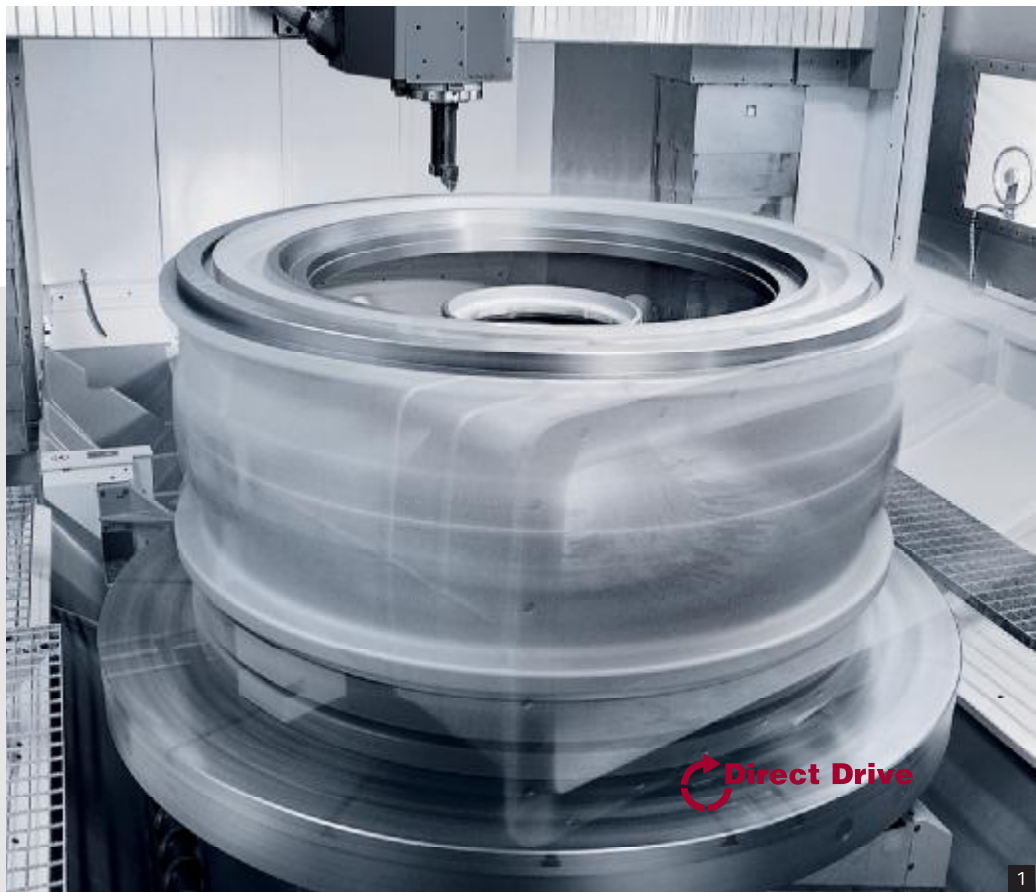
Machine 1

Machine 2

Machine 3







1: Turning of a turbocharger housing for a ship's engine on a DMU 340 FD  
 2-3: Combined tool measurement: Laser measurement of rotating milling tools, probe measurement of turning tools  
 4: Box jaws



## Unique technology

- + Mill-turn drives featuring Direct Drive technology – for speeds up to 250 rpm, power up to 68 kW, torque up to 20,000 Nm and a maximum table load of 7,000 kg
- + NC-controlled swivelling milling head as a B-axis (speed up to 30 rpm) for 5-sided machining and simultaneous 5-axis milling
- + 5X torqueMASTER® as a B-axis rated at 8,000 rpm, max. 52 kW and 1,800 Nm
- + Oil mist separator and shatter-proof safety glass

## Advantages of mill-turn (FD) technology

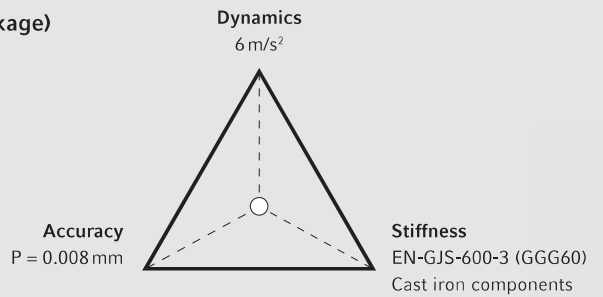
- + Complete machining with milling and turning on one machine in one set-up
- + Faster and more precise thanks to the absence of additional set-ups
- + Lower investment and smaller footprint by using only one machine
- + Quicker machining and lower logistics costs by eliminating idle times and process steps – lower unit production costs and higher precision

\*Optional

Highlights of the DMU P/FD and DMC U/FD portal series

# Unrivalled rigidity and dynamics up to $6 \text{ m/s}^2$ .

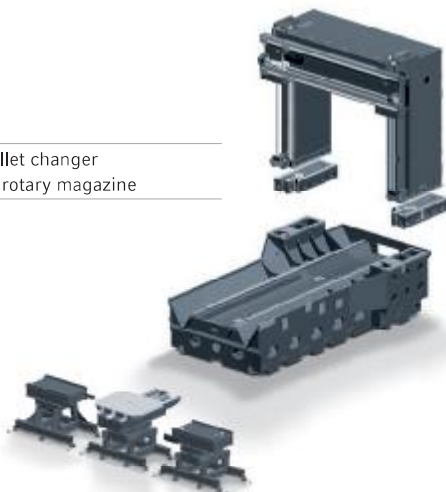
- + Superior dynamics: up to  $6 \text{ m/s}^2$  and  $60 \text{ m/min}$
- + **Highest precision:  $P=0.008 \text{ mm}$  (210 series with precision package)**
- + A high degree of stiffness for maximum milling power, **EN-GJS-600-3 (GGG60) cast iron components**
- + High-performance motor spindles ( **$1,000 \text{ Nm}$  or  $100 \text{ kW}$** )
- + Powerful gear-driven spindle ( **$1,800 \text{ Nm} - 8,000 \text{ min}^{-1}$** )
- + **Three-point support** with an inherently stiff machine bed made of EN-GJS-600-3 (GGG60), no foundation required



## Modules of the 210, 270 and 340 series

Portal, crossbeam, X-slide

Pallet changer or rotary magazine



Milling heads



B-axis

A-axis

Gear-driven B-axis

Table



210 / 270 / 340 tool magazine



NC rotary table

NC rotary table

Turn / mill table



Wheel magazine with changer and up to 243 tools



Chain magazine with up to 120 tools

DMU P/FD and DMC U/FD portal series

# Maximum precision with temperature stability.

Comprehensive cooling produces long-term precision. The entire feed drive is cooled, which guarantees higher component precision.

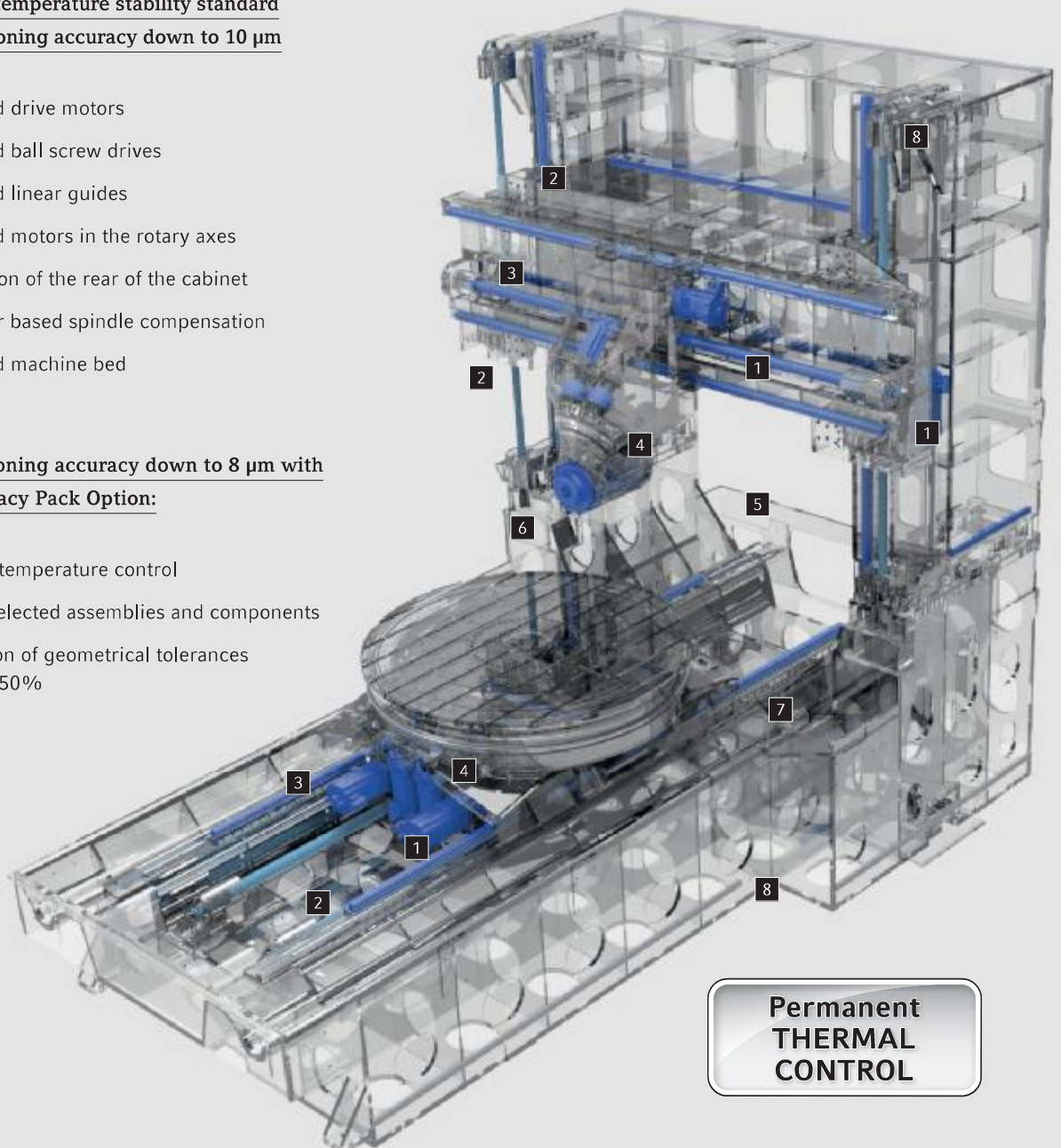
## High temperature stability standard

Positioning accuracy down to 10 µm

- 1 Cooled drive motors
- 2 Cooled ball screw drives
- 3 Cooled linear guides
- 4 Cooled motors in the rotary axes
- 5 Isolation of the rear of the cabinet
- 6 Sensor based spindle compensation
- 7 Cooled machine bed

## Positioning accuracy down to 8 µm with Accuracy Pack Option:

- + Coolant temperature control
- + Use of selected assemblies and components
- + Reduction of geometrical tolerances of up to 50%



*μPRECISION*

# Maximum precision: +80% increase in volumetric accuracy

The high precision variant *μPRECISION* of the DMU/DMC 210/270 with a volumetric accuracy of down to 20 μm (DMU/DMC 210 *μPRECISION*) is unique worldwide. In order to achieve the required accuracy, the guideways undergo over 500 hours of hand scraping. To achieve perfect machining results over the entire working area, high precision flatness, squareness and straightness of all axes is required.



### Highlights

- + **Maximum precision thanks to 500 hours of hand scraping of the guideways** (flatness and straightness  $\leq 4 \mu\text{m}$ )
- + **Positioning accuracy down to 4 μm**
- + **Volumetric precision down to  $\leq 20 \mu\text{m}$**
- + **Individual optimisation on the user's premises** – Compensation of thermal expansion and volumetric compensation under individual on-site conditions
- + **Unbeatable dynamics** up to 6 m/s<sup>2</sup> and 60 m/min
- + **Temperature control** of all relevant heat-generating machine components





## 500 hours of manual scraping

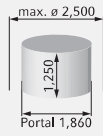
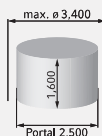
Scraping process:  
Up to 80% increase in precision

|   |               | DMU/DMC 210 $\mu$ PRECISION | DMU/DMC 270 $\mu$ PRECISION |
|---|---------------|-----------------------------|-----------------------------|
| Positioning accuracy of the linear axes X / Y / Z     | $\mu\text{m}$ | 4 / 4 / 4                   | 6 / 6 / 6                   |
| Positioning accuracy of the rotational axes A / B / C | arcsec        | 5 / 4 / 4                   | 5 / 4 / 4                   |
| Straightness and flatness of the linear axes          | $\mu\text{m}$ | 4                           | 6                           |
| Volumetric accuracy*                                  | $\mu\text{m}$ | 20                          | 25                          |

\*Only the **linear** axes were considered for compensation

## Package $\mu$ PRECISION includes:

- + All features of the increased **accuracy package**
- + **Hand scraped guideways**
- + Coolant **temperature control**
- + **Volumetric Compensation System (VCS)**—Compensation of thermal expansion and volumetric compensation under individual on-site conditions
- + **Spindle Growth Sensor (SGS)**
- + **Machine Protection Control (MPC)**
- + **Tool measuring in machining area BLUM**
- + **Increased number of compensation base points** in all axes
- + **Tolerance reduced up to 80% compared to standard**

|                       |    | DMU / DMC 210 $\mu$ PRECISION   | DMU / DMC 270 $\mu$ PRECISION   |
|-----------------------|----|---|---|
| Travel ranges X/Y/Z   | mm | 2,100 / 2,100 / 1,250   | 2,700 / 2,700 / 1,600   |
| Maximum table load    | kg | 8,000 (10,000*) / 6,000   | 12,000 / 9,000  |
| Maximum table load FD | kg | 5,000 / 4,000   | 7,000 / 6,000   |
| Workpiece dimensions  | mm |  |  |

DMU P/FD and DMC U/FD portal series

## 5X torqueMASTER® – B-axis with gear-driven spindle, 8,000 rpm, 52 kW and 1,800 Nm torque.

5-axis simultaneous machining and torque of up to 1,800 Nm – the 5X torqueMASTER® combines all the advantages of a B-axis with the power and torque of a gear-driven spindle without any limitations. With the latest, most precise technology, the portal machines are setting new standards in 5-sided and 5-axis simultaneous machining. The patented and optimised 5-axis concepts have overcome every challenge and are in use in all sectors around the world.

DMU/DMC 210 / 270 / 340 P/U/FD : Spindle selection

| Speed/Tool Carrier<br>Power/Torque (40% DC)                                      | DMU 210 P<br>DMC 210 U | DMU 210 FD<br>DMC 210 FD | DMU 270 P<br>DMC 270 P | DMU 270 FD<br>DMC 270 FD | DMU 340 P<br>DMC 340 U | DMU 340 FD<br>DMC 340 FD |
|--|------------------------|--------------------------|------------------------|--------------------------|------------------------|--------------------------|
| <b>Motor spindle rated at 12,000 rpm</b><br>SK50/HSK-A100<br>44 kW/288 Nm        | Standard               | Standard                 | Standard               | Standard                 | Standard               | Standard                 |
| <b>Motor spindle rated at 12,000 rpm</b><br>HSK-A100<br>52 kW/430 Nm             | •                      | •                        | •                      | •                        | •                      | •                        |
| <b>Motor spindle rated at 15,000 rpm</b><br>HSK-A100<br>52 kW/404 Nm             | •                      | –                        | •                      | –                        | •                      | –                        |
| <b>Motor spindle rated at 20,000 rpm</b><br>SK40/HSK-A63<br>35 kW/130 Nm         | •                      | –                        | •                      | –                        | –                      | –                        |
| <b>powerMASTER 9,000 rpm</b><br>HSK-A100<br>54 kW/700 Nm                         | •                      | –                        | •                      | –                        | •                      | –                        |
| <b>Gear-driven spindle rated at 8,000 rpm</b><br>SK50/HSK-A100<br>52 kW/1,800 Nm | •                      | •                        | •                      | •                        | •                      | •                        |
| <b>Pick-up motor spindle rated at 24,000 rpm</b><br>HSK-A63<br>20 kW/33 Nm       | –                      | –                        | •                      | –                        | •                      | –                        |
| <b>Pick-up motor spindle rated at 30,000 rpm</b><br>HSK-E50<br>18 kW/9.6 Nm      | •                      | –                        | –                      | –                        | –                      | –                        |

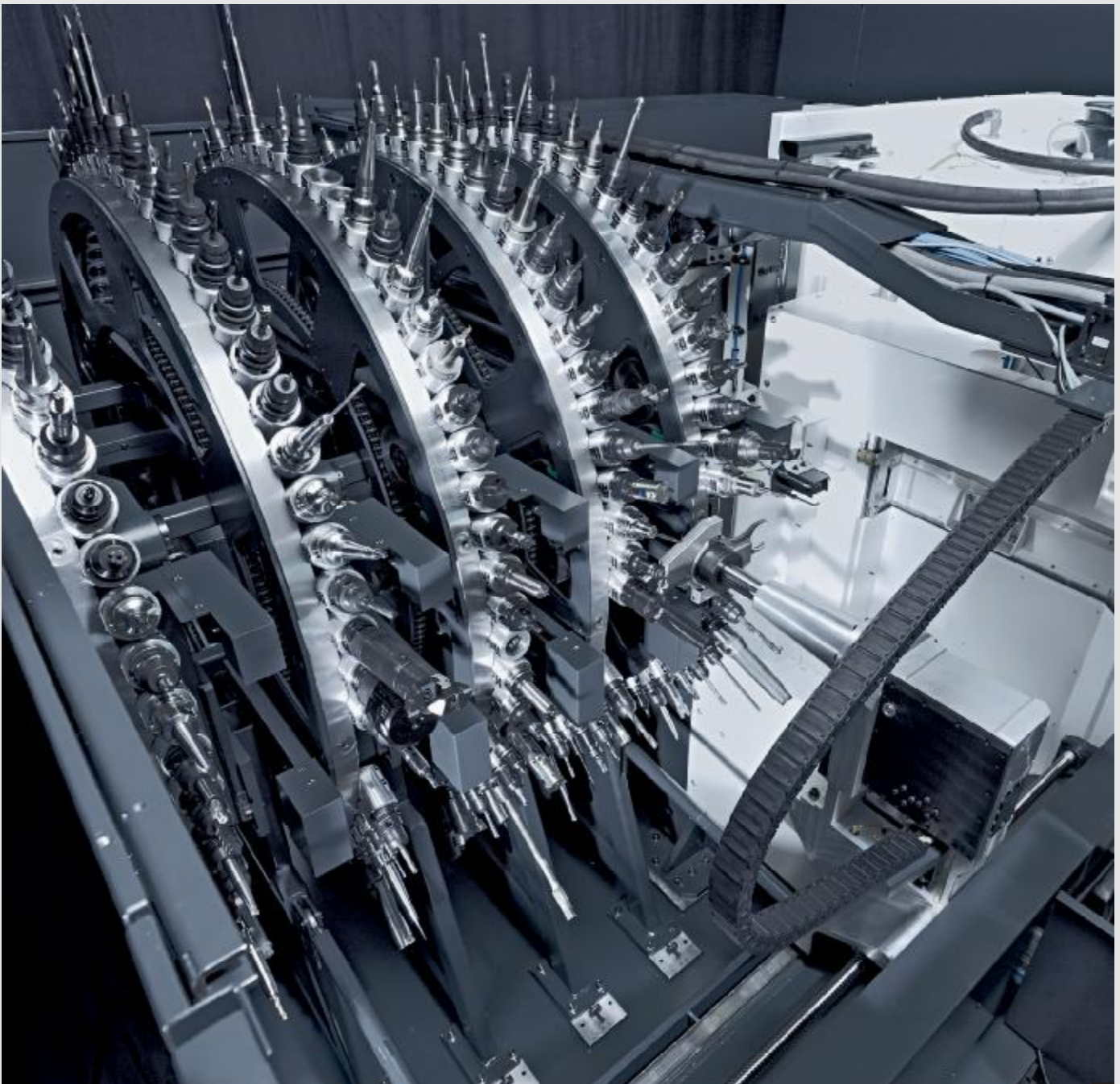
• Optional



- 1: 5X torqueMASTER® – gear-driven spindle with 1,800 Nm torque integrated into the B-axis
- 2: A axis – for simultaneous 5-axis milling of negative angles up to  $-40^\circ$
- 3: Finishing with exchangeable 30,000 rpm HSC pick-up spindle
- 4: NC-controlled swivelling B-axis milling head for simultaneous 5-axis milling with maximum stability due to machining at the centre of rotation
- 5: Roughing a mould for a dashboard with the 5X torqueMASTER®



- 1: Chain magazine for up to 180 tools
- 2: Pick-up spindle 24,000 rpm or 30,000 rpm
- 3: Rack magazine for up to 243 tools





DMU P/FD and DMC U/FD portal series

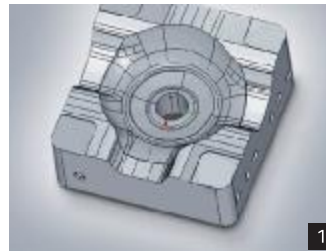
# Innovative Tool Handling.

| Machine    | SK50 / HSK-A100<br>Chain magazine |                  | SK50 / HSK-A100<br>Wheel magazine |                  |                  |                  | SK40 / HSK-A63<br>Wheel magazine |               |
|------------|-----------------------------------|------------------|-----------------------------------|------------------|------------------|------------------|----------------------------------|---------------|
|            | 60<br>positions                   | 120<br>positions | 63<br>positions                   | 123<br>positions | 183<br>positions | 243<br>positions | 93 positions                     | 183 positions |
| DMU 210 P  | Standard                          | •                | •                                 | •                | •                | –                | •                                | •             |
| DMU 210 FD | Standard                          | –                | •                                 | •                | •                | –                | –                                | –             |
| DMC 210 U  | Standard                          | •                | •                                 | •                | •                | •                | •                                | •             |
| DMC 210 FD | Standard                          | –                | •                                 | •                | •                | •                | –                                | –             |
| DMU 270 P  | Standard                          | •                | •                                 | •                | •                | –                | •                                | •             |
| DMU 270 FD | Standard                          | –                | •                                 | •                | •                | –                | –                                | –             |
| DMC 270 U  | Standard                          | •                | •                                 | •                | •                | •                | •                                | •             |
| DMC 270 FD | Standard                          | –                | •                                 | •                | •                | •                | –                                | –             |
| DMU 340 P  | Standard                          | •                | •                                 | •                | •                | –                | –                                | –             |
| DMU 340 FD | Standard                          | –                | •                                 | •                | •                | –                | –                                | –             |
| DMC 340 U  | Standard                          | •                | •                                 | •                | •                | •                | –                                | –             |
| DMC 340 FD | Standard                          | –                | •                                 | •                | •                | •                | –                                | –             |

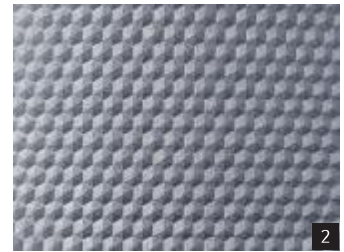
| Magazine types                                 | Chain magazine  | Wheel magazine                      |
|--|-----------------|-------------------------------------|
| Tool carrier                                   | SK50 (HSK-A100) | SK40 (HSK-A63) /<br>SK50 (HSK-A100) |
| Measurements (adjacent positions occupied), mm | ø 110           | ø 110 / ø 80                        |
| Measurements (adjacent positions free), mm     | ø 250           | ø 280 / ø 160                       |
| Boring bar dimensions, mm                      | ø 250 × 400     | ø 200 to ø 400                      |
| Tool length, mm                                | 650             | 900                                 |
| Weight, kg                                     | 15/30           | 15/30                               |
| Chip-to-chip time (HSK), seconds               | 10              | 7.5                                 |

| Pick-up spindles and<br>exchangeable milling heads* | Pick-up spindle<br>24,000 rpm | Pick-up spindle<br>30,000 rpm |
|---|-------------------------------|-------------------------------|
| Tool carrier  | HSK-A63                       | HSK-E50                       |
| Dimensions, mm                                      | 50                            | 42                            |
| Tool length, mm                                     | 200                           | 150                           |
| Weight, kg  | 4                             | 1.2                           |

• Optional, \* Tools are all stored in the same magazine



1



2

1: LASERSOFT 3D texturing software for generating the laser machining program 2: Geometrically defined honeycomb structure 3: Laser structuring of a steering wheel cover mould 4: Final injection-moulded steering wheel cover mould with honeycomb structure



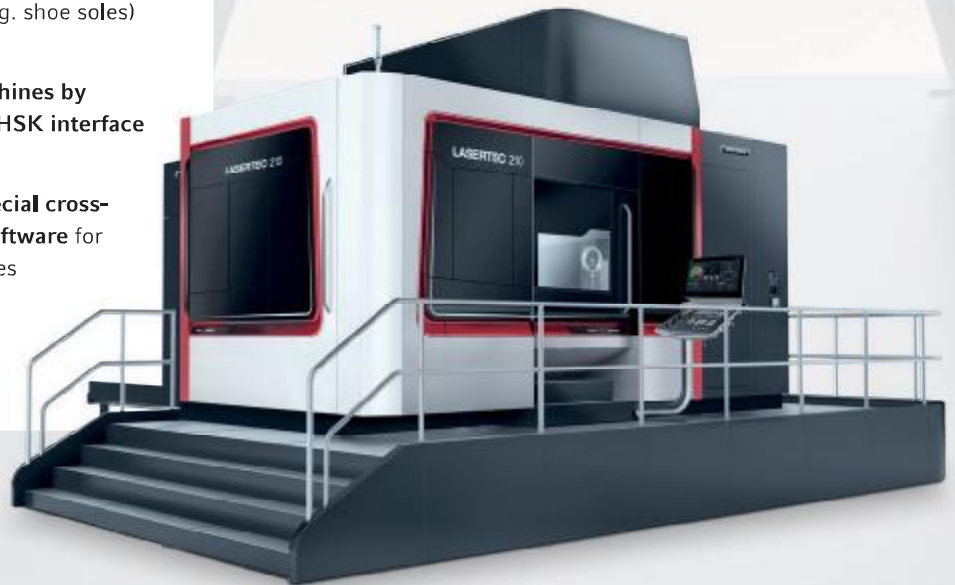
3



4

### Advantages of LASERTEC

- + **5-axis milling and laser structuring of freeform tool and mould surfaces** in a single set-up on one machine
- + Moulds for **automotive** (e.g. armatures), **electronics** (e.g. mobile phone cases), **lifestyle** (e.g. shoe soles) and general **tool and mould making**
- + **Can be integrated into all portal machines by adapting a fibre laser source via the HSK interface on the spindle head**
- + **SIEMENS 840D solutionline with special cross-process LASERSOFT 3D texturing software** for organic and technical surface structures



### LASERTEC Shape

## 5-axis milling and laser surface structuring – a design advantage in mould making.

For the first time, flexible integration of a fibre laser in the spindle head via the HSK interface enables laser surface structuring as well as 5-axis milling of mould components on one machine in a single set-up. Moulds for automotive armatures, household appliances, mobile phone and camera casings, shoe soles and other plastic injection mould tools can be pre-milled and then tailored by laser structuring to customers' specific requirements.

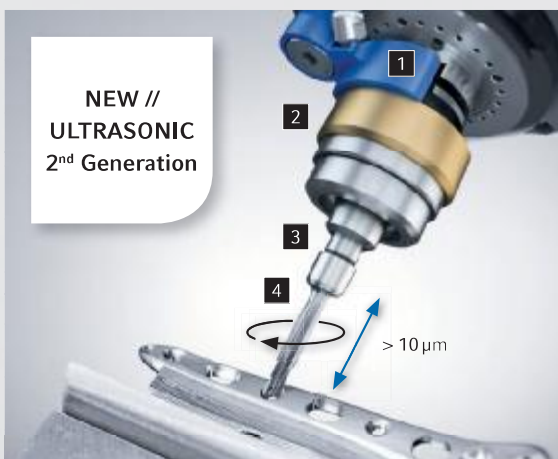


1: Machining a diffuser case from Inconel 718 with an ULTRASONIC 125 FD 2: ULTRASONIC 60 FD duoBLOCK®: Thin-walled, lightweight structures of a Zerodur mirror carrier 3: External / internal cylindrical grinding of a mineral cast pump housing on an ULTRASONIC 125 FD

## ULTRASONIC technology integration

# Unbeatable range of materials thanks to ULTRASONIC and milling on one machine.

ULTRASONIC machining is a pioneering technology for the production of complex geometries in high-tech materials which is finding its way into almost every sector with unbelievable speed. Thanks to the kinematic overlapping of tool rotation with additional axial oscillation, high-performance materials which are normally difficult to machine can be economically processed to the highest quality. The low process forces allow the production of thin walls and result in longer tool service life and significantly reduced micro-cracks in the material. Depending on the material properties, outstanding surface finishes of  $Ra < 0.1 \mu m$  can be achieved.



- 1 Powerful ULTRASONIC**  
with optimised inductive transmission
- 2 Stronger ULTRASONIC booster**  
for up to 3 times higher amplitudes
- 3 Shorter actuator**  
for higher stiffness
- 4 Tools**  
with undefined and defined cutting edge

## Functional principle

The tool rotation is superimposed via the HSK-E32 / HSK-E40 / HSK-E50 / HSK-A63 / HSK-A100 interface of the ULTRASONIC actuator tool holder with an additional oscillation in the axial direction (piezoelectric effect).

## Highlights

- + Economical grinding, milling and drilling of hard and brittle as well as hard-to-machine advanced materials
- + New, stiffer ULTRASONIC HSK actuating tool holder with increased amplitude power for a powerful ULTRASONIC performance
- + Up to 40 % reduced process forces for high productivity, excellent surface quality and precision and longer tool life
- + Automatic detection and tracking of ULTRASONIC frequency and amplitude



1



2

1: Detecting of components via spindle load  
 2: Acoustic emission sensor for dressing

DMU P/FD and DMC U/FD portal series

# Grinding



## Achievable tolerances

- + Surface finish <math><0.4\ \mu\text{m}</math>
- + Roundness <math><5\ \mu\text{m}</math>
- + Quality 5 with diameter <math><120\ \text{mm}</math>
- + Quality 4 with diameter <math>>120\ \text{mm}</math>

## Highlights

- + Milling, turning and grinding in one set-up
- + Unrivalled surface quality
- + Grinding cycles for internal cylindrical, external cylindrical and surface grinding as well as dressing cycles
- + **NEW:** External, automatically interchangeable nozzle unit to deliver coolant directly between the grinding wheel and the workpiece
- + **NEW:** AE-sensor (Acoustic Emission) integrated into the dressing unit, to detect the initial contact between the grinding wheel and the dressing unit
- + **NEW:** Detection of the initial contact between the grinding wheel and the workpiece via spindle load

## Grinding package

- + Linear guideways and ball screws with additional wipers
- + Sealing air for all linear encoders
- + Extended lubrication intervals
- + Observation of additional maintenance notes
- + Coolant supply 1.300l incl. centrifugal filter for particles down to





1



2



3

1: Turning 2: Tapping  
3: Gear milling with standard tools

DMU P/FD and DMC U/FD portal series

# DMG MORI gearMILL®



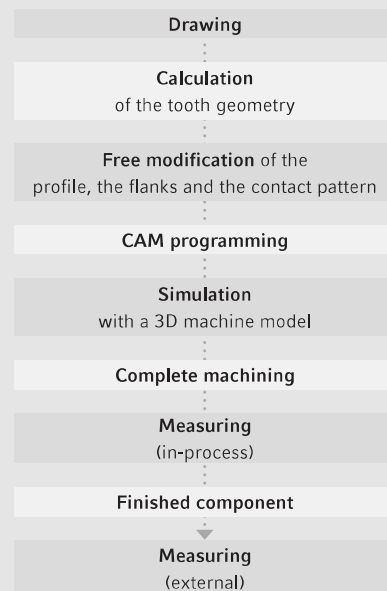
## Achievable gear qualities

- + Bevel gear DIN ≤ 5
- + Spur gear DIN ≤ 6  
(depending on the pitch circle diameter)

### Highlights

- + Gears up to  $\varnothing 5,000$  mm or gear segments
- + Complete machining with turning, drilling and gear cutting
- + Highest flexibility due to machining with standard tools on a standard machine
- + Unrestricted modifications of profiles, flanks and contact patterns with verification
- + Flexible for different gear types
- + Soft and hard machining on one machine
- + Quality control on the process with output log

### Process chain



Spur gear

- + Complex profile and flank modifications
- + Straight spur gear
- + Helical spur gear
- + Double helical spur gear with or without middle gap



Bevel gear

- + Straight bevel gear
- + Helical bevel gear
- + Hypoid
- + Shaft angle  $\neq 90^\circ$
- + Klingelnberg Cyclo-Palloid®
- + Gleason type, FORMATE & SGT



Worm gear

- + Free modification of contact pattern
- + Profile ZA
- + Profile ZN
- + Profile ZI

DMU P/FD and DMC U/FD portal series

# Spindles for special materials and applications.



**Aerospace spindle – Machining of tool steel**  
Motor spindle rated at 15,000 rpm (52 kW, 404 Nm) –  
for high-performance milling

|                       |   |
|-----------------------|---|
| Workpiece material    | 50CrV4  |
| Material removal rate | 460 cm <sup>3</sup> /min                        |
| Tool                  | Milling head D = 80 mm<br>(seven cutting edges) |
| Spindle speed         | 477 rpm ( $V_c = 120$ m/min)                    |
| Feed                  | 1,282 mm/min ( $F_z = 0.385$ mm)                |
| Cutting depth / width | 6/60 mm   |

22



**5X torqueMASTER® – Machining of tool steel**  
Gear-driven spindle rated at 8,000 rpm (52 kW, 1,800 Nm) –  
for high-performance milling

|                       |   |
|-----------------------|---|
| Workpiece material    | 50CrV4  |
| Material removal rate | 792 cm <sup>3</sup> /min                      |
| Tool                  | Milling head D = 160 mm<br>(12 cutting edges) |
| Spindle speed         | 238 rpm ( $V_c = 120$ m/min)                  |
| Feed                  | 1,100 mm/min ( $F_z = 0.385$ mm)              |
| Cutting depth / width | 6/120 mm                                      |



**powerMASTER® – Machining steel**  
Motor spindle rated at 9,000 rpm (77,5 kW\*, 1,000 Nm\*) –  
for high-performance milling

|                       |   |
|-----------------------|---|
| Workpiece material    | Steel (Ck45)                            |
| Material removal rate | 1,680 cm <sup>3</sup> /min              |
| Tool                  | Milling head D = 100 (11 cutting edges) |
| Spindle speed         | 900 rpm ( $V_c = 280$ m/min)            |
| Feed                  | 14,000 mm/min ( $F_z = 1.42$ mm)        |
| Cutting depth / width | 2/60 mm                                 |

\* 15% DC (2 min)

# Example applications



**Hard machining of a bevel spur gear (60 HRC) – ø 1,320 mm**  
Complete machining on a DMU 210 FD

|          |                                |         |            |
|----------|--------------------------------|---------|------------|
| Sector   | Mechanical engineering         | Spindle | 12,000 rpm |
| Tool     | Solid carbide end mill ø 12 mm | Power   | 44 kW      |
| Material | 18CrNiMo-6                     | Torque  | 288 Nm     |

Machining focus: 5-axis simultaneous finishing of the tooth flanks;  
Machining with standard tools; soft milling and hard turning on the same machine



**Finishing of a Pelton wheel from a single piece – ø 1,600 mm**  
Complete machining on a DMU 210 FD

|          |                            |         |            |
|----------|----------------------------|---------|------------|
| Sector   | Energy technology          | Spindle | 12,000 rpm |
| Tool     | Ball nose end mill ø 16 mm | Power   | 44 kW      |
| Material | 1.4317 steel casting       | Torque  | 288 Nm     |

Machining focus: Turning of the outer contour; 5-axis simultaneous roughing and finishing of the buckets;  
no post-processing required



**Pre-finishing of a bumper mould**  
Complete machining on a DMU 340 P

|          |                                    |         |           |
|----------|------------------------------------|---------|-----------|
| Sector   | Automotive                         | Spindle | 8,000 rpm |
| Tool     | Indexable insert end mill ø 100 mm | Power   | 52 kW     |
| Material | 40CrMnNiMo8-6-4                    | Torque  | 1,800 Nm  |

Machining focus: 5-axis simultaneous machining with 5X torqueMASTER® – NC-controlled B-axis with counter spindle; finishing with an exchangeable pick-up motor spindle rated at 24,000 rpm; complete machining in one set-up



**Roughing of a machine column**  
Complete finish machining on a DMC 340 U

|          |                                    |         |           |
|----------|------------------------------------|---------|-----------|
| Sector   | Mechanical engineering             | Spindle | 8,000 rpm |
| Tool     | Indexable insert end mill ø 280 mm | Power   | 52 kW     |
| Material | GGG60                              | Torque  | 1,800 Nm  |

Machining focus: 5-axis simultaneous machining with 5X torqueMASTER® – NC-controlled B-axis with gear-driven spindle; minimally attended production with integrated rotary storage



**Turning of a bearing housing (wind energy)**  
Complete machining on a DMC 340 FD

|          |                   |         |           |
|----------|-------------------|---------|-----------|
| Sector   | Energy technology | Spindle | 8,000 rpm |
| Tool     | Turning tool      | Power   | 52 kW     |
| Material | GGG40             | Torque  | 1,800 Nm  |

Machining focus: Turning of the inner contour; machining of the horizontal recess with spindle tools (540 mm length); complete machining in two set-ups

Simplified machine operation.  
The holistic integration of machines  
within a manufacturing organisation.

Like on a smartphone, the operator has direct access to all available applications through the **APP MENU**.

## ERGOline® Control with 21.5" multi-touch- display and SIEMENS control

### Simple

User-friendly machine operation for all new high-tech machines from DMG MORI.

### Continuous

Consistent administration, documentation and visualisation of order, process and machine data.

### Compatible

Compatible with PPS and ERP systems.  
Can be networked with CAD / CAM products.  
Open to trendsetting CELOS® apps extensions.



**SMARTkey®**  
Personalised user  
authorisation:  
Individually adapted  
access privileges to the control  
system and the machine.



DMU P/FD and DMC U/FD portal series

# CELOS® – from the idea to the finished product.

CELOS® features a standard user interface for all new high-tech machines from DMG MORI. CELOS® apps enable the consistent administration, documentation and visualisation of order, process and machine data. They also simplify, standardise and automate the operation of the machine. 16 standard apps help the machine operator prepare, optimise and systematically process production jobs.

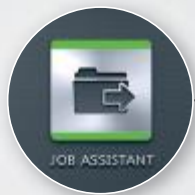
## CELOS® APPS – 3 examples:



### JOB MANAGER

*Systematic planning, administration and preparation of orders.*

- + Machine-specific set-up and management of new orders
- + Organised storage of all production-related data and documents
- + Easy visualisation of orders, including NC program, resource allocation etc.



### JOB ASSISTANT

*Process-defined orders.*

- + Menu-guided set-up of the machine and menu-driven processing of production orders
- + Reliable error prevention through specific screen instructions with mandatory confirmation function



### TOOL HANDLING

*Shorter tool set-up times through assessment of the magazine configuration for subsequent orders.*

- + Displays all tools required for a job, including automatically generating a loading list
- + Generation of an unloading list by automatically detecting all tools not required for subsequent jobs



## Exclusive, optionally available DMG MORI technology cycles



### MPC – Machine Protection Control

#### **Protecting machines with an emergency shut-off function**

NEW: Cutting force monitoring for drilling and tapping

Vibration sensors on the milling spindle

Emergency shut-off function with teach function

Process monitoring by means of a bar graph

Milling spindle bearing diagnostics

*MPC* Machine Protection Control



### 3D quickSET®

#### **Quick and easy for maximum precision**

Tool kit for checking and correcting the kinematic precision of 5-axis machine configurations

All head variants and all table axes

*3D quickSET*



### ATC – Application Tuning Cycle

#### **Process optimisation at the push of a button**

Process-oriented feed drive tuning

Minimised machining time with maximised component quality, regardless of workpiece weight

*ATC* Application Tuning Cycle



### Laser measuring sensor package

#### **Enhanced measuring options with a laser measuring sensor**

Measurement of slots and grooves

Measurement in hard-to-reach areas

Measurement of individual points

Package with manual and automatic calibration



### Grinding

#### **Machining with the highest surface precision**

Grinding on a universal milling machine

For internal, external and surface grinding

Cycles for dressing the grinding wheel

NEW: AE-sensor (Acoustic Emission) – precise approach to the dressing unit

NEW: Precise approach to the workpiece via spindle load



### Multi-tool

#### **Save time by efficiently using tools**

Several "sister tools" on one tool holder

Save tool change times and magazine pockets



## SIEMENS 840D solutionline Operate

- + Highly simplified interactive programming with identical "look and feel" for turning and milling
- + SINUMERIK Operate new user interface
- + ATC\*, 3D quickSET®\*
- + Powerful 32-bit multiprocessor system and controller, 1 GB RAM
- + Fast block processing time of approx. 0.6 ms
- + Look-ahead function for up to 150 NC blocks (capable of parameterisation)
- + Graphical simulation of the machining process with overhead view, triple-plane display and 3D display; synchronised display during the machining process
- + 3D machining, optional 3D tool correction via the surface normal vector
- + DECKEL MAHO Package MDynamics, optional optimisation of surface finish and speed for smoothing surface transitions

\* Optional

## HEIDENHAIN TNC 640

- + Unique, highly detailed 3D simulation display
- + New optimised TNC user interface
- + HSCI – HEIDENHAIN Serial Controller Interface
- + Conversational or ISO programming
- + Rapid program generation with plain text programming
- + Graphical programming
- + Collision monitoring (DCM)
- + ATC\*, 3D quickSET®\*
- + Powerful dual-core processor (Intel i7-3)
- + New optimised ADP (Advanced Dynamic Prediction) movement guide for improved surfaces and quicker machining (block processing time of just 0.5 ms)
- + Dynamic look-ahead function with no path restrictions
- + Dynamic Efficiency with adaptive feed control AFC and trochoidal milling as standard (Active Chatter Control ACC optional)

\* Optional

DMU P/FD and DMC U/FD portal series

# High-end CNCs for reliable processes and maximum precision.

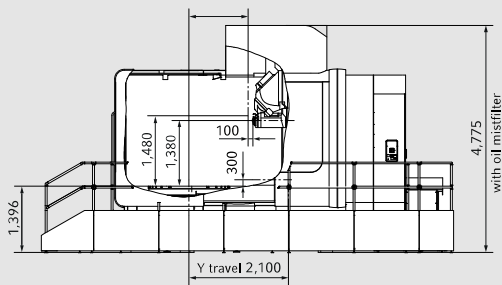
Together with SIEMENS 840D solutionline, the portal series is equipped with the ERGOline® Control th a 21.5" monitor and CELOS®. The 19" ERGOline® panel is available for the HEIDENHAIN TNC 640. Optionally, various exclusive software cycles such as ATC, MPC or 3D quickSET® are available, which are able to optimise work-piece quality and productivity.

DMU P/FD and DMC U/FD portal series

# Floor plans

**DMU 210 P/FD**

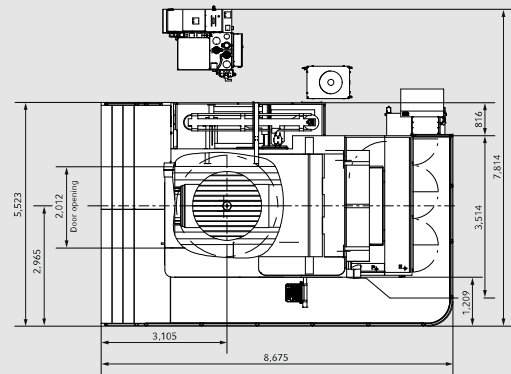
Side view



**DMU 210 P/FD with chain magazine with 60 positions**

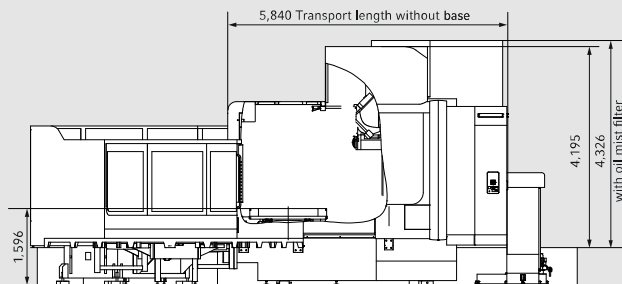
Plan view

Footprint 47.9 m<sup>2</sup>



**DMC 210 U/FD**

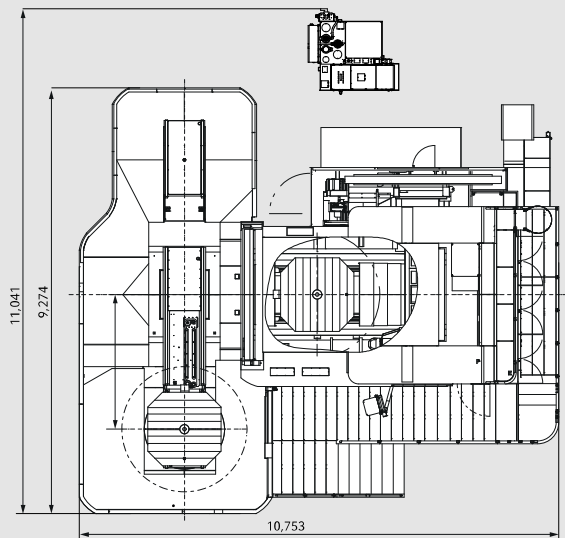
Side view



**DMC 210 U/FD with chain magazine with 60 positions**

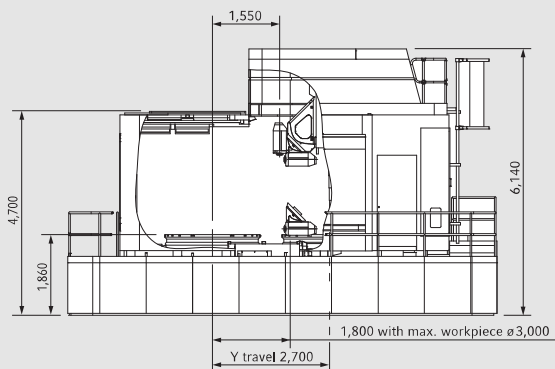
Plan view

Footprint 99.7 m<sup>2</sup>



**DMU 270 P/FD**

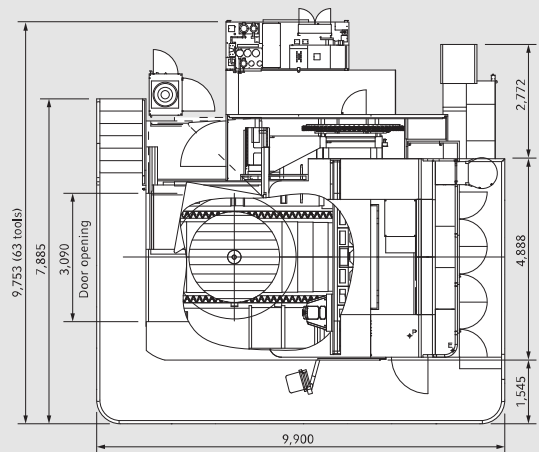
Side view



**DMU 270 P/FD with chain magazine with 60 positions**

Plan view

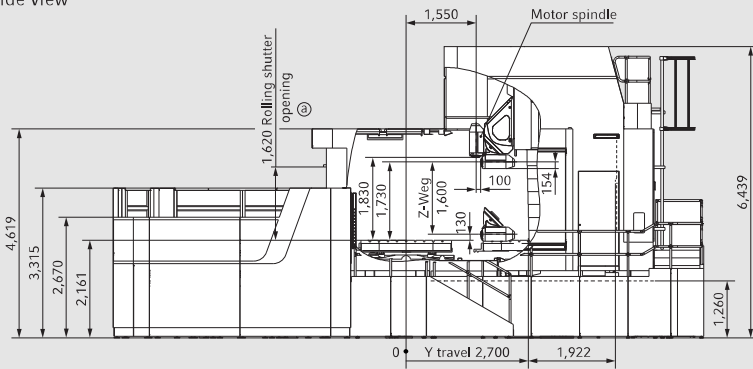
Footprint 96.6 m<sup>2</sup>





**DMC 270 U/FD**

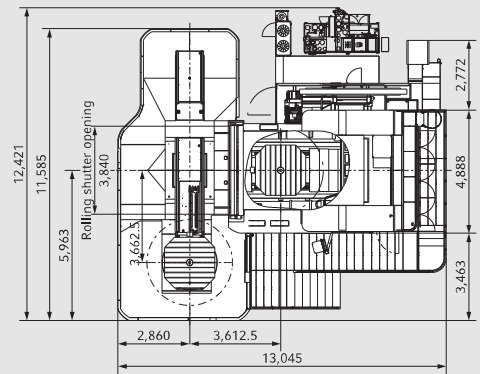
Side view



**DMC 270 U/FD with chain magazine with 60 positions**

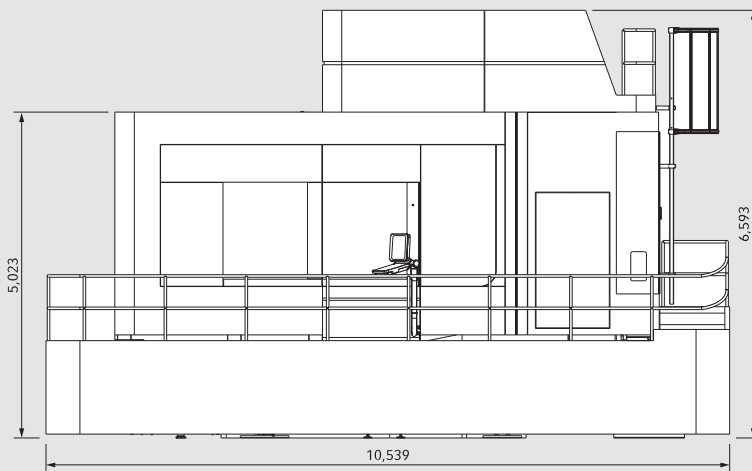
Plan view

Footprint 151.1 m<sup>2</sup>



**DMU 340 P/FD**

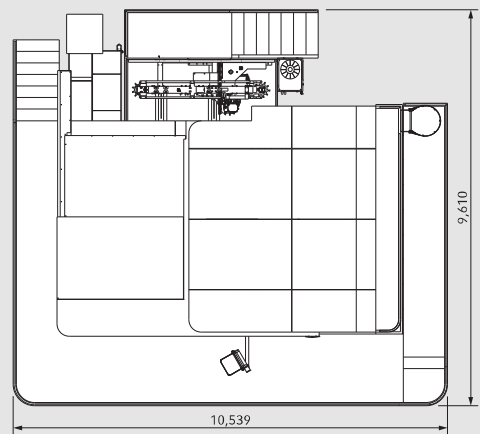
Side view



**DMU 340 P/FD with chain magazine with 60 positions**

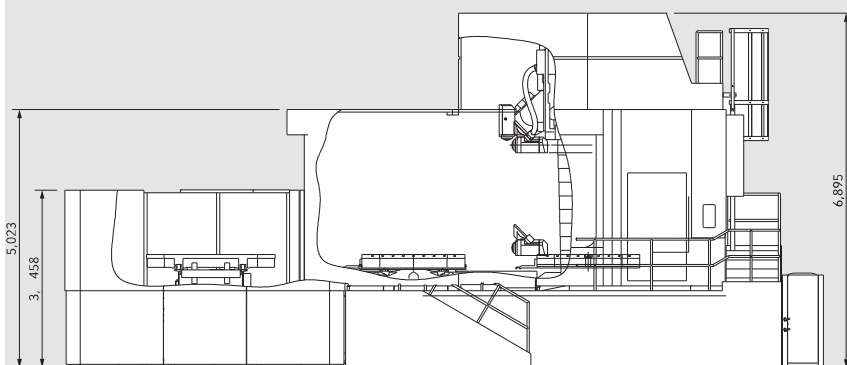
Plan view

Footprint 101.3 m<sup>2</sup>



**DMC 340 U/FD**

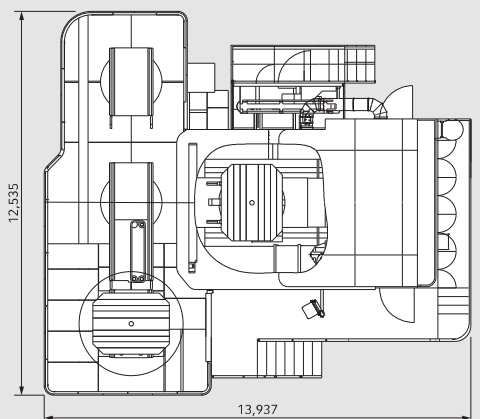
Side view



**DMC 340 U/FD with chain magazine with 60 positions**

Plan view

Footprint 174.7 m<sup>2</sup>



## DMU P/FD portal series

# Technical data

|   |          | DMU 210 P         |
|---|----------|-------------------|
| <b>Working area</b>   |          |                   |
| X-/Y-/Z-axis  | mm       | 2,100×2,100×1,250 |
| Distance from spindle centre to table surface                         |          |                   |
| Horizontal milling head   | mm       | 130–1,380         |
| Vertical milling head   | mm       | 230–1,480         |
| Distance from spindle nose to table centre                            |          |                   |
| Horizontal milling head   | mm       | –750 to 1,350     |
| Vertical milling head   | mm       | –850 to 1,250     |
| <b>Tables</b>   |          |                   |
| NC rotary table   |          | Standard          |
| Speed   | rpm      | 12                |
| Mill-turn table (milling/turning)                                     | rpm      | –                 |
| Table size  | mm       | ø 1,700           |
| Maximum table load  | kg       | 8,000 (10,000)*   |
| <b>5-axis options</b>   |          |                   |
| NC-controlled swivelling milling head (B-axis)                        |          | Standard          |
| Swivel range (0 = vertical / 180 = horizontal)                        | Degrees  | –70/+180          |
| Rapid traverse and feed   | rpm      | 30                |
| NC-controlled swivelling milling head (A-axis)                        |          | ◦                 |
| Swivel range (0 = vertical / –90 = horizontal)                        | Degrees  | –130/+45          |
| Rapid traverse and feed   | rpm      | 30                |
| 5X torqueMASTER® – NC-controlled B-axis with gear-driven spindle      |          | ◦                 |
| Swivel range (0 = vertical / 180 = horizontal)                        | Degrees  | 0/+180            |
| Rapid traverse and feed   | rpm      | 30                |
| <b>Main drive</b>   |          |                   |
| Integrated SK50 motor spindle   | rpm      | 12,000            |
| Integrated HSK-A100 motor spindle                                     | rpm      | –                 |
| Power (40/100 % DC) // Torque (40/100 % DC)                           | kW // Nm | 44/32//288/187    |
| Integrated gear-driven spindle for holding exchangeable milling heads | rpm      | –                 |
| Power (100 % DC) // Torque (100 % DC)                                 | kW // Nm | –                 |
| <b>SK50 tool magazine – tool magazine</b>                             |          |                   |
| Linear axes (X/Y/Z)   | m/min    | 60/40/40          |
| Machine weight  | kg       | 43,000            |
| P <sub>max</sub> (X/Y/Z) – VDI DGQ 3441/ISO 230-2                     | µm       | 10                |
| P <sub>smax</sub> (X/Y/Z) – VDI DGQ 3441/ISO 230-2                    | µm       | 6                 |
| <b>Control System</b>   |          |                   |
| CELOS® mit SIEMENS 840D solutionline Operate                          |          | •                 |
| HEIDENHAIN TNC640   |          | ◦                 |

• Standard ◦ Optional

|  | DMU 270 P         | DMU 340 P                     | DMU 210 FD        | DMU 270 FD        | DMU 340 FD                    |
|--|-------------------|-------------------------------|-------------------|-------------------|-------------------------------|
|  | 2,700×2,700×1,600 | 3,400×3,400×1,600<br>(2,000)* | 1,800×2,100×1,250 | 2,700×2,700×1,600 | 3,400×3,400×1,600<br>(2,000)* |
|  | 130-1,730         | 130-1,730 (2,130)*            | 130-1,380         | 130-1,730         | 130-1,730 (2,130)*            |
|  | 230-1,830         | 230-1,830 (2,230)*            | 230-1,480         | 230-1,830         | 230-1,830 (2,230)*            |
|  | -1,050 to 1,650   | -1,500 to 1,900               | -750 to 1,350     | -1,050 to 1,650   | -1,500 to 1,900               |
|  | -1,150 to 1,550   | -1,600 to 1,800               | -850 to 1,250     | -1,150 to 1,550   | -1,600 to 1,800               |
|  | Standard          | Standard                      | -                 | -                 | -                             |
|  | 9                 | 5                             | -                 | -                 | -                             |
|  | -                 | -                             | 20/250            | 20/200            | 20/120                        |
|  | ø2,200            | ø2,600×2,200                  | ø1,850            | ø2,200            | ø2,500                        |
|  | 12,000            | 16,000                        | 5,000             | 7,000             | 7,000                         |
|  | Standard          | Standard                      | Standard          | Standard          | Standard                      |
|  | -70/+180          | -70/+180                      | -70/+180          | -70/+180          | -70/+180                      |
|  | 30                | 30                            | 30                | 30                | 30                            |
|  | o                 | o                             | o                 | o                 | o                             |
|  | -130/+45          | -130/+45                      | -130/+45          | -130/+45          | -130/+45                      |
|  | 30                | 30                            | 30                | 30                | 30                            |
|  | o                 | o                             | o                 | o                 | o                             |
|  | 0/+180            | 0/+180                        | 0/+180            | 0/+180            | 0/+180                        |
|  | 30                | 30                            | 30                | 30                | 30                            |
|  | 12,000            | 12,000                        | -                 | -                 | -                             |
|  | -                 | -                             | 12,000            | 12,000            | 12,000                        |
|  | 44/32/288/187     | 44/32//288/187                | 44/32//288/187    | 44/32/288/187     | 44/32//288/187                |
|  | -                 | -                             | -                 | -                 | -                             |
|  | -                 | -                             | -                 | -                 | -                             |
|  | 60/chain          | 60/chain                      | 60/chain          | 60/chain          | 60/chain                      |
|  | 60/30/40          | 60/30/40                      | 60/30/40          | 60/30/40          | 60/30/40                      |
|  | 84,500            | 96,000                        | 44,000            | 74,000            | 97,000                        |
|  | 12                | 15/20/15                      | 10                | 12                | 15/20/15                      |
|  | 6                 | 8/10/8                        | 6                 | 6                 | 8/10/8                        |
|  | •                 | •                             | •                 | •                 | •                             |
|  | o                 | o                             | -                 | -                 | -                             |

## DMC U/FD portal series

# Technical data

|   |          | DMC 210 U         |
|---|----------|-------------------|
| <b>Working area</b>   |          |                   |
| X-/Y-/Z-axis  | mm       | 2,100×2,100×1,250 |
| Distance from spindle centre to pallet                                |          |                   |
| Horizontal milling head   | mm       | 130–1,380         |
| Vertical milling head   | mm       | 230–1,480         |
| Distance from spindle nose to pallet centre                           |          |                   |
| Horizontal milling head   | mm       | –750 to 1,350     |
| Vertical milling head   | mm       | –850 to 1,250     |
| <b>Tables / pallets</b>   |          |                   |
| NC rotary table   |          | Standard          |
| Speed   | rpm      | 12                |
| Mill-turn table (milling / turning)                                   | rpm      | –                 |
| Pallet size   | mm       | 1,600×1,400       |
| Maximum pallet load   | kg       | 6,000             |
| <b>5-axis options</b>   |          |                   |
| NC-controlled swivelling milling head (B-axis)                        |          |                   |
| Swivel range (0 = vertical / 180 = horizontal)                        | Degrees  | –70/+180          |
| Rapid traverse and feed   | rpm      | 30                |
| NC-controlled swivelling milling head (A-axis)                        |          |                   |
| Swivel range (0 = vertical / –90 = horizontal)                        | Degrees  | –130/+45          |
| Rapid traverse and feed   | rpm      | 30                |
| 5X torqueMASTER® – NC-controlled B-axis with gear-driven spindle      |          |                   |
| Swivel range (0 = vertical / 180 = horizontal)                        | Degrees  | 0/+180            |
| Rapid traverse and feed   | rpm      | 30                |
| <b>Main drive</b>   |          |                   |
| Integrated SK50 motor spindle   | rpm      | 12,000            |
| Integrated HSK-A100 motor spindle                                     | rpm      | –                 |
| Power (40/100 % DC) // Torque (40/100 % DC)                           | kW // Nm | 44/32//288/187    |
| Integrated gear-driven spindle for holding exchangeable milling heads | rpm      | –                 |
| Power (100 % DC) // Torque (100 % DC)                                 | kW // Nm | –                 |
| <b>SK50 tool magazine – tool magazine</b>                             |          |                   |
| Linear axes (X/Y/Z)   | m/min    | 60/40/40          |
| Machine weight  | kg       | 45,000            |
| P <sub>max</sub> (X/Y/Z) – VDI DGQ 3441/ISO 230-2                     | µm       | 10                |
| P <sub>smax</sub> (X/Y/Z) – VDI DGQ 3441/ISO 230-2                    | µm       | 6                 |
| <b>Control System</b>   |          |                   |
| CELOS® mit SIEMENS 840D solutionline Operate                          |          | •                 |
| HEIDENHAIN TNC640   |          | ◦                 |
| • Standard ◦ Optional   |          |                   |



|  | DMC 270 U         | DMC 340 U                     | DMC 210 FD        | DMC 270 FD        | DMC 340 FD                    |
|--|-------------------|-------------------------------|-------------------|-------------------|-------------------------------|
|  | 2,700×2,700×1,600 | 3,400×3,400×1,600<br>(2,000)* | 1,800×2,100×1,250 | 2,700×2,700×1,600 | 3,400×3,400×1,600<br>(2,000)* |
|  | 130-1,730         | 130-1,730 (2,130)*            | 130-1,380         | 130-1,730         | 130-1,730 (2,130)*            |
|  | 230-1,830         | 230-1,830 (2,230)*            | 230-1,480         | 230-1,830         | 230-1,830 (2,230)*            |
|  | -1,050 to 1,650   | -1,500 to 1,900               | -750 to 1,350     | -1,050 to 1,650   | -1,500 to 1,900               |
|  | -1,150 to 1,550   | -1,600 to 1,800               | -850 to 1,250     | -1,150 to 1,550   | -1,600 to 1,800               |
|  | Standard          | Standard                      | -                 | -                 | -                             |
|  | 9                 | 5                             | -                 | -                 | -                             |
|  | -                 | -                             | 20/250            | 20/200            | 20/120                        |
|  | 2,000×2,000       | 2,500×2,000                   | ø 1,850           | ø 2,200           | ø 2,500                       |
|  | 9,000             | 10,000                        | 4,000             | 6,000             | 6,000                         |
|  | Standard          | Standard                      | Standard          | Standard          | Standard                      |
|  | -70/+180          | -70/+180                      | -70/+180          | -70/+180          | -70/+180                      |
|  | 30                | 30                            | 30                | 30                | 30                            |
|  | o                 | o                             | o                 | o                 | o                             |
|  | -130/+45          | -130/+45                      | -130/+45          | -130/+45          | -130/+45                      |
|  | 30                | 30                            | 30                | 30                | 30                            |
|  | o                 | o                             | o                 | o                 | o                             |
|  | 0/+180            | 0/+180                        | 0/+180            | 0/+180            | 0/+180                        |
|  | 30                | 30                            | 30                | 30                | 30                            |
|  | 12,000            | 12,000                        | -                 | -                 | -                             |
|  | -                 | -                             | 12,000            | 12,000            | 12,000                        |
|  | 44/32/288/187     | 44/32//288/187                | 44/32//288/187    | 44/32/288/187     | 44/32//288/187                |
|  | -                 | -                             | -                 | -                 | -                             |
|  | -                 | -                             | -                 | -                 | -                             |
|  | 60/chain          | 60/chain                      | 60/chain          | 60/chain          | 60/chain                      |
|  | 60/30/40          | 60/30/40                      | 60/40/40          | 60/30/40          | 60/30/40                      |
|  | 89,500            | 101,000                       | 46,000            | 91,000            | 102,000                       |
|  | 12                | 15/20/15                      | 10                | 12                | 15/20/15                      |
|  | 6                 | 8/10/8                        | 6                 | 6                 | 8/10/8                        |
|  | •                 | •                             | •                 | •                 | •                             |
|  | o                 | o                             | -                 | -                 | -                             |

DMU P/FD and DMC U/FD portal series

# Options

|  | DMU 210 P /<br>DMC 210 U | DMU 270 P /<br>DMC 270 U |
|--|--------------------------|--------------------------|
| <b>Table options</b>   |                          |                          |
| NC rotary table  | •                        | •                        |
| RS 3 / RS 2 rotary pallet storage, including 3 / 2 additional pallets<br>(only for DMC machines)               | RS 5                     | RS 4                     |
| <b>Tool carrier</b>  |                          |                          |
| HSK-A63 / BT 40 / CAT 40 (HSK for turn-mill machines, FD, as standard)   | ◦                        | ◦                        |
| HSK-A100 / BT 50 / CAT 50 (HSK for turn-mill machines, FD, as standard)  | •                        | •                        |
| <b>Automation / measurement / monitoring</b>   |                          |                          |
| 3D quickSET®   | ◦                        | ◦                        |
| Infrared measuring probe   | ◦                        | ◦                        |
| Wireless measuring probe (used with pick-up spindle or exchangeable milling head)                              | ◦                        | ◦                        |
| Tool measuring in working area, Blum Laser NT hybrid<br>(standard with the pick-up spindle)                    | ◦                        | ◦                        |
| Mechanical tool breakage monitor   | ◦                        | ◦                        |
| Combined tool measurement in the working area, laser system for milling tools,<br>3D scanner for turning tools | –                        | –                        |
| Quad-colour signal lights  | ◦                        | ◦                        |
| <b>Coolants / chip disposal</b>  |                          |                          |
| Protective cabin   | •                        | •                        |
| Production package with 980-litre coolant unit, paper band filter, 40-bar internal coolant supply              | •                        | –                        |
| Production package with 2,500-litre coolant unit, paper band filter, 40-bar internal coolant supply            | ◦                        | •                        |
| Internal coolant supply, 80 bar, frequency-controlled  | ◦                        | ◦                        |
| Coolant temperature control for internal coolant supply unit   | ◦                        | ◦                        |
| Spray gun with 2-bar pump, 40 litres per minute  | ◦                        | ◦                        |
| Minimum quantity lubrication through the spindle centre internally and through nozzles externally              | ◦                        | ◦                        |
| Oil and emulsion mist separator  | ◦                        | ◦                        |
| Air blast cooling through the spindle centre   | ◦                        | ◦                        |
| <b>Optional TNC 640 control systems</b>  |                          |                          |
| Application Tuning Cycle ATC   | ◦                        | ◦                        |
| Electronic handwheel TNC 640   | •                        | •                        |
| Control panel for tool magazine loading station  | •                        | •                        |
| ACC – Active Chatter Control   | ◦                        | ◦                        |
| <b>Optional SIEMENS 840D solutionline</b>  |                          |                          |
| Electronic handwheel SIEMENS 840D  | •                        | •                        |
| Control panel for tool magazine loading station  | •                        | •                        |
| DECKEL MAHO MDynamics  | ◦                        | ◦                        |
| <b>General options</b>   |                          |                          |
| Shatter-proof safety glass viewing window  | ◦                        | ◦                        |
| Operating mode 4 "Processor monitoring in production"  | ◦                        | ◦                        |
| Package for increased accuracy   | ◦                        | ◦                        |

• Standard, ◦ Optional, – not available

\* Only in combination with pick-up motor spindle

|  | DMU 340 P /<br>DMC 340 U | DMU 210 FD /<br>DMC 210 FD | DMU 270 FD /<br>DMC 270 FD | DMU 340 FD /<br>DMC 340 FD |
|--|--------------------------|----------------------------|----------------------------|----------------------------|
|  | •                        | Mill-turn table            | Mill-turn table            | Mill-turn table            |
|  | RS 4                     | RS 5                       | RS 4                       | RS 4                       |
|  | *                        | –                          | –                          | –                          |
|  | •                        | •                          | •                          | •                          |
|  | ○                        | ○                          | ○                          | ○                          |
|  | ○                        | ○                          | ○                          | ○                          |
|  | ○                        | –                          | –                          | –                          |
|  | ○                        | –                          | –                          | –                          |
|  | ○                        | ○                          | ○                          | ○                          |
|  | –                        | ○                          | ○                          | ○                          |
|  | ○                        | ○                          | ○                          | ○                          |
|  | •                        | •                          | •                          | •                          |
|  | –                        | •                          | –                          | –                          |
|  | •                        | ○                          | •                          | •                          |
|  | ○                        | ○                          | ○                          | ○                          |
|  | ○                        | ○                          | ○                          | ○                          |
|  | ○                        | ○                          | ○                          | ○                          |
|  | ○                        | ○                          | ○                          | ○                          |
|  | ○                        | •                          | •                          | •                          |
|  | ○                        | ○                          | ○                          | ○                          |
|  | ○                        | ○                          | ○                          | ○                          |
|  | •                        | •                          | •                          | •                          |
|  | •                        | •                          | •                          | •                          |
|  | ○                        | ○                          | ○                          | ○                          |
|  | ○                        | •                          | •                          | •                          |
|  | ○                        | ○                          | ○                          | ○                          |
|  | ○                        | ○                          | ○                          | ○                          |



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