



M60

M60-G

M65

M60 | M60-G | M65

[DE] [EN] [US] [FR] [IT] [ES] [BR] [RU] [CN] [JP]

CLAMP ONCE – MACHINE COMPLETE



The design of today for the production of tomorrow

Anyone who wishes to stay ahead in the market must react quickly and in a flexible manner to their customers' requirements. The components that customers require are becoming increasingly complex and therefore more demanding to manufacture. By combining all of the manufacturing steps in a multifunctional MILLTURN turning-boring-milling centre, the requirements of both current and future manufacturing jobs can be fulfilled with the highest level of precision. The possibility of freely interpolating the NC axes B, C, X, Y and Z offers the user an incomparable range of technologies. Complete machining without

manual intervention, by means of turning, drilling, milling, deep hole drilling, internal and external gear cutting, turn-milling, circular milling and automatic workpiece measurement to enable compliance with the tightest of tolerances. Compensation of thermal influences is also provided for. Any geometric profile can be efficiently machined with the maximum level of precision. There are absolutely no limits when it comes to workpiece complexity. Its multifunctionality is simply ingenious.



M60 MILLTURN | M65 MILLTURN





M65
MILL

Features

Compact design of the bottom slides
(favourable for short parts)



[5]

Individual clamping solutions



Automatic coolant docking





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Features

Turning-boring-milling unit with
integrated measuring probe



Workpiece transfer



Tool change in a position
of your choice



The standard tool interface

In order to respond to the demands of the broad technological spectrum, MILLTURN turning-boring-milling centres use only modular tool interfaces with the highest levels of long-term precision and the maximum rigidity (HSK, Capto, KM, etc.). The high pull-in forces of

the standard tool interface provide for particularly reliable machining. WFL offers a broad range of add-ons to ensure highly-productive deep hole drilling processes and to enable a variety of special technologies to be used.

High coolant pressure

- High coolant pressure for optimised chip breakage
- Coolant pressure below 150 bar – High Pressure Coolant (HPC)
- Coolant pressure between 150 and 350 bar – Ultra High Pressure Coolant (UHPC)
- Significant increases in cutting parameters, tool life and process safety
- Reduced machining costs
- No additional interfaces required for up to 200 bar (coolant supplied directly through the milling spindle)

Coolant solutions for deep hole drilling

- High coolant supply rates to ensure the best possible removal of chips from the hole – this makes the MILLTURN a fully-fledged deep hole drilling machine
- Coolant supply rates of up to 800 l/min
- External interfaces with manual or automatic docking
- Additional manual interfaces possible for automatic docking
- Individual configuration of the coolant pumps and filters

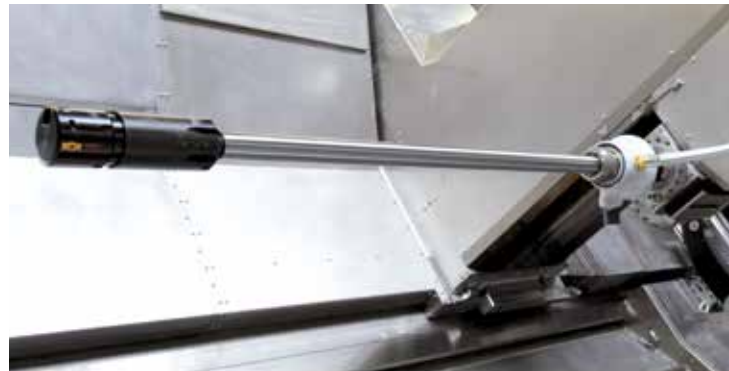
Special tool heads

- Special tool heads for special manufacturing requirements (difficult to access workpiece geometries, special processes and special coolant solutions)
- The special tool heads are handled by means of the automatic tool changer
- Optional torque support prevents undesirable turning of the special tool head and ensures a rigid connection to the swivel housing

Ultra-High Pressure Coolant (UHPC)



Ejector drilling



Angular head with torque support



The tool magazine

A sufficient number of tool stations

The comprehensive range of machining possibilities requires a large number of tools. Up to 120 tool stations (depending on the tool system) housed in a particularly reliable disc magazine guarantee a sufficient quantity. In addition to the disc magazine, a chain magazine is also available as an option, providing a capacity of up to 200* tool stations. The tool changer travels in a lengthwise direction by means of a wear-free rack and pinion drive. The quick and robust tool changer with double gripper ensures that the tool changing process remains reliable in the long term.

Maximum user-friendliness

In order to reduce travel movements to a minimum, thereby also reducing non-productive idle time during tool changes, particularly in the case of long shaft components, the tool change position can be freely programmed anywhere along the travel path. The magazine can be equipped from the front side of the machine, even during



machining, demonstrating the highest possible level of user-friendliness. Convenient software functions support the forward-looking and cross-task assembly of the magazine and guarantee that the tools will be able to be used until the end of the tool life.

* Higher values available upon request

Additional flap for long tools



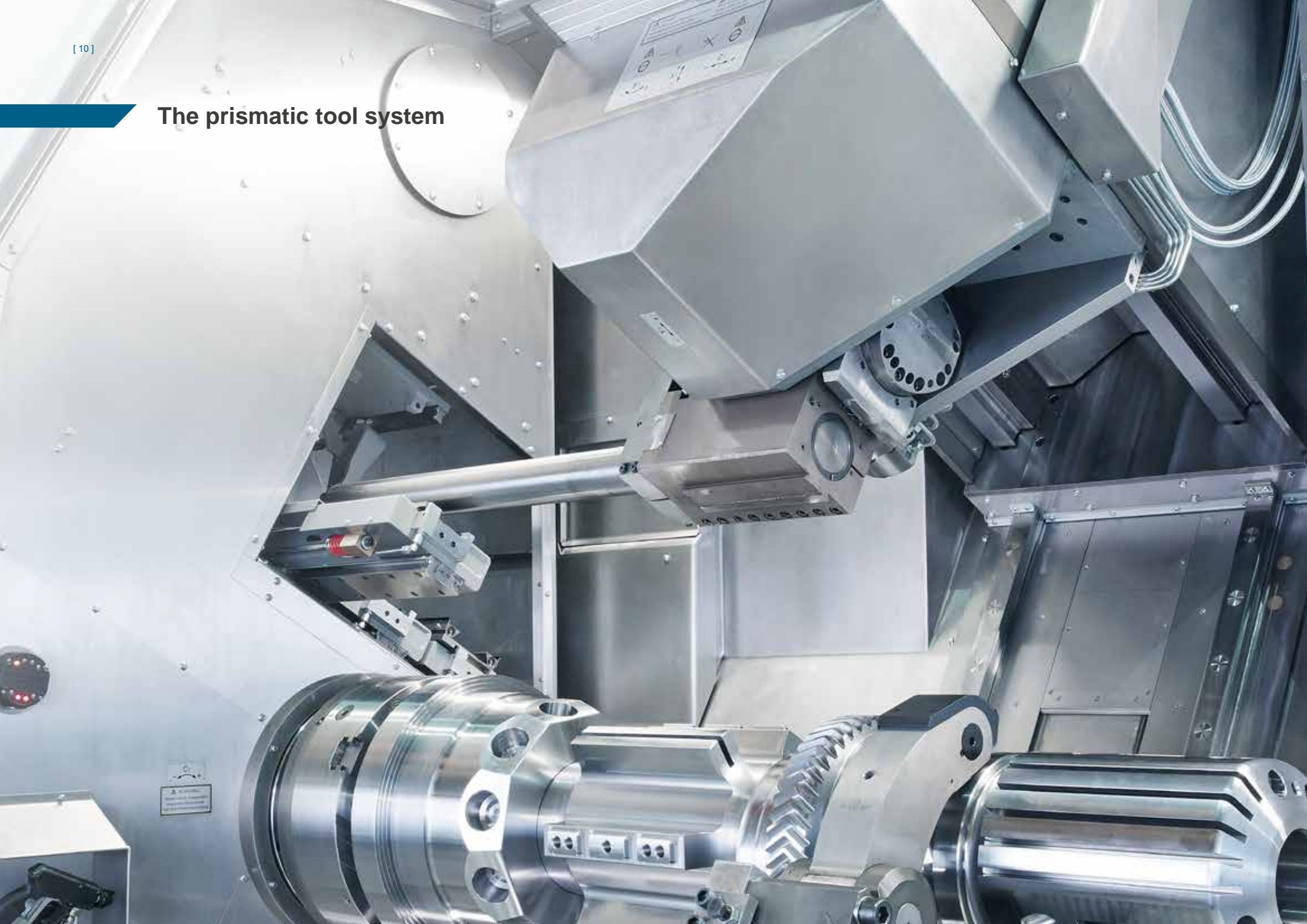
Maintenance-free disc magazine



Optional chain magazine



The prismatic tool system





WFL system boring bar



Prismatic tool magazine



Tool control

The interface for large tools

The prismatic tool interface enables the use of tools that exceed the maximum dimensions of standard tools. Thanks to the use of robust prismatic tool holders, boring bars, solid drills, angular heads and facing heads can be attached to the milling unit in a highly stable manner. If the WFL system boring bar is being used, the cutting heads can also be changed automatically. Two types of magazine are available to provide automatic handling of heavy internal machining tools.

Prismatic tool magazine

By expanding the disc magazine to include the appropriate tool holders, prismatic tools can also be stored alongside standard tools. In this case, the automatic handling of these tools is ensured by an additional tool changer.

Pick-up magazine

Prismatic tools can be stored in this additional magazine, which is positioned above the headstock. A further design variant of the pick-up magazine enables long tools to be stored using the standard tool interface.

Manufacturing solutions using prismatic tools and the U-axis





Manufacturing of pockets (seat pocket)



Internal machining with damped boring bar



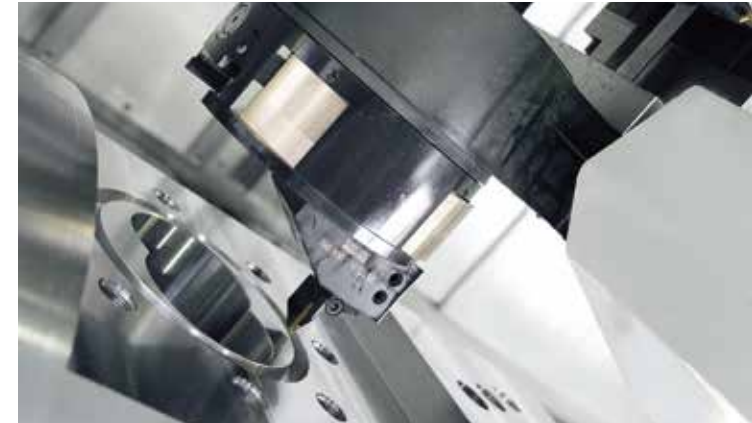
CNC special contour boring bar
(radial feed out using the U-axis)



Deep hole drilling with automatic coolant docking



Internal milling with angular head



CNC facing head for complex
spindle operations

Increased possibilities thanks to the prismatic tool system

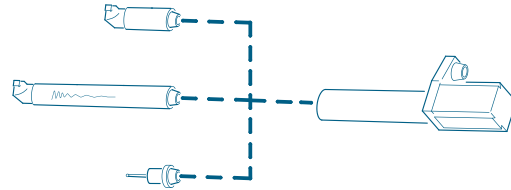
The prismatic tool system vastly increases functionality. MILLTURNS do not need to fear comparisons with special machines, however. Quite the opposite in fact: for many special technologies, MILLTURN offers unbeatable advantages in terms of manufacturing precision and performance. As complete machining is carried out within a single machine, the results achieved with regard to the concentricity of outside and inside diameters are second to none, and the tightest positional tolerances for bores and milled surfaces can be adhered to without any difficulty.

The U-axis

This additional NC axis (U-axis) on the turning-boring-milling unit enables CNC facing heads and CNC special contour boring bars to be used with rotating tools during radial feed out. This means that MILLTURNS also provide the full functionality of special machining centres with drilling quills. The U-axis solutions for the manufacturing of pockets and complex spindle operations offer a great deal of potential in terms of savings, particularly for users active in the aerospace industry or in the oil and gas industry.

Prismatic tools

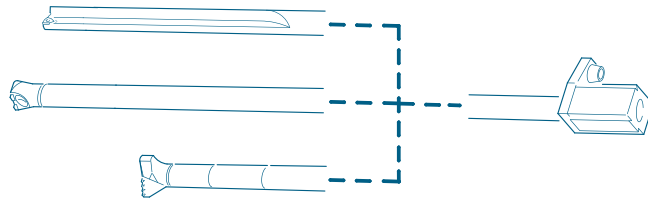
WFL system boring bar
Automatic tool head change



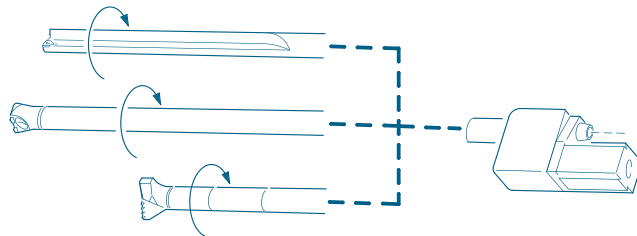
Boring bar
Single-piece, vibration damped



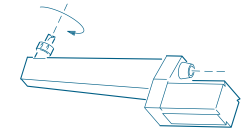
Deep hole drilling tool
For central holes



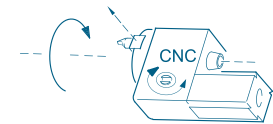
Deep hole drilling tool
Rotating, with coolant supply



Internal machining tool
Driven



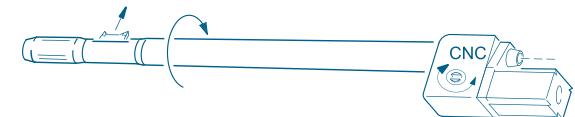
CNC facing head
Rotating with radial feed out
B-axis: $-90^\circ / +45^\circ$



CNC special contour boring bar
Static with radial feed out
(bottle boring)



CNC special contour boring bar
Rotating with radial feed out
(seat pocket machining)



Ergonomic industrial design



Simple tool setting-up

- Optimal accessibility from the front
- Setting-up during machining
- Large magazine windows that slide smoothly in a horizontal direction
- Optional loading aid for heavy prismatic tools

Optimal view of the workpiece

- Large safety windows provide the best possible overview of the working area
- Optional spin windows
- Innovative and energy-saving lighting concept with LED lamps

Machine operation made easy

- Adjustable operator panel
- Tiltable 19-inch display
- Ability of the operator panel to travel along the full length of the working range as far as the tool magazine

Modular machine concept for customer-specific manufacturing solutions

1. Machine bed

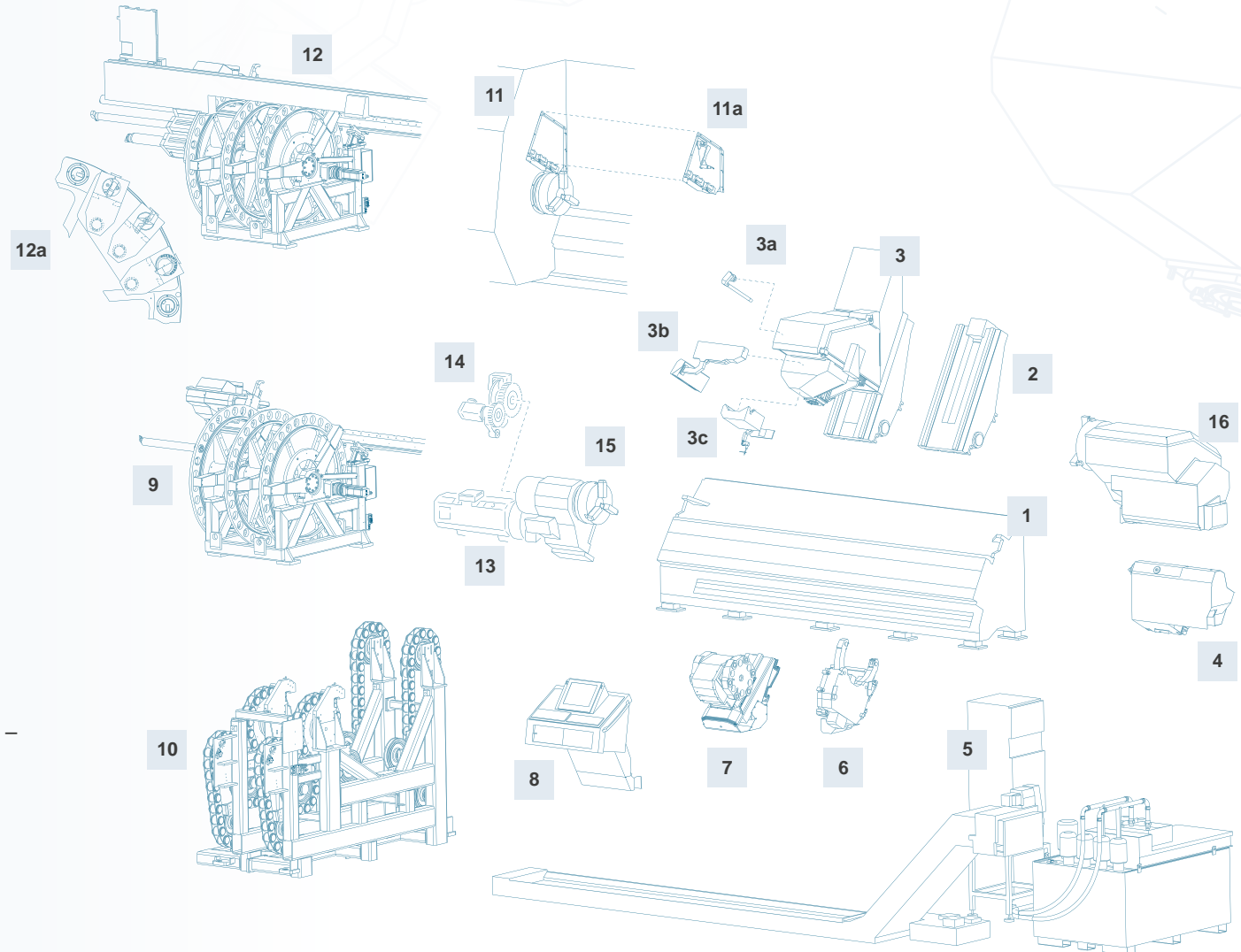
- 60° slant bed with large-scale guide ways
- Heavily ribbed cast body, designed to provide optimal torsional rigidity
- Optimal damping properties
- Minimal influx thanks to optimised chip flow
- Compact design of the bottom slides

2. Compound slide

- Cast body with optimal damping properties
- Best possible torsional and bending strength

3. Turning-boring-milling unit

- Linear direct measuring system in the X- and Y-axes
- Interpolable B-axis and B-axis clamping
- Indexable milling spindle
- Standard tool interface
- Optional prismatic tool interface
- Coolant supplied directly through the milling spindle (up to 200 bar)
- Optional external coolant supply for high supply rates – manual and automatic docking variants (3a)
- Optional U-axis for feed out tools (3b)
- Optional integrated measuring probe (3c)



4. Tailstock

- Adjustable quill force
- Adjustable tip height
- Automatically positionable (dragged or with its own NC drive)
- Also available with optional neck
- Optional NC quill

5. Chip conveyor and coolant cleaning system

- Travels to the right
- With coolant tank and filter system

6. Steady rest

- Self-centring steady rests
- Individual clamping device and support solutions
- Automatically positionable (dragged or with its own NC drive)

7. Disc turret

- 12-position or 2 x 12-position (6 tools per disc, also driven)
- Disc turret available in axial or radial design

8. Operator panel

- Control elements for the Siemens Sinumerik 840D sl control system
- Integrated printer

9. Disc magazine

- For up to 120 tools with a standard tool interface
- Setting-up parallel to machining time
- Max. tool length: 900 mm
- Max. tool weight: 20 kg
- Automatic tool change

10. Chain magazine (optional)

- For high tool requirements
- For up to 200 tools with a standard tool interface
- Setting-up parallel to machining time
- Automatic tool change

11. Pick-up magazine (optional)

- For up to 2 prismatic tools
- Design variants for long tools with standard tool interfaces
- Max. tool length: 1700 mm
- Max. tool weight: 200 kg
- Automatic tool change
- Optional integrated tool control using a measuring probe in the form of a probe or a laser (11a)

12. Prismatic tool magazine (optional)

- Expansion of the standard disc magazine
- For up to 18 prismatic tools – max. 6 segments with 3 positions each (12a)
- Max. tool length: 2000 mm
- Max. tool weight: 180 kg
- Automatic tool change

13. Main spindle

- AC drive with 2-speed gearbox
- Motor and headstock thermally separated
- Robust cast housing with stable spindle bearing

14. C-axis with retaining brake

- Can be swivelled hydraulically
- Clearance-free AC drive with Harmonic Drive
- Separate retaining brake for machining while the main spindle is static (optional damping function)

15. Chuck

- Partially-hollow or hollow centre clamping
- Automatic power chuck
- Rapid changing of clamping jaws
- Tool-specific special clamping devices

16. Counter spindle (M60-G only)

- With tailstock and synchronous spindle function
- 2-speed gearbox
- Digital AC drive

Software solutions by WFL

The latest in control technology

Not only does the Sinumerik 840D sl, which is perfectly-suited to machining tasks, have the highest processing power, alongside its especially user-friendly programming it is also perfectly compatible with all current CAD/CAM systems. NC programs, technological data, measuring protocols, tool data and machine and process parameters can be transferred to a host computer, for example, using an Ethernet connection. This means that the MILLTURN is fully prepared for connection to networked production and to meet future requirements.

Safety is a central concern

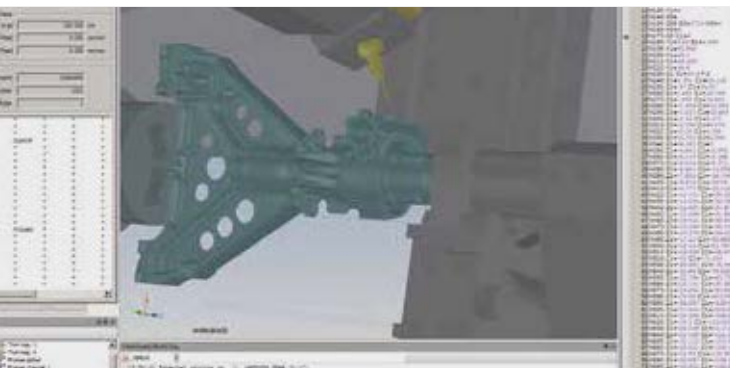
The sophisticated MILLTURN safety concept works on an exclusively electronic basis. The advantages of this are that the system reacts extremely quickly in comparison to conventional concepts, the cabinet configuration is more simple and it provides the option of precise fault diagnosis on site and via a network connection.

Good parts from the very first workpiece

High-precision measuring probes, linear direct measuring systems and clearance-free anti-friction guideways transform the MILLTURN into a 3D measuring machine. WFL provides the user with comprehensive modular measuring software and proven expertise for intelligent measuring strategies, which serve to exclude as many error-causing variables as possible, right from the very start.

- Creation of complex user-specific measuring processes
- Determination of workpiece features or any forging allowances prior to machining
- Automatic recording and compensation for tool wear
- Software-controlled temperature compensation in order to eliminate machining errors caused by the thermal expansion of the workpiece
- Saving or printing of measuring protocols

Simulation

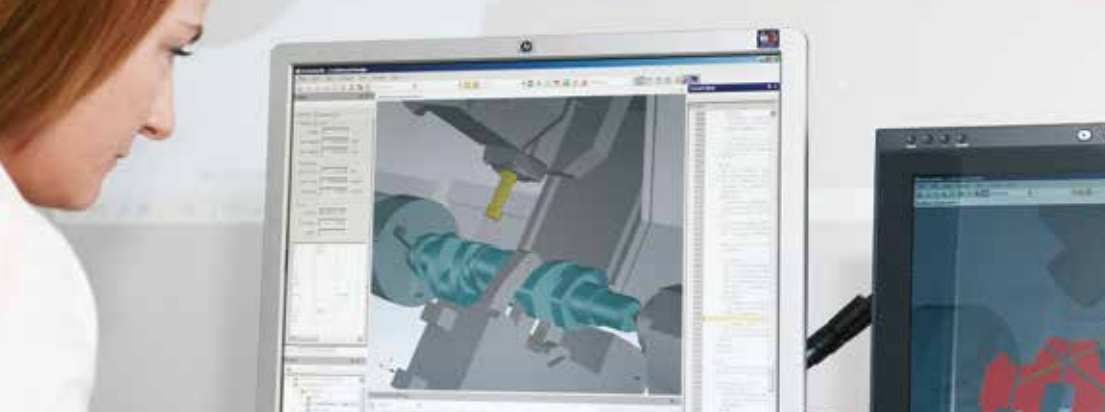


Reality



Technology cycles





CrashGuard Studio



CrashGuard

Professional CAM solutions from WFL

... for the programmer:

CrashGuard Studio: Offline 3D simulation with material removal to enable verification of NC programs

Millturn PRO: Programming editor in CrashGuard Studio with interactive graphics



... for the machine operator:

CrashGuard: Real time collision prevention software within the CNC machine control system



Safe machining with up to 12 monitoring channels...

During machining, the sophisticated process monitoring visualises and monitors the flow of forces on all of the axes and spindles. This renders the cutting process fully transparent and makes it easy to identify potential for optimisation.

- Tool breakage and collision monitoring
- Teach-In procedure to enable cutting forces to be saved and used for calibration in the event that the same task is repeated
- Machining aborts in the event that the process parameters exceed the freely-definable tolerance limits

Process monitoring



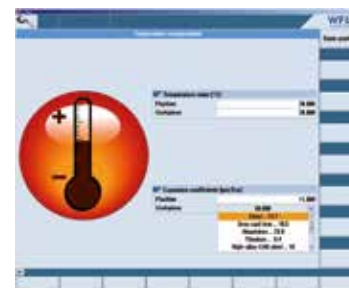
Tool management



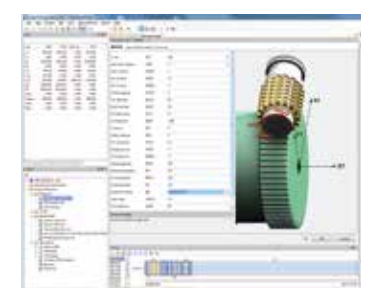
Tool correction



Temperature compensation

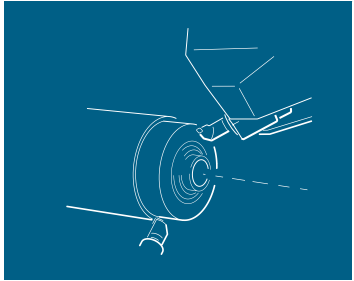


Millturn PRO programming editor

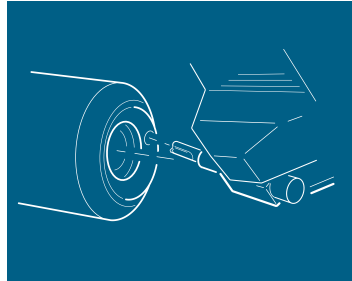


Technologies by WFL

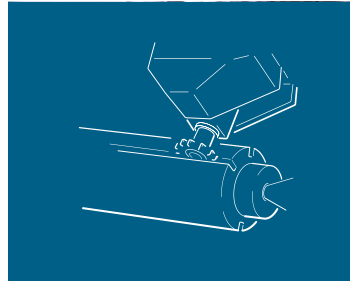
Turning



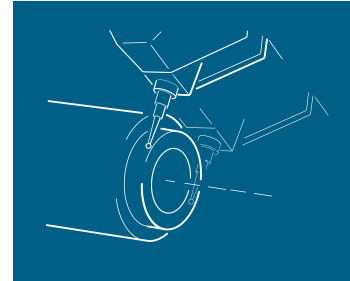
Drilling



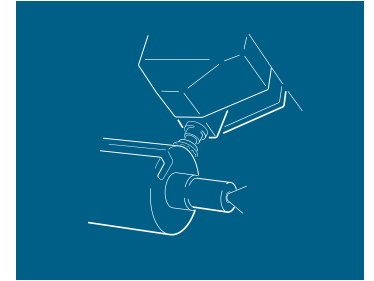
Milling



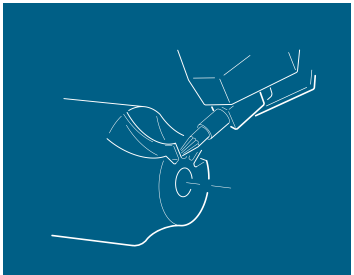
In-process measuring



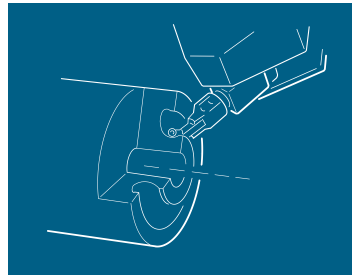
Turn-milling



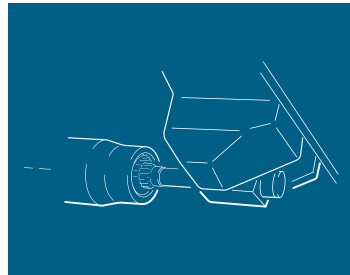
5-axis milling



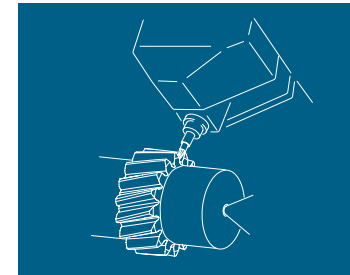
B-axis turning



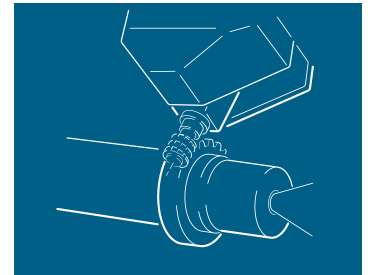
Shaping of gear teeth (Flanx-Spline)



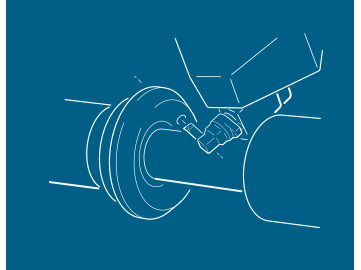
Milling of gear teeth (Flanx-LM)



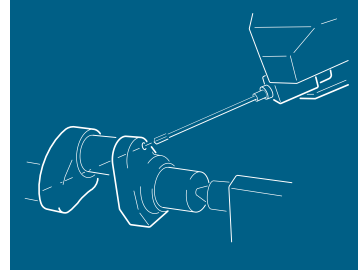
Hobbing of gear teeth (Flanx-Hob)



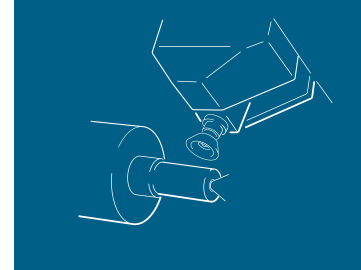
Special tool heads



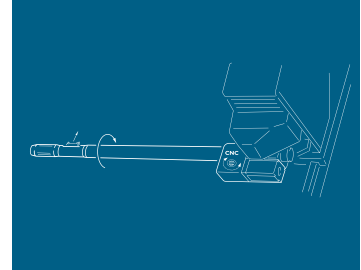
Deep hole drilling



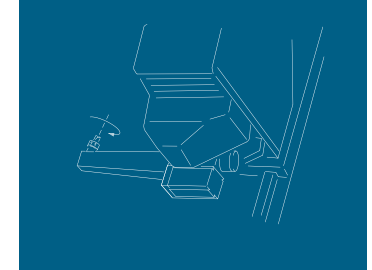
Grinding and fine machining



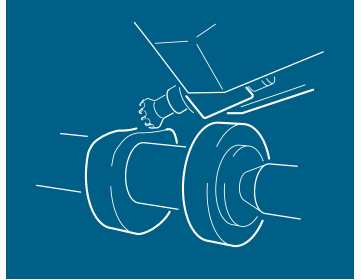
CNC special contour boring bar



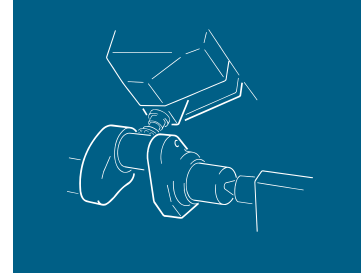
Internal machining tool



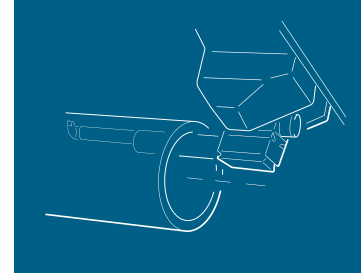
Cam milling



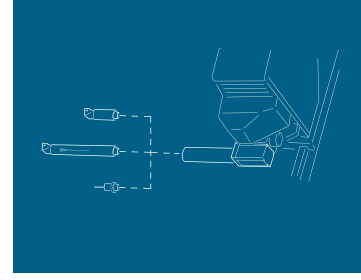
Milling of crankshaft pins



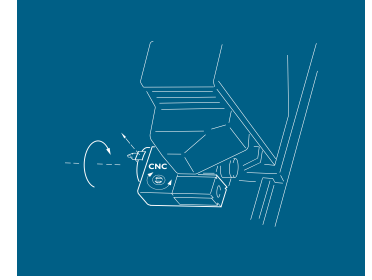
Drilling and internal turning



WFL system boring bar

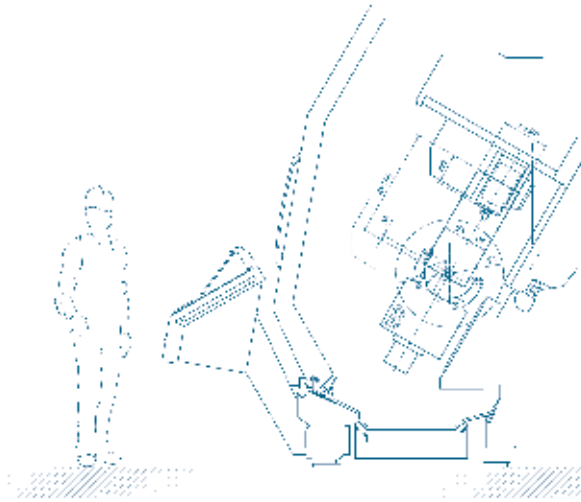


CNC facing head

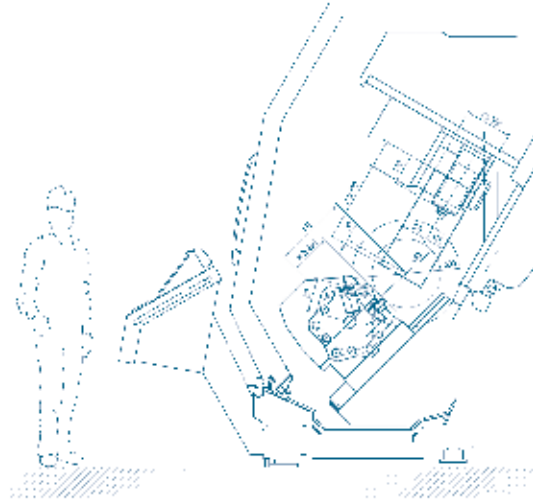


Machine cross section

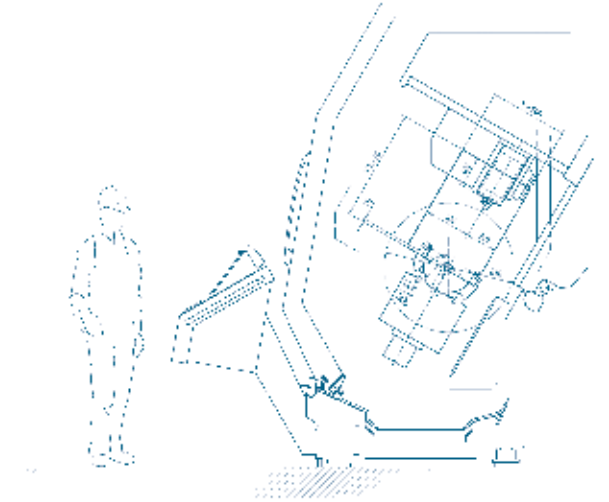
M60 MILLTURN



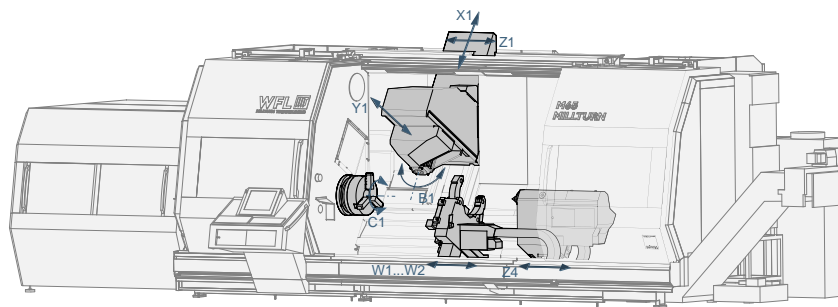
M60-G MILLTURN



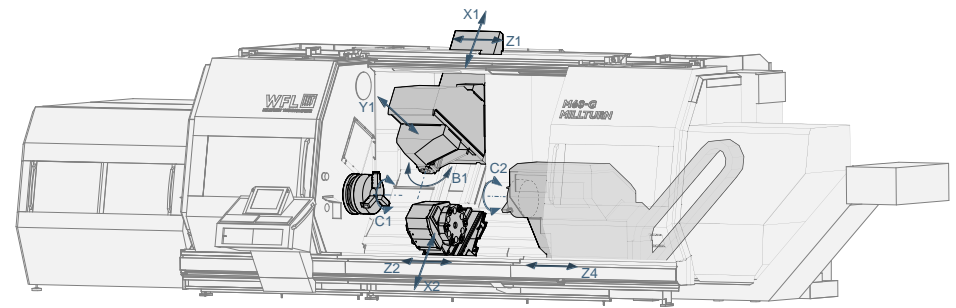
M65 MILLTURN



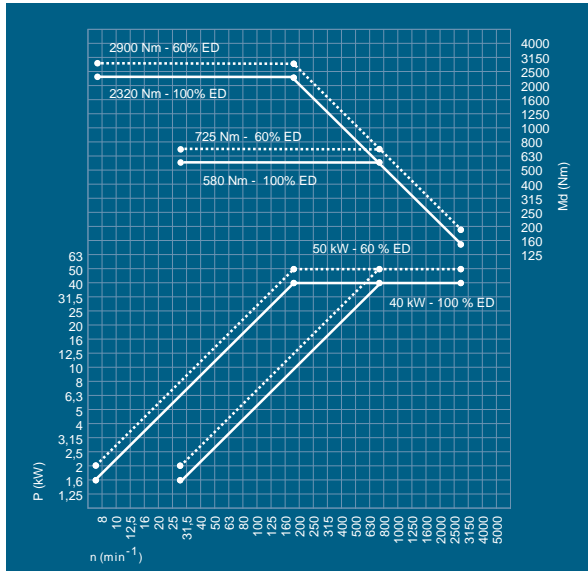
Axis scheme



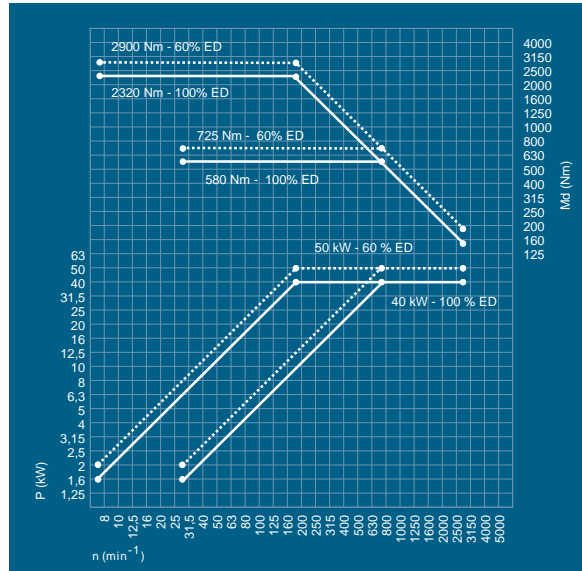
M60 MILLTURN | M65 MILLTURN



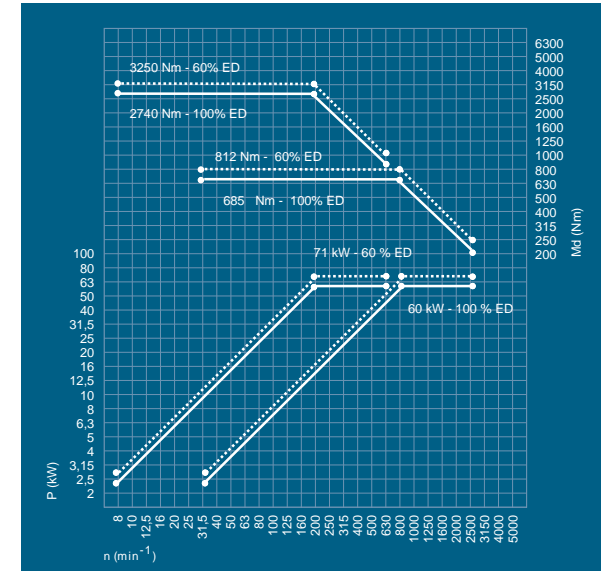
M60-G MILLTURN



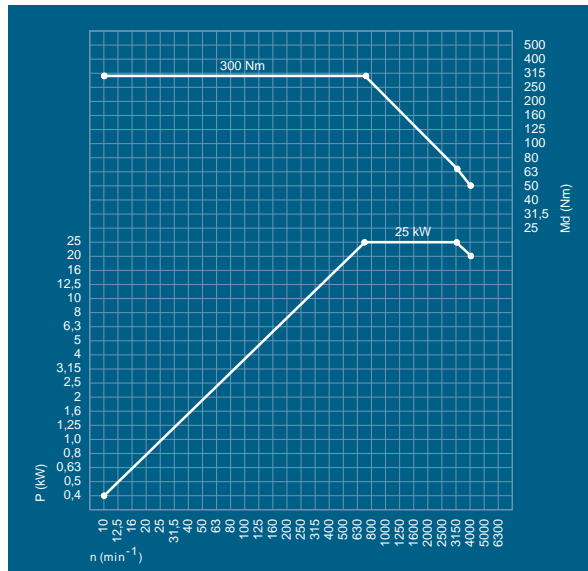
Main spindle 50 (40) kW - 2600 min⁻¹



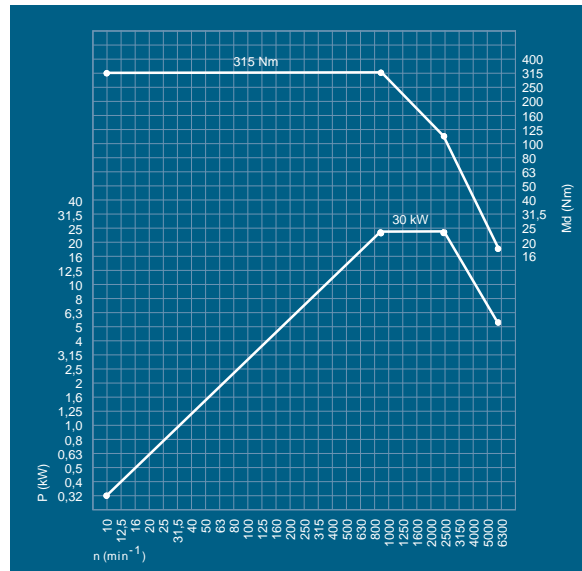
Main spindle 71 (60) kW - 2600 min⁻¹



Main spindle left/right 50 (40) kW - 3300 min⁻¹



Milling spindle 25 kW - 4000 min⁻¹



Milling spindle 30 kW - 6000 min⁻¹

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WORKING RANGE

Centre distance	mm	1000 / 2000 / 3000 / 4500	2000 / 3000 / 4500	1000 / 2000 / 3000 / 4500
Turning length incl. standard chuck approx.	mm	1070 / 2070 / 3070 / 4570	-	1070 / 2070 / 3070 / 4570
Swing diameter over top slide	mm	690	690	830
Swing diameter over bottom slide	mm	480	480	640
Max. turning diameter between centres (with coupling device)	mm	690 (610)	-	830 (760)

TURNING SPINDLE – LEFT // RIGHT

		L	L // R	L
Spindle head DIN 55026	Size	A11 / A15	A11 // A11	A15
Spindle bore	mm	115 / 165 - 145	115 // 115	165 - 145
Spindle diameter in front bearing	mm	160 / 240	160 // 160	240

MAIN DRIVE – LEFT // RIGHT

		L	L // R	L
Max. power 100% duty cycle	kW	40 / 60	40 / 60 // 40	40 / 60
Max. speed	min ⁻¹	3300 / 2600	3300 / 2600 // 3300	2600 / 2600
Torque at the spindle max. 100% duty cycle	Nm	1830 / 2748	1830 / 2748 // 1830	2318 / 2748

C-AXIS – LEFT // RIGHT

		L	L // R	L
Max. speed	min ⁻¹	25 // 20	25 // 25	20
Torque at the spindle max. 100% duty cycle	Nm	1500 / 3000	1500 // 1500	3000
Holding torque of the disc brake	Nm	4000	4000 // 4000	4000
Smallest programmable increment	Degrees	0,0001	0,0001 // 0,0001	0,0001

TURNING-BORING-MILLING UNIT – UPPER TOOL CARRIER*

Max. power 100% duty cycle	kW	30	25	30
Max. speed	min ⁻¹	6000	4000	6000
Torque at the spindle max. 100% duty cycle	Nm	315	300	315
Milling spindle diameter in front bearing	mm	100	100	100
Z-axis travel	mm	1150 / 2150 / 3150 / 4650	1150 / 2150 / 3150 / 4650	1150 / 2150 / 3150 / 4650
X-axis travel	mm	720 (-20...+700)	700 (-30...+670)	720 (-20...+700)
Y-axis travel	mm	300 (-125...+175)	300 (-125...+175)	600 (-200...+400)
Z-axis feed force 100% duty cycle	kN	20	20	20
X-axis feed force 100% duty cycle	kN	20	20	20
Y-axis feed force 100% duty cycle	kN	20	15	20
Rapid feed speed Z / X / Y	m/min	20 / 15 / 12,5	20 / 15 / 12,5	20 / 15 / 12,5
B-axis swivelling range	Degrees	-110...+90	-110...+90	-110...+90
B-axis additional indexing	Degrees	2,5	2,5	2,5
B-axis swivelling torque max.	Nm	1200	1200	1200
B-axis holding torque, indexed and clamped	Nm	10000	7000	10000
Smallest programmable increment on B-axis (interpolable)	Degrees	0,0001	0,0001	0,0001
Tool system	Type	HSK-A63 / HSK-A80 / HSK-A100	HSK-A63 / HSK-A80 / HSK-A100	HSK-A63 / HSK-A80 / HSK-A100
Tool system	Type	C6 / C8; KM 63 / KM 80	C6 / C8; KM 63 / KM 80	C6 / C8; KM 63 / KM 80

M60 MILLTURN
M60-G MILLTURN
M65 MILLTURN
TAILSTOCK

Quill diameter	mm	140	-	180
Quill travel	mm	160	-	200
Adjustable quill force	kN	3,5 - 31	-	3,5 - 31
Live centre	MK	5	-	6

STEADY REST

Clamping diameter max.	mm	350*	-	460*
Clamping diameter with steady rest on disc turret max.	mm	160	160	-
Swing over steady rest slide	mm	530	-	680

DISC MAGAZINE

Number of tool stations (place-encoded), HSK-A63 / C6	Number	40 / 80 / 120	40 / 80 / 120	40 / 80 / 120
Number of tool stations (place-encoded), HSK-A80 / C8	Number	36 / 72 / 108	36 / 72 / 108	36 / 72 / 108
Number of tool stations (place-encoded), HSK-A100	Number	30 / 60 / 90	30 / 60 / 90	30 / 60 / 90
Tool diameter, adjacent, max.	mm	110	110	110
Tool diameter, non-adjacent, max.	mm	200	200	200
Max. tool length	mm	900	900	900
Max. tool weight	kg	20	20	20

DISC TURRET – BOTTOM TOOL CARRIER

Z-axis travel	mm	1000 / 2000 / 3000 / -	2000 / 3000	1000 / 2000 / 3000 / -
X-axis travel	mm	260	260	260
Z-axis feed force 100% duty cycle	kN	20	20	20
X-axis feed force 100% duty cycle	kN	10	10	10
Rapid feed speed Z / X	m/min	15 / 10	15 / 10	15 / 10
Single disc turret tool stations, HSK-A63 modular / VDI 40	Number	12	-	12
Turning diameter max.	mm	440	-	360
Double disc turret tool stations, HSK-A63 modular / VDI 50	Number	-	2 x 12	-
Turning diameter max.	mm	-	440	-

PRINCIPAL DIMENSIONS OF THE BASE MACHINE

Length x width x height (max. magazine)	m	10 / 11 / 12 / 13,5 x 4,2 x 3,5	11 / 12 / 13,5 x 4,2 x 3,5	10 / 11 / 12 / 13,5 x 4,2 x 3,5
Number of sliding doors	Number	1 / 2 / 2 / 3	2 / 2	1 / 2 / 2 / 3
Height of the turning spindle/turning centre above the ground	mm	1230	1195	1230
Total weight of the machine approx.	kg	21000 - 33000	27000 - 30000	22000 - 35000

CONTROL

		Sinumerik 840D sl		
Display on the operator panel	Type	LCD colour display / 19"		

PAINTING

RAL 5023 distant blue, texture / 7035 light grey, texture / 7037 dusty grey, texture

* Other values available upon request