ENDURA® MACHINES

Excellent quality of motion control.

MECHANICAL ENGINEERING
AT ITS BEST

360° CUSTOMER
FOCUS

Hendrik Fooke,
Head of Sales
Business field development
Fifth Generation

Johannes Fooke,
Fourth generation Managing Director

OVER 110 YEARS OF EXPERIENCE ‘MADE IN GERMANY’

Mechanical engineering at its best.

FOOKE GmbH is a medium-sized family business based in Borken in the west of Germany’s Münsterland region. It was founded in 1904 and is currently run by 4th generation Managing Director Johannes Fooke.

FOOKE has been manufacturing large and very large 5-axis milling machines for over 30 years. These tooling machines are often used as gantry milling machines in various designs.

Demanding and ambitious customers from a wide range of industries, such as aerospace, rail and automotive industries trust in FOOKE’s reliable, high-performance ENDURA® machines. Especially in the automotive and aerospace industries, model, prototype building as well as tool and mould construction are the most common applications.

The FOOKE ENDURA® tooling machines are characterised by their outstanding motion control, which is defined by the highest dynamics, excellent precision and the best surface quality. Furthermore, the ENDURA® machines impress with exceptional reliability, process stability and availability.

Based on customers’ individual requirements, holistic engineering services are among FOOKE’s core competences. In this regard, FOOKE has great experience in cutting, designing and constructing structural components for motion systems, as well as in the design and integration of feed drives and the complete commissioning of complex tooling machines.

FOOKE offers an extremely high level of vertical production. The completely self-made structural components are individually cut, fired, welded and finally built by using mechanical production and the proprietary colour scheme. FOOKE’s own employees also take responsibility for the proprietary electrical engineering, switch cabinet construction and wiring of the machines. FOOKE offer you thus all services from one single source.

HEAD OFFICE
IN BORKEN

ENDURA® MILLING MACHINES REPRESENT
QUALITY ‘MADE IN GERMANY’

THERE IS NO ALTERNATIVE TO “QUALITY”

Quality ‘Made in Germany’ – FOOKE consistently implements this philosophy.

As the years have gone by, we have continually grown. Together with our national and international customers, we have developed a global company that operates in multiple countries all around the world.

However, we are still firmly committed to our home country, Germany. Our origins lie in Borken located in Germany’s Münsterland region.

Here, we have established our success and it is here that our highly qualified employees manufacture first-class quality products under optimum conditions – and will continue to do so in the future. Our suppliers are more than just procurement sources; they are rather our partners, developing with us to exceed highest quality standards.

WE ARE DRIVEN BY YOUR REQUIREMENTS

ENDURA® machines. Fascinating solutions for your machining tasks.

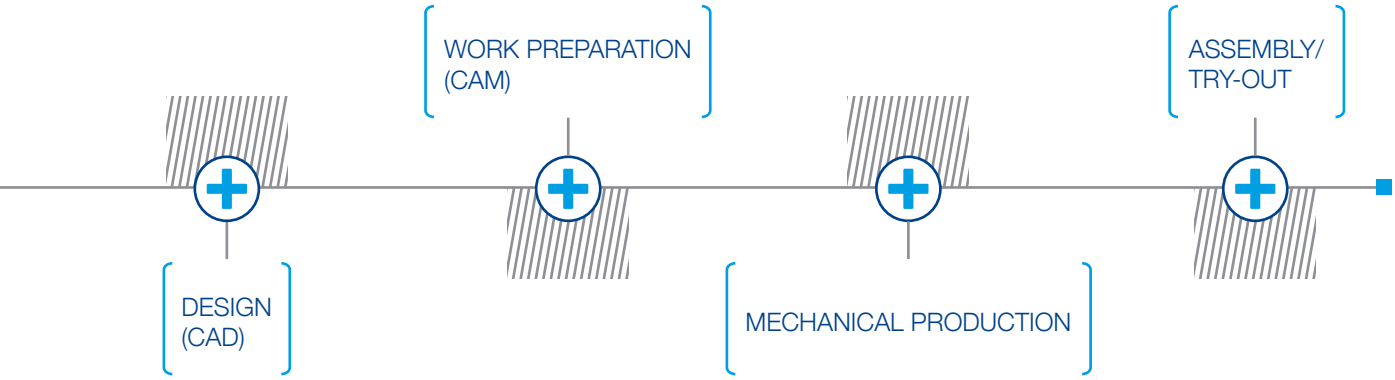
We understand that our customers are unique. We are your professional partner and work with you to devise and develop a sound and conclusive machine concept based on your specific task.

Our specialists analyse the process as a whole using an interdisciplinary approach and under consideration of your expertise and Know-How:

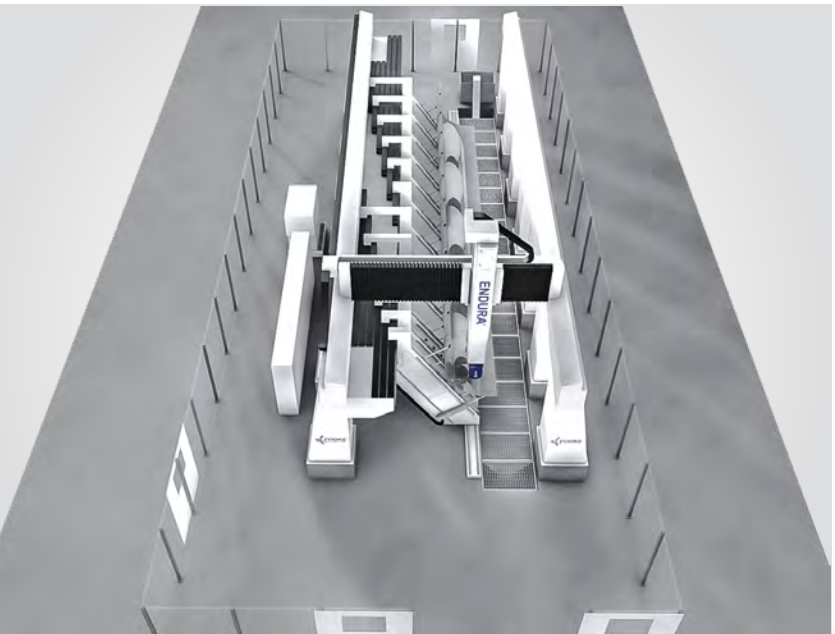
- Selection of the suitable machine series based on workpiece size and material
- Milling strategy and programming
- Selection of tools and workpiece clamping systems
- Description of specific HSC roughing and finishing parameters
- Definition of the additional equipment required (tool changer, measuring systems, coolant systems, etc.)

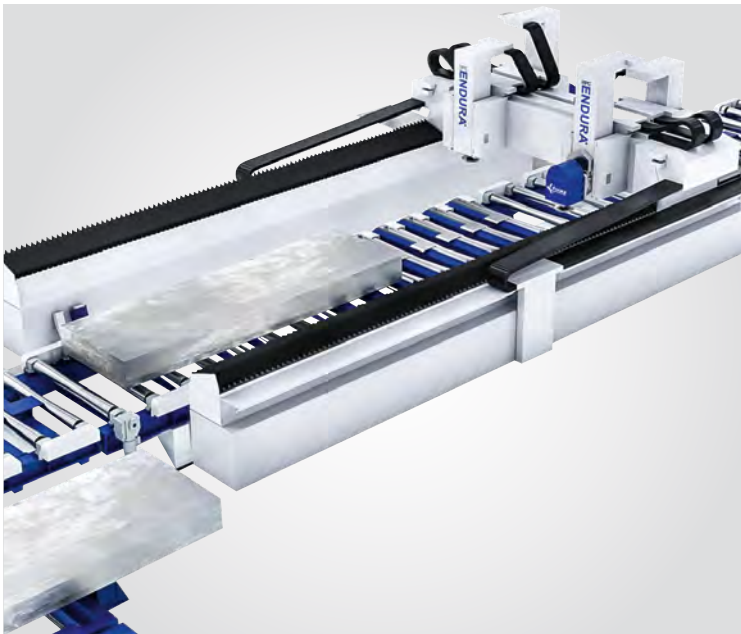
The result is an ENDURA® machine configuration optimally tailored to your process.

Our process chain



SPECIAL ENDURA® MACHINES





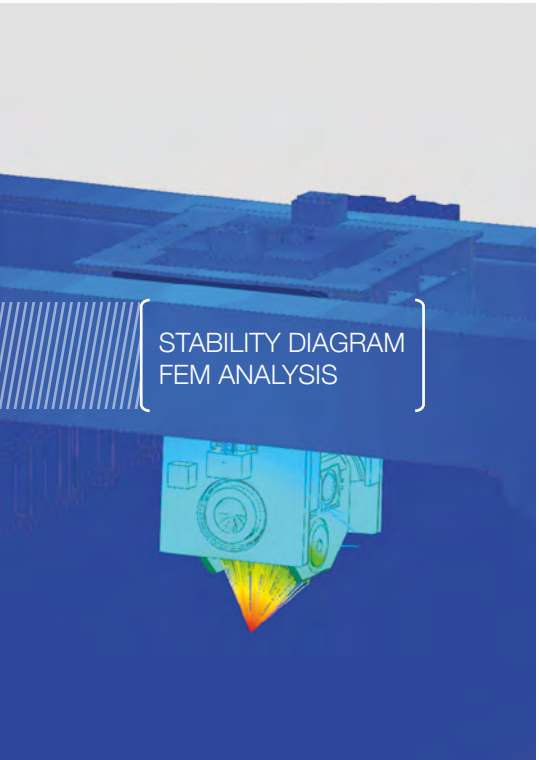
SPECIAL MACHINES

Special requirements and procedures demand special solutions.

We work in close cooperation with our customers to develop product and process-specific machines and systems. Following an in-depth analysis of your machining task, we will propose productive, cost-effective solutions and present potential alternatives. Considering the latest researches and engineering methods, we identify the system-related target setpoints :

- Rigidity
- Attenuation
- Dynamics
- Precision
- Process reliability

The design of all machine components and the holistic simulation ensure that these setpoints are all met. Our many years of experience and expertise form the basis for the theoretical representation of reality. This enables us to reliably determine a system's performance and productivity in advance.



RESEARCH AND DEVELOPMENT

The concept of ‘excellent quality of motion control’ motivates us during all research and development work.

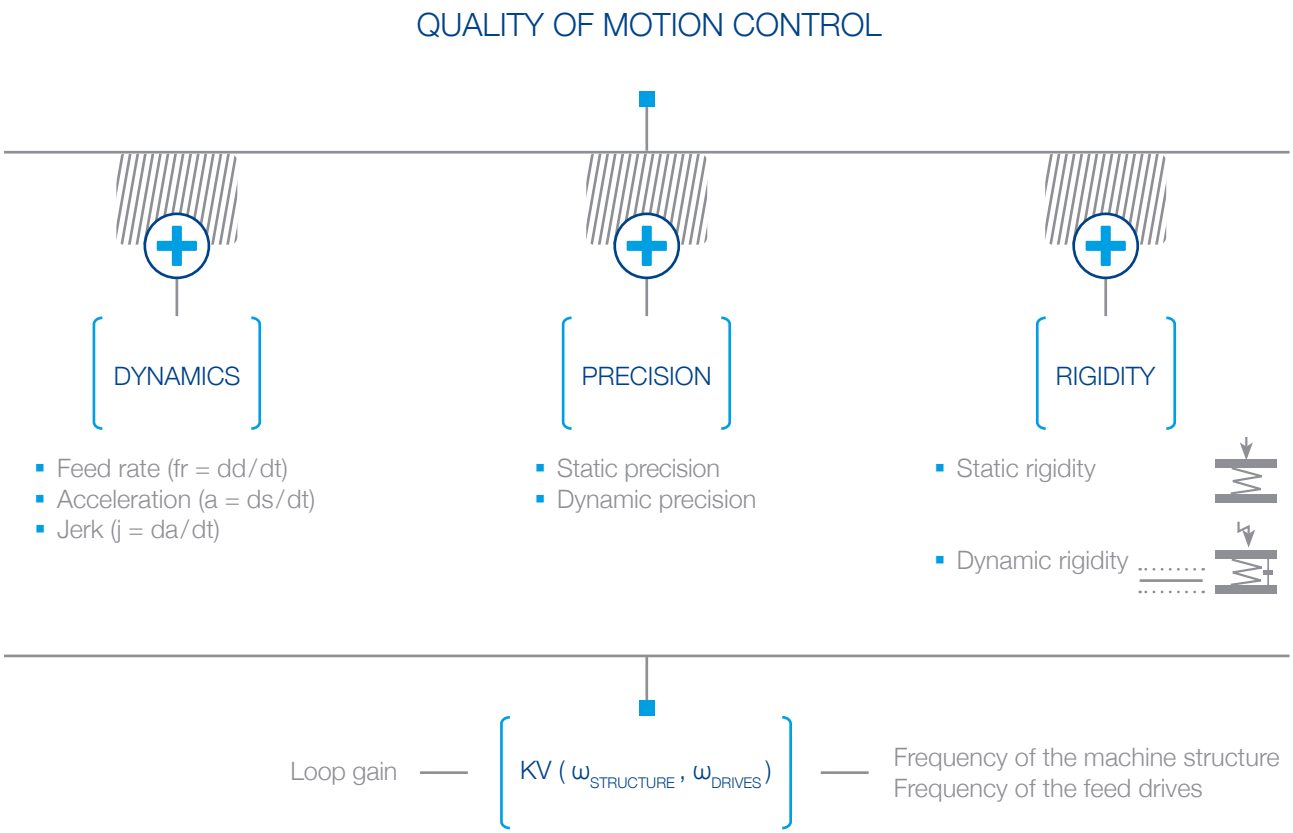
Here at FOOKE, we have always believed in the importance of research and development. Innovations that enable us to outstand our competitors form the core of our work. We develop complex, high-tech products, globally regarded as technology drivers in the machine tool sector. Our decades of experience in machine-tool-related research and development enable us to offer competitive advantages to our customers worldwide. We aim to use our development activities to further increase our products’ added value for our customers.

The aim of our research and development has always been and will always be to develop pioneering products that conserve resources. We will continue to raise the bar with regard to the energy efficiency of machine tools.

The quality of motion control and the interaction between the tool and the workpiece at the tool centre point will always be a primary focus of our research and development activities.

An optimally designed machine structure thanks to FEM and the incorporation of high-performance machine components, such as non-contact linear motors, ensure excellent quality of motion control and an extremely stable process.

Schematic representation



AUTOMOTIVE INDUSTRY

AEROSPACE INDUSTRY

RAIL INDUSTRY

AUTOMOTIVE INDUSTRY: DIFFERENT TIMES, DIFFERENT REQUIREMENTS

What used to only be possible through highly skilled workmanship, is now done with great precision by modern machine tools.

Surface quality and precision are the key requirements in the fields of model, prototype, tool and mould building. Machines have to be able to rationally and reliably work different materials, from rigid foam to alloy tool steel. FOOKE makes this possible with high-performance, highly dynamic 5-axis milling machines.

Models and prototypes in particular, but also tools and moulds, are today machined with the smallest step-overs in linear format. This partially occurs in a classic 3+2 mode but increasingly also as a 5-axis simultaneous process. With this type of machining, the programmed feed speed has to be kept virtually constant yet also at the highest level. The maximum rigidity of the machine's structural elements and the feed drives are the essential basis for surface quality and precision coupled with outstanding productivity.

Our many years of experience and consistent further development, with our 'finger constantly on the market's pulse', have enabled us to develop a wide range of machines that meets almost any requirements.

AEROSPACE INDUSTRY: ALL CLEAR FOR NEW OPPORTUNITIES

Minimum tolerances and a wide range of modern materials. These are the real challenges of the aerospace industry.

Demanding workpieces require demanding solutions. To provide these, we not only develop the machine required for the machining work, but also workpiece clamping systems specially tailored to the workpiece either as hard tooling systems or universal ‘multi-tooling clamp systems’. We supply turnkey solutions, all from one single source.

The high-performance chipping of aluminium or titanium and the machining of CFRP and other compound materials require different milling machines and machining centres – if desired, including hybrid process technology, such as abrasive water jet cutting or laser cutting and milling combined in one single system.

RAIL INDUSTRY: MAKE WAY FOR PRODUCTIVITY

They need to be big, quick, safe and, above all, robust: milling systems for the production of rail vehicles.

These days, a number of modern high-speed trains and trams are made all around the world from high-volume aluminium profiles and components. FOOKE has been working in close cooperation with different customers to produce milling systems and turnkey production centres since the 1990s.

As a reliable partner for our customers, it goes without saying that we have consistently adapted our machines to constantly changing requirements. This is what has made us todays global market leader in this sector.

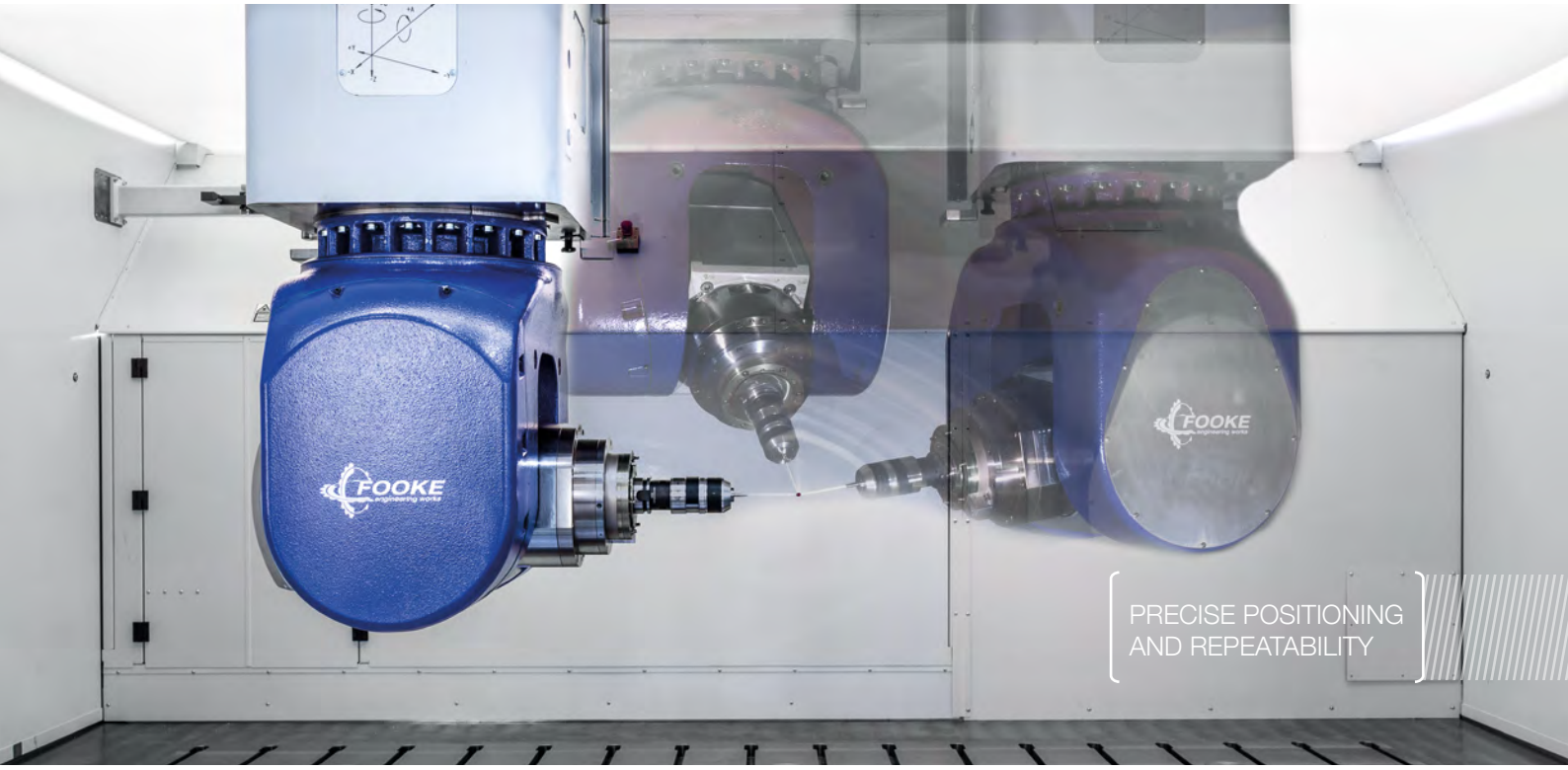
Our portfolio for this sector includes friction-stir welding, welding and joining systems as well as fitting and assembly stands.

Reliable, modern, economical.

MACHINING OF ALUMINIUM WELDED ASSEMBLIES

PRODUCTION SOLUTION WITH A DOUBLE GANTRY

INTELLIGENT INTEGRATION OF LINEAR MOTORS INTO ENDURA® MACHINES



HIGHEST DYNAMICS AND PRECISION

The integration of linear motors into suitable structural components boosts productivity by up to 40%.

ENDURA® machines impress with the highest dynamics and precision. Since 2002, FOOKE has used linear and torque motors for the feed axes of many machine series. By omitting the electromechanical drive elements, (e.g. ball screw drives and nuts or toothed pinions and racks, as well as their bearings and upstream gear units, such as toothed belt drives and reduction gears) and instead using a linear or torque motor, the spring stiffness chain is reduced and a quasi infinitely rigid feed drivetrain is achieved.

The linear motor comprises an unwound synchronous servo motor (primary component) and the permanent magnets (secondary component). The feed power is created by an electromagnetic field between the primary and secondary components. The rapid current regulation therefore makes it possible to generate almost infinitely high levels of rigidity and reduce the dead time between the target and actual values to almost zero. The linear motor feed drive has no mechanical play or lost motion. In conjunction with the machine's highly rigid structural components, these properties form the basis for highly dynamic and precise movements of the tool centre point. The action and reaction speeds of the machine's driven structural components are far faster.

DIRECT DRIVES
- LINEAR AND TORQUE MOTORS -

The linear motor feed drive enables a far more uniform feed motion.

When using a machine with linear motor drives, the deviations between the programmed target speed and the actual speed are far lower than with conventionally driven machines. This results in a far better surface quality and far greater precision.

The direct drive in the feed axes (linear motors X, Y and Z and torque motors C and A) counters disruptive influences such as process forces and inertia changes to the machine kinematics more quickly, making it possible to optimally adhere to the programmed setpoints such as the feed speed, acceleration and jerk.

With its core competency ‘quality of motion control’, FOOKE is a specialist in custom engineering and designs tailored to specific machining tasks. We create a detailed simulation of your machining and milling process in order to customize the design of your machine system to this. To this end, we have an application centre for test milling and empirical verification. Put us to the test.

Optimised speed profile: Positioning time $t_{total_2} < t_{total_1}$

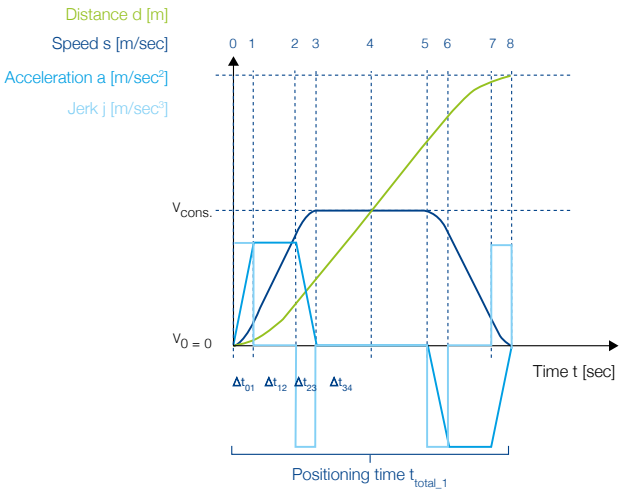


Image 1: d-, s-, a-, j- graph

Aim: optimised speed profile with the shortest possible acceleration and jerk phases and long constant speed phases (potentially at the highest possible speed). Framework condition: the speed level is determined by factors including the technological relation fr = rpm · t · cl

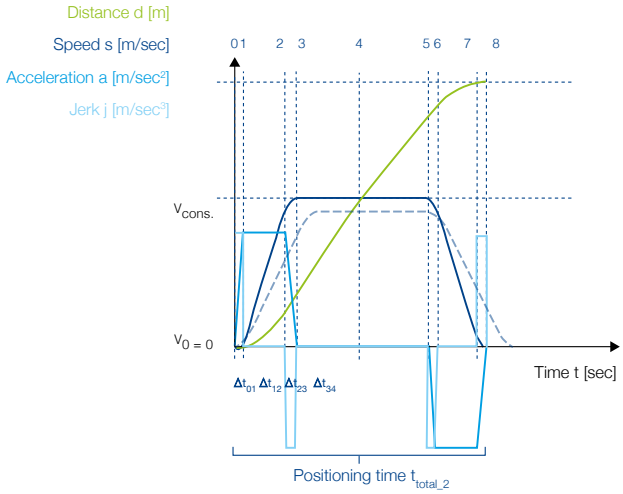
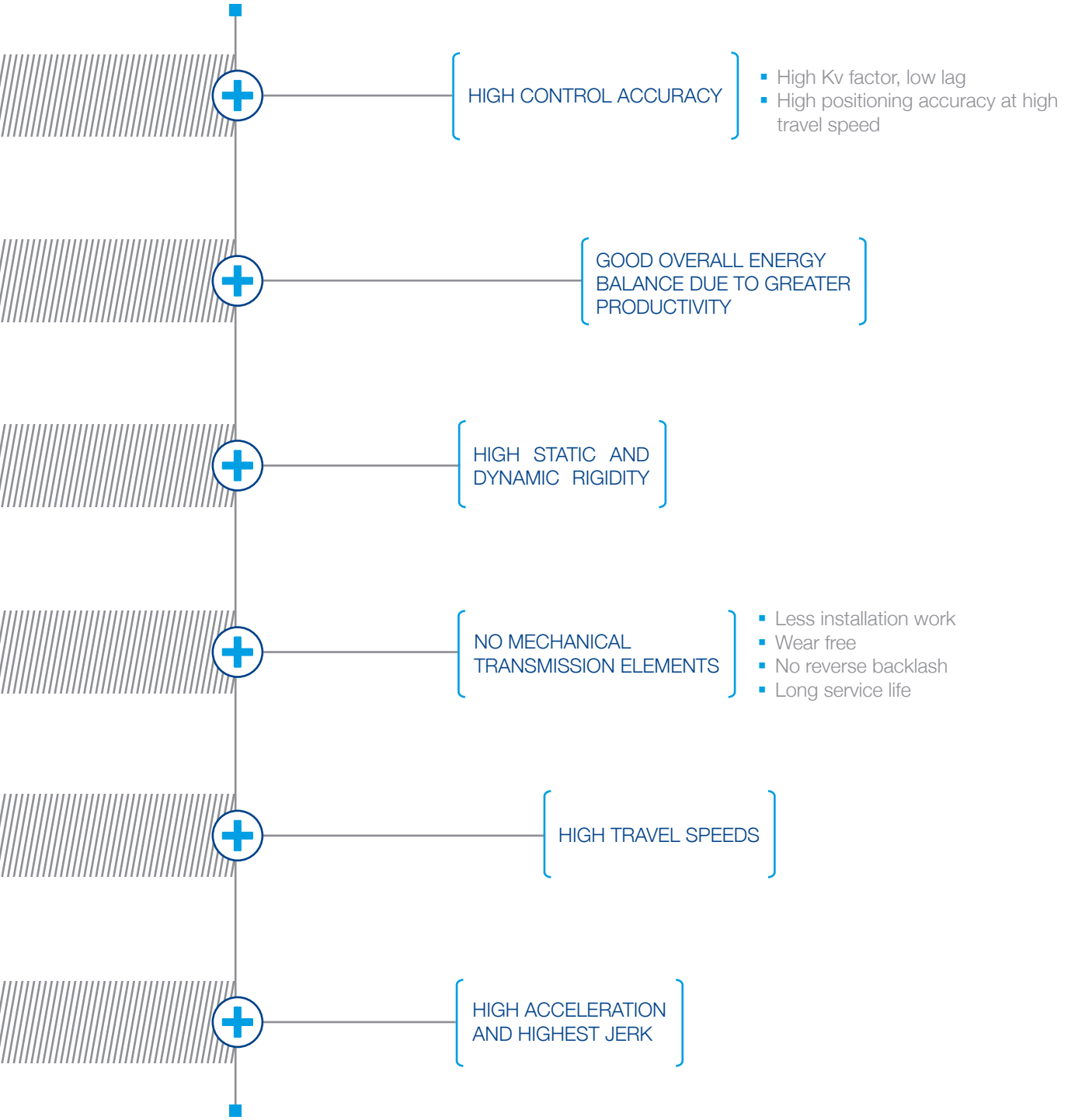


Image 2: d-, s-, a-, j- graph

Optimised speed profile while also raising the speed level by increasing the jerk and the acceleration. This reduces the production time and therefore boosts productivity.

LINEAR MOTOR DRIVE TECHNOLOGY

Benefits of linear motor drive technology in ENDURA® milling machines:



OUR
ENDURA® MILLING MACHINES

ENDURA® 400LINEAR

ENDURA® 600LINEAR

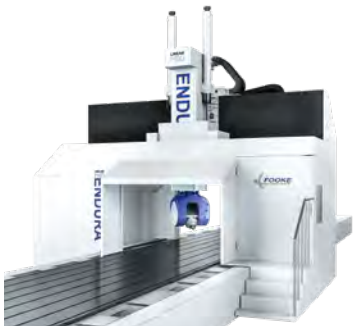
ENDURA® 700LINEAR

ENDURA® 900LINEAR

ENDURA® 900LINEAR COMPACT

ENDURA® 1000LINEAR

ENDURA® 7000LINEAR



ENDURA® PRO LINEAR

ENDURA® 800

COMPACT GANTRY MILLING MACHINE

ENDURA® 400LINEAR

COMPACT DESIGN

LARGE MACHINING AREA
SMALL INSTALLATION SURFACE

COMPACT GANTRY MILLING MACHINE ENDURA® 400LINEAR

TECHNICAL DATA

Traverse paths

X-axis:	2,700 mm
Y-axis:	2,000 / 3,000 mm
Z-axis:	1,200 mm

Feed rate

X-axis:	5 - 90,000 mm/min
Y-axis:	5 - 90,000 mm/min
Z-axis:	5 - 80,000 mm/min

Acceleration

up to 5 m/sec^2

Positioning accuracy

in X (P)	0.015 mm
in Y (P)	0.015 mm
in Z (P)	0.015 mm

Positioning scatter band

in X ($P_{s\ Average}$)	0.010 mm
in Y ($P_{s\ Average}$)	0.010 mm
in Z ($P_{s\ Average}$)	0.010 mm

HIGHLIGHTS

- Large machining area
- Small installation surface
- Direct drive in all axes (linear- and torque motors)
- Can be set up without additional foundation

Equipment

- Rigid compact machine with enclosed machine bed.
- Resistant, highly dynamic linear motors in all linear axes (X, Y and Z).
- Direct measuring systems in all axes (X, Y, Z, C and A).
- Safety system and brakes in all linear axes (X, Y and Z).

Additional equipment

- Dynamic Damping
- Automatic tool changer
- Minimum quantity spray dosing system
- Tool measuring systems
- Workpiece measuring systems
- Chips and dust disposal systems
- Plane cover / Sound insulation enclosure
- Online Service
- and much more

TORQUE MOTORS IN C- AND A-AXIS

DIRECT MEASURING SYSTEMS IN C- AND A-AXIS

MILLING HEAD 10

C-axis (Milling head rotary axis)	
Pivoting angle:	550° (+/-275°)
Pivoting torque:	350 Nm
Clamping torque:	840 Nm
Revolution:	300°/sec
Position accuracy:	15“ (0.0041°)
Position deviation:	10“ (0.0027°)

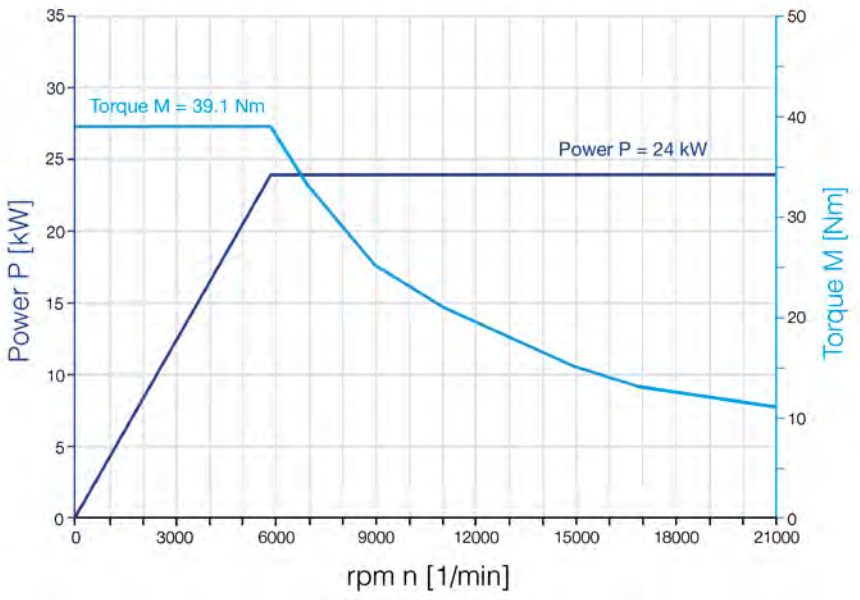
A-axis (Spindle pivoting axis)	
Pivoting angle:	220° (+/-110°)
Pivoting torque:	350 Nm
Clamping torque:	840 Nm
Revolution:	300°/sec
Position accuracy:	15“ (0.0041°)
Position deviation:	10“ (0.0027°)

High-frequency milling spindle	
Tool holding fixture:	HSK63 A
max. power:	24 kW
max. rpm:	21,000 rpm
max. torque:	39.1 Nm

Milling head 10

High-frequency milling spindle
HSK63 A

with 24 kW, 21,000 rpm



MATERIAL

Plastics	Blockmaterials for modelling	Composite materials (CFRP/GRP)	Aluminium	Cast Iron	Steel
+	+	+	+	−	−

TORQUE MOTORS IN C- AND A-AXIS

DIRECT MEASURING SYSTEMS IN C- AND A-AXIS

MILLING HEAD 11

C-axis
(Milling head rotary axis)

Pivoting angle:	550° (+/-275°)
Pivoting torque:	350 Nm
Clamping torque:	840 Nm
Revolution:	300°/sec
Axis acceleration:	600°/sec²
Position accuracy:	15“ (0.0041°)
Position deviation:	10“ (0.0027°)

A-axis
(Spindle pivoting axis)

Pivoting angle:	220° (+/-110°)
Pivoting torque:	350 Nm
Clamping torque:	840 Nm
Revolution:	300°/sec
Axis acceleration:	600°/sec²
Position accuracy:	15“ (0.0041°)
Position deviation:	10“ (0.0027°)

High-frequency milling spindle

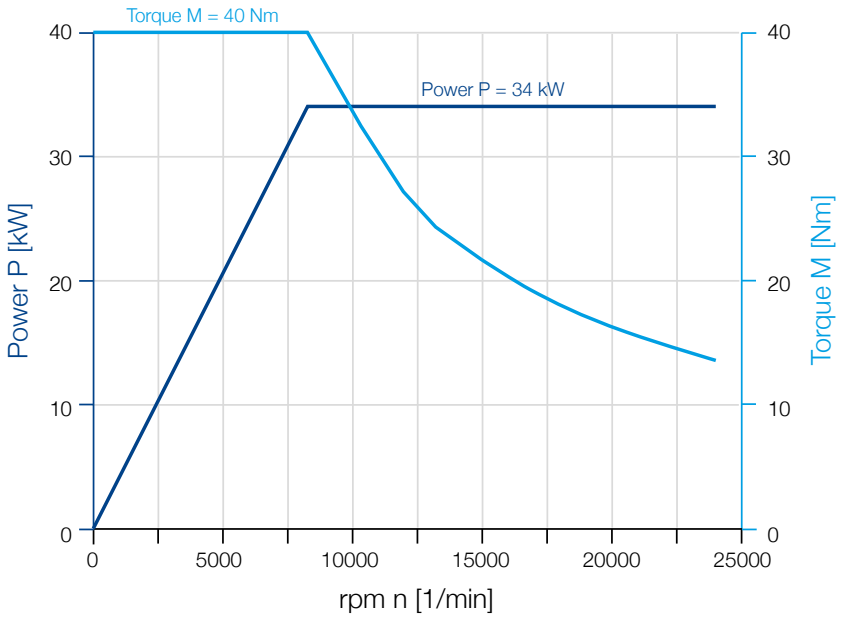
Tool holding fixture:	HSK63 A
max. power:	34 kW
max. rpm:	24,000 rpm
max. torque:	40 Nm

Milling head 11

High-frequency milling spindle
HSK63 A

with 34 kW, 24,000 rpm ——

Spindle also available with other performance characteristics



MATERIAL

Plastics	Blockmaterials for modelling	Composite materials (CFRP/GRP)	Aluminium	Cast Iron	Steel
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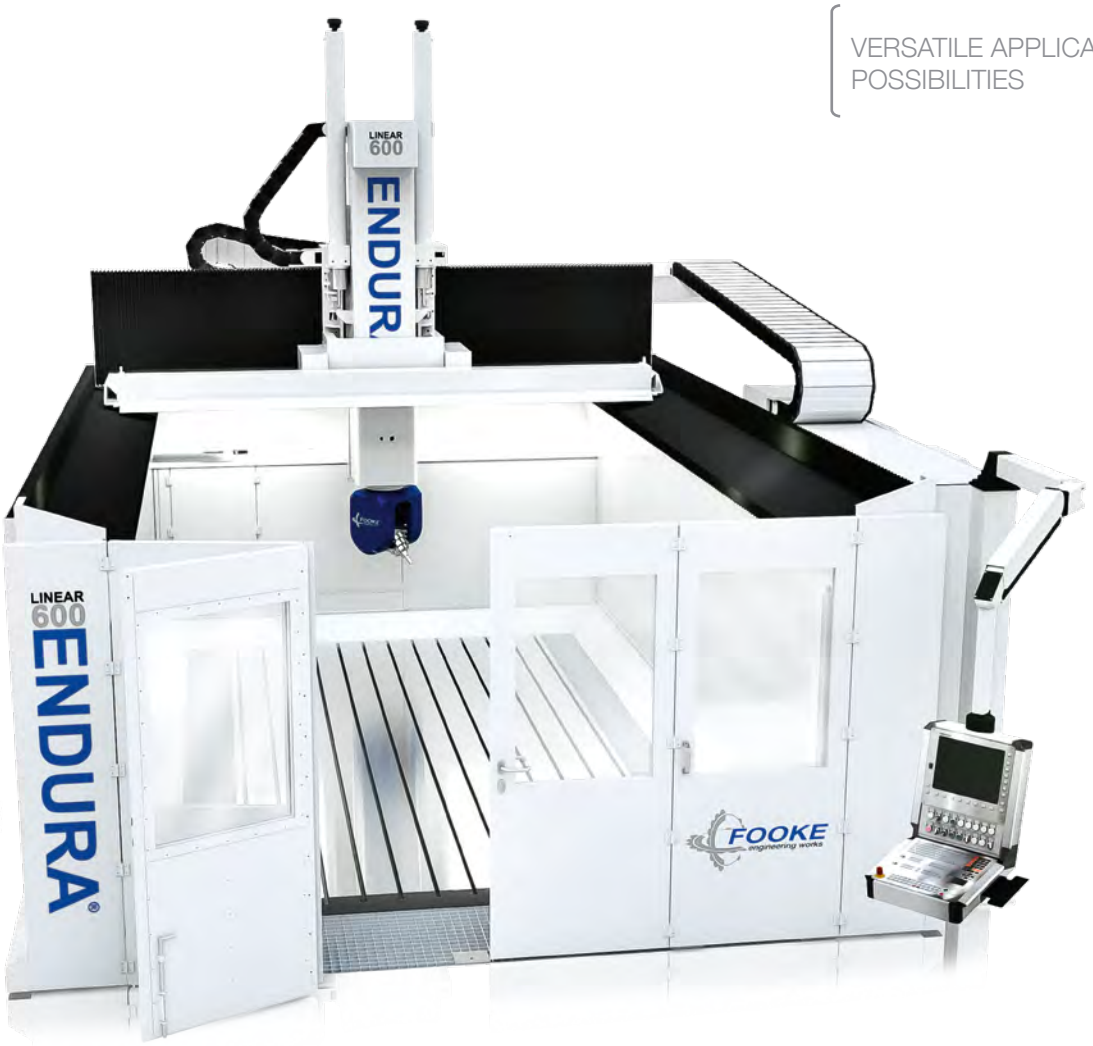
GANTRY MILLING MACHINE

ENDURA® 600LINEAR

VERSATILE APPLICATION POSSIBILITIES



MEDIUM-WEIGHT GANTRY MILLING MACHINE

GANTRY MILLING MACHINE ENDURA® 600LINEAR

TECHNICAL DATA

Traverse paths

X-axis:	5,000 - 30,000 mm
Y-axis:	2,800 / 3,500 mm
Z-axis:	1,200 / 1,500 / 2,000 / 2,300 mm

Feed rate

X-axis:	5 - 65,000 mm/min
Y-axis:	5 - 65,000 mm/min
Z-axis:	5 - 65,000 mm/min

Acceleration

up to 3.0 m/sec^2

Positioning accuracy

in X (P)	0.030 mm
in Y (P)	0.020 mm
in Z (P)	0.015 mm

Positioning scatter band

in X ($P_{s\ Average}$)	0.015 mm
in Y ($P_{s\ Average}$)	0.010 mm
in Z ($P_{s\ Average}$)	0.010 mm

HIGHLIGHTS

- Very large enclosed milling chamber
- Efficient dust suction and conveyance
- Direct drive in all axes (linear and torque motors)
- Loadable at ground level

Equipment

- Resistant, highly powerful linear motors in all linear axes (X, Y and Z) and torque motors in all rotary axes.
- Direct measuring systems in all axes (X, Y, Z, C and A).
- Safety system and brakes in all linear axes (X, Y and Z).
- Drive units efficiently protected by bellows.
- Extremely fast and highly dynamic overhead X-axis gantry milling machine.
- Easily accessible ground-level milling chamber facilitates loading and unloading with crane or forklift.

Additional equipment

- Dynamic Damping
- Automatic tool changer
- Minimum quantity spray dosing system
- Cooling system (wet operation)
- Tool measuring systems
- Workpiece measuring systems
- Chips and dust disposal systems
- Plane cover / Sound insulation enclosure
- Online Service
- and much more

TORQUE MOTORS IN C- AND A-AXIS

DIRECT MEASURING SYSTEMS IN C- AND A-AXIS

MILLING HEAD 4

C-axis
(Milling head rotary axis)

Pivoting angle:	550° (+/-275°)
Pivoting torque:	570 Nm
Clamping torque:	3,000 Nm
Revolution:	360°/sec
Axis acceleration:	1,200°/sec²
Position accuracy:	15“ (0.0041°)
Position deviation:	10“ (0.0027°)

A-axis
(Spindle pivoting axis)

Pivoting angle:	220° (+/-110°)
Pivoting torque:	570 Nm
Clamping torque:	2,000 Nm
Revolution:	360°/sec
Axis acceleration:	1,200°/sec²
Position accuracy:	15“ (0.0041°)
Position deviation:	10“ (0.0027°)

High-frequency milling spindle 1

Tool holding fixture:	HSK63 A
max. power:	39 kW
max. rpm:	24,000 rpm
max. torque:	32 Nm

High-frequency milling spindle 2

Tool holding fixture:	HSK63 A
max. power:	42 kW
max. rpm:	24,000 rpm
max. torque:	67 Nm

High-frequency milling spindle 3

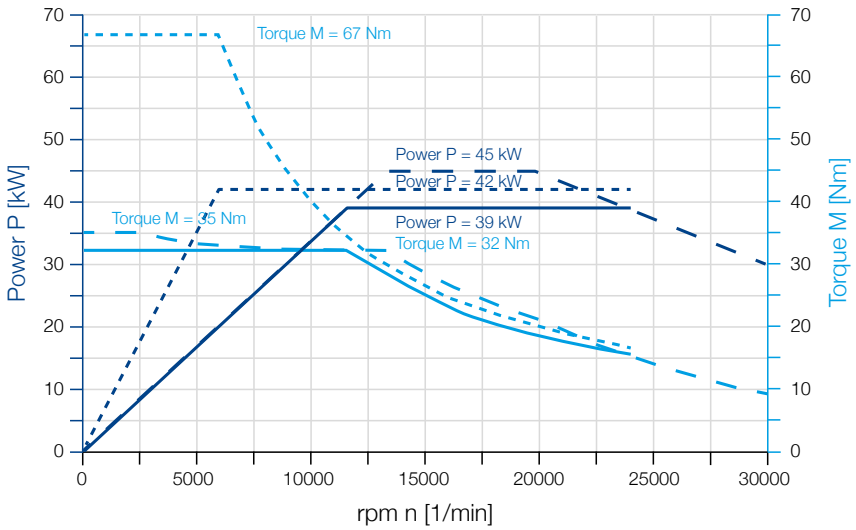
Tool holding fixture:	HSK63 A
max. power:	45 kW
max. rpm:	30,000 rpm
max. torque:	35 Nm

Milling head 4

High-frequency milling spindle
HSK63 A

with 39 kW, 24,000 rpm ——————
with 42 kW, 24,000 rpm - - - - - - -
with 45 kW, 30,000 rpm — — —

Spindle also available with other performance characteristics



MATERIAL

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+	+	+	+	−	−

TORQUE MOTORS IN C- AND A-AXIS

DIRECT MEASURING SYSTEMS IN C- AND A-AXIS

MILLING HEAD 9

C-axis
(Milling head rotary axis)

Pivoting angle:	550° (+/-275°)
Pivoting torque:	800 Nm
Clamping torque:	1,600 Nm
Revolution:	60°/sec
Axis acceleration:	600°/sec²
Position accuracy:	15“ (0.0041°)
Position deviation:	10“ (0.0027°)

A-axis
(Spindle pivoting axis)

Pivoting angle:	220° (+/-110°)
Pivoting torque:	800 Nm
Clamping torque:	1,600 Nm
Revolution:	60°/sec
Axis acceleration:	600°/sec²
Position accuracy:	15“ (0.0041°)
Position deviation:	10“ (0.0027°)

High-frequency milling spindle 1

Tool holding fixture:	HSK63 A
max. power:	39 kW
max. rpm:	24,000 rpm
max. torque:	32 Nm

High-frequency milling spindle 2

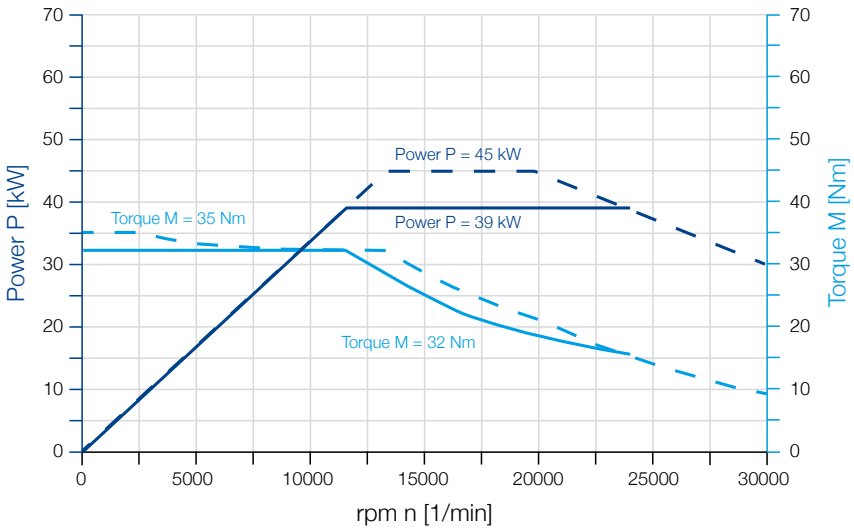
Tool holding fixture:	HSK63 A
max. power:	45 kW
max. rpm:	30,000 rpm
max. torque:	35 Nm

Milling head 9

High-frequency milling spindle
HSK63 A

with 39 kW, 24,000 rpm ——
with 45 kW, 30,000 rpm – – –

Spindle also available with other performance characteristics



MATERIAL

Plastics	Blockmaterials for modelling	Composite materials (CFRP/GRP)	Aluminium	Cast Iron	Steel
⊕	⊕	⊕	⊖	⊖	⊖

TORQUE MOTORS IN C- AND A-AXIS

DIRECT MEASURING SYSTEMS IN C- AND A-AXIS

MILLING HEAD 11

C-axis
(Milling head rotary axis)

Pivoting angle:	550° (+/-275°)
Pivoting torque:	350 Nm
Clamping torque:	840 Nm
Revolution:	300°/sec
Axis acceleration:	600°/sec²
Position accuracy:	15“ (0.0041°)
Position deviation:	10“ (0.0027°)

A-axis
(Spindle pivoting axis)

Pivoting angle:	220° (+/-110°)
Pivoting torque:	350 Nm
Clamping torque:	840 Nm
Revolution:	300°/sec
Axis acceleration:	600°/sec²
Position accuracy:	15“ (0.0041°)
Position deviation:	10“ (0.0027°)

High-frequency milling spindle 1

Tool holding fixture:	HSK63 A
max. power:	20 kW
max. rpm:	22,000 rpm
max. torque:	30 Nm

High-frequency milling spindle 2

Tool holding fixture:	HSK63 A
max. power:	20 kW
max. rpm:	30,000 rpm
max. torque:	21.5 Nm

High-frequency milling spindle 3

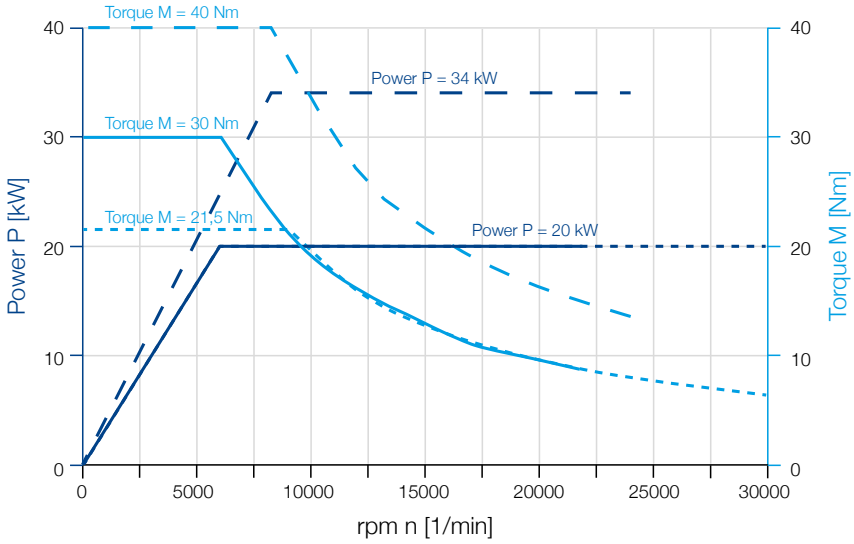
Tool holding fixture:	HSK63 A
max. power:	34 kW
max. rpm:	24,000 rpm
max. torque:	40 Nm

Milling head 11

High-frequency milling spindle
HSK63A

with 20 kW, 22,000 rpm ——————
with 20 kW, 30,000 rpm - - - - - - -
with 34 kW, 24,000 rpm — — —

Spindle also available with other performance characteristics



MATERIAL

Plastics	Blockmaterials for modelling	Composite materials (CFRP/GRP)	Aluminium	Cast Iron	Steel
+	+	+	+	−	−

COMPACT GANTRY MILLING MACHINE

ENDURA® 700LINEAR

COMPACT DESIGN

LARGE MACHINING AREA
SMALL INSTALLATION SURFACE

COMPACT GANTRY MILLING MACHINE ENDURA® 700LINEAR

TECHNICAL DATA

Traverse paths

X-axis:	1,500 / 2,200 / 5,500 mm
Y-axis:	2,000 / 2,800 / 3,500 mm
Z-axis:	1,200 / 1,500 mm

Feed rate

X-axis:	5 - 90,000 mm/min
Y-axis:	5 - 90,000 mm/min
Z-axis:	5 - 90,000 mm/min

Acceleration

up to 5 m/sec^2

Positioning accuracy

in X (P)	0.015 mm
in Y (P)	0.015 mm
in Z (P)	0.015 mm

Positioning scatter band

in X ($P_{s\ Average}$)	0.010 mm
in Y ($P_{s\ Average}$)	0.010 mm
in Z ($P_{s\ Average}$)	0.010 mm

HIGHLIGHTS

- Large machining area
- Small installation surface
- Direct drive in all axes (linear- and torque motors)
- Can be set up without additional foundation

Equipment

- Rigid compact machine with enclosed machine bed.
- Resistant, highly dynamic linear motors in all linear axes (X, Y and Z).
- Direct measuring systems in all axes (X, Y, Z, C and A).
- Safety system and brakes in all linear axes (X, Y and Z).
- Drive units efficiently protected by bellows.
- Easily accessible ground-level milling chamber facilitates loading and unloading with crane or forklift truck.

Additional equipment

- Dynamic Damping
- Automatic tool changer
- Minimum quantity spray dosing system
- Cooling system (wet operation)
- Tool measuring systems
- Workpiece measuring systems
- Chips and dust disposal systems
- Plane cover / Sound insulation enclosure
- Online Service
- and much more

TORQUE MOTORS IN C- AND A-AXIS

DIRECT MEASURING SYSTEMS IN C- AND A-AXIS

MILLING HEAD 4

C-axis
(Milling head rotary axis)

Pivoting angle:	550° (+/-275°)
Pivoting torque:	570 Nm
Clamping torque:	3,000 Nm
Revolution:	360°/sec
Axis acceleration:	1,200°/sec²
Position accuracy:	15“ (0.0041°)
Position deviation:	10“ (0.0027°)

A-axis
(Spindle pivoting axis)

Pivoting angle:	220° (+/-110°)
Pivoting torque:	570 Nm
Clamping torque:	2,000 Nm
Revolution:	360°/sec
Axis acceleration:	1,200°/sec²
Position accuracy:	15“ (0.0041°)
Position deviation:	10“ (0.0027°)

High-frequency milling spindle 1

Tool holding fixture:	HSK63 A
max. power:	25 kW
max. rpm:	20,000 rpm
max. torque:	119 Nm

High-frequency milling spindle 2

Tool holding fixture:	HSK63 A
max. power:	39 kW
max. rpm:	24,000 rpm
max. torque:	32 Nm

High-frequency milling spindle 3

Tool holding fixture:	HSK63 A
max. power:	42 kW
max. rpm:	24,000 rpm
max. torque:	67 Nm

High-frequency milling spindle 4

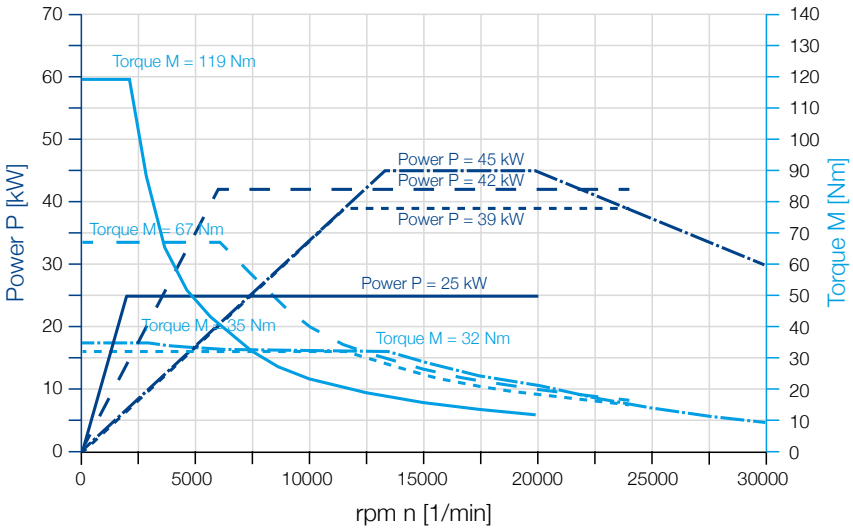
Tool holding fixture:	HSK63 A
max. power:	45 kW
max. rpm:	30,000 rpm
max. torque:	35 Nm

Milling head 4

High-frequency milling spindle
HSK63 A

with 25 kW, 20,000 rpm ——————
with 39 kW, 24,000 rpm - - - - - - -
with 42 kW, 24,000 rpm – – – – –
with 45 kW, 30,000 rpm —·—·—·—

Spindle also available with other performance characteristics



MATERIAL

Plastics	Blockmaterials for modelling	Composite materials (CFRP/GRP)	Aluminium	Cast Iron	Steel
+	+	+	+	+	+

TORQUE MOTORS
IN C- AND A-AXIS

DIRECT MEASURING
SYSTEMS IN C- AND
A-AXIS

MILLING HEAD 11

C-axis (Milling head rotary axis)	
Pivoting angle:	550° (+/-275°)
Pivoting torque:	350 Nm
Clamping torque:	840 Nm
Revolution:	300°/sec
Axis acceleration:	600°/sec²
Position accuracy:	15“ (0.0041°)
Position deviation:	10“ (0.0027°)

A-axis (Spindle pivoting axis)	
Pivoting angle:	220° (+/-110°)
Pivoting torque:	350 Nm
Clamping torque:	840 Nm
Revolution:	300°/sec
Axis acceleration:	600°/sec²
Position accuracy:	15“ (0.0041°)
Position deviation:	10“ (0.0027°)

High-frequency milling spindle 1	
Tool holding fixture:	HSK63 A
max. power:	20 kW
max. rpm:	22,000 rpm
max. torque:	30 Nm

High-frequency milling spindle 2	
Tool holding fixture:	HSK63 A
max. power:	20 kW
max. rpm:	30,000 rpm
max. torque:	21.5 Nm

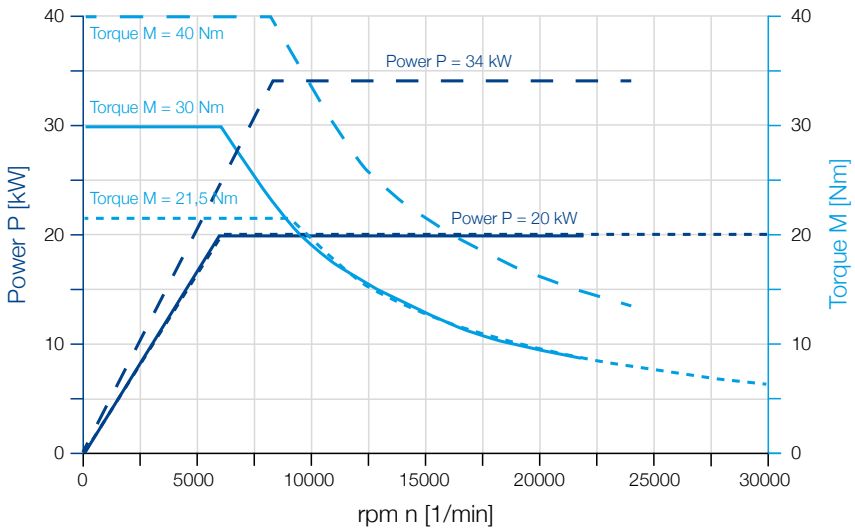
High-frequency milling spindle 3	
Tool holding fixture:	HSK63 A
max. power:	34 kW
max. rpm:	24,000 rpm
max. torque:	40 Nm

Milling head 11

High-frequency milling spindle
HSK63 A

with 20 kW, 22,000 rpm ——
with 20 kW, 30,000 rpm - - - - - -
with 34 kW, 24,000 rpm – – –

Spindle also available with other performance characteristics



MATERIAL

Plastics	Blockmaterials for modelling	Composite materials (CFRP/GRP)	Aluminium	Cast Iron	Steel
⊕	⊕	⊕	⊕	⊖	⊖

HIGH PRECISION WORM GEAR UNITS IN C- AND A-AXIS

DIRECT MEASURING SYSTEMS IN C- AND A-AXIS

MILLING HEAD 14

C-axis
(Milling head rotary axis)

Pivoting angle:	550° (+/-275°)
Pivoting torque:	1,000 Nm
Clamping torque:	2,000 Nm
Revolution:	90°/sec
Axis acceleration:	600°/sec²
Position accuracy:	15“ (0.0041°)
Position deviation:	10“ (0.0027°)

A-axis
(Spindle pivoting axis)

Pivoting angle:	200° (+/-100°)
Pivoting torque:	1,000 Nm
Clamping torque:	2,000 Nm
Revolution:	90°/sec
Axis acceleration:	600°/sec²
Position accuracy:	15“ (0.0041°)
Position deviation:	10“ (0.0027°)

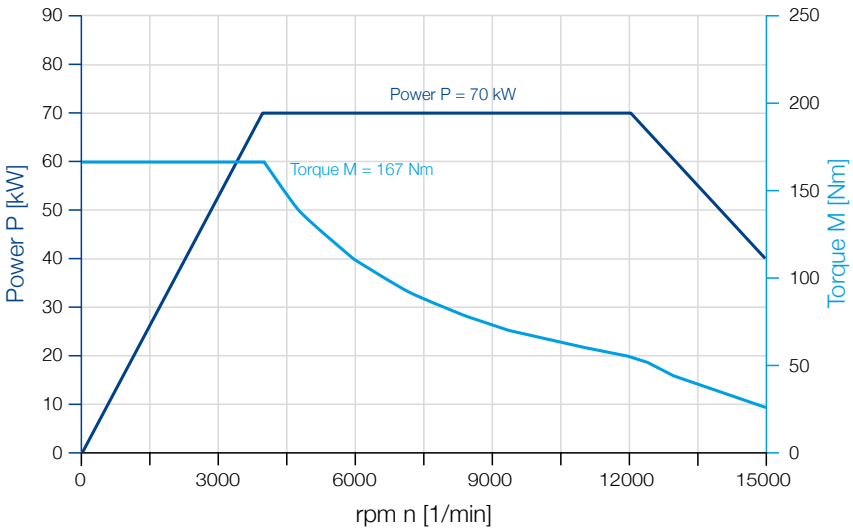
High-frequency milling spindle

Tool holding fixture:	HSK100 A
max. power:	70 kW
max. rpm:	15,000 rpm
max. torque:	167 Nm

Milling head 14

High-frequency milling spindle
HSK100 A

with 70 kW, 15,000 rpm



MATERIAL

Plastics	Blockmaterials for modelling	Composite materials (CFRP/GRP)	Aluminium	Cast Iron	Steel
−	−	−	+	+	+

TORQUE MOTORS IN C- AND A-AXIS

DIRECT MEASURING SYSTEMS IN C- AND A-AXIS

MILLING HEAD 15

C-axis
(Milling head rotary axis)

Pivoting angle:	550° (+/-275°)
Pivoting torque:	560 Nm / 1,139 Nm
Clamping torque:	3,000 Nm
Revolution:	360°/sec
Axis acceleration:	1,200°/sec²
Position accuracy:	15“ (0.0041°)
Position deviation:	10“ (0.0027°)

A-axis
(Spindle pivoting axis)

Pivoting angle:	220° (+/-110°)
Pivoting torque:	550 Nm / 1,100 Nm
Clamping torque:	2,160 Nm
Revolution:	360°/sec
Axis acceleration:	1,200°/sec²
Position accuracy:	15“ (0.0041°)
Position deviation:	10“ (0.0027°)

High-frequency milling spindle 1

Tool holding fixture:	HSK100 A
max. power:	60 kW
max. rpm:	16,000 rpm
max. torque:	160 Nm

High-frequency milling spindle 2

Tool holding fixture:	HSK63 A
max. power:	45 kW
max. rpm:	20,000 rpm
max. torque:	130 Nm

High-frequency milling spindle 3

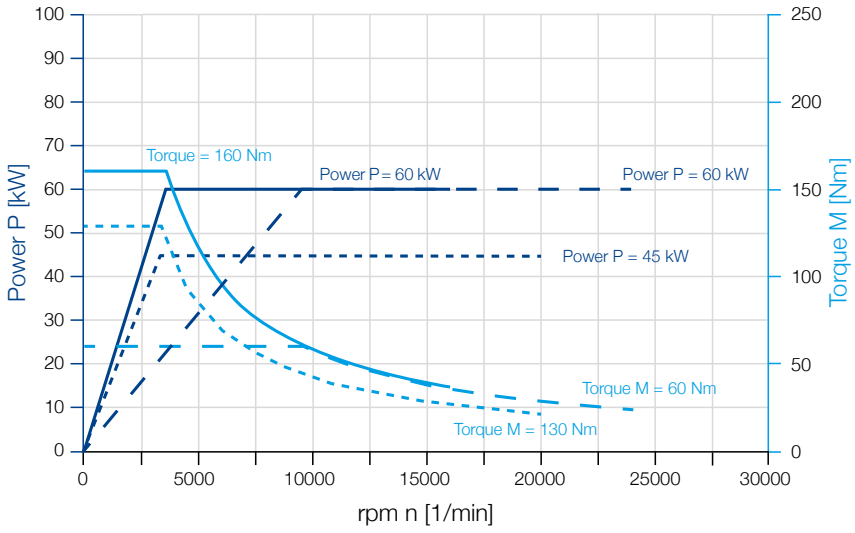
Tool holding fixture:	HSK63 A
max. power:	60 kW
max. rpm:	24,000 rpm
max. torque:	60 Nm

Milling head 15

High-frequency milling spindle
HSK100 A
with 60 kW, 16,000 rpm ——————

High-frequency milling spindle
HSK63 A
with 45 kW, 20,000 rpm - - - - - - -
with 60 kW, 24,000 rpm – – –

Spindle also available with other performance characteristics



MATERIAL

Plastics	Blockmaterials for modelling	Composite materials (CFRP/GRP)	Aluminium	Cast Iron	Steel
+	+	+	+	+	+

GANTRY MILLING MACHINE

ENDURA® 900LINEAR

EXTREMELY RIGID OVER-HEAD GANTRY MACHINE

SPECIALIST FOR UNIVERSAL APPLICATIONS

GANTRY MILLING MACHINE ENDURA® 900LINEAR

TECHNICAL DATA

Traverse paths

X-axis:	3,000 - 30,000 mm
Y-axis:	2,000 - 4,000 mm
Z-axis:	1,200 - 3,000 mm

Feed rate

X-axis:	5 - 65,000 mm/min
Y-axis:	5 - 65,000 mm/min
Z-axis:	5 - 65,000 mm/min

Acceleration

up to 5.0 m/sec²

Positioning accuracy

in X (P)	0.025 mm
in Y (P)	0.020 mm
in Z (P)	0.015 mm

Positioning scatter band

in X ($P_{s\ Average}$)	0.010 mm
in Y ($P_{s\ Average}$)	0.010 mm
in Z ($P_{s\ Average}$)	0.010 mm

HIGHLIGHTS

- Very large enclosed milling chamber
- Efficient dust suction and chip conveyance concepts
- Direct drive in all axes (linear and torque motors)
- Loadable at ground level

Equipment

- Rigid compact machine with enclosed machine bed.
- Resistant, highly dynamic linear motors in all linear axes (X, Y and Z).
- Direct measuring systems in all axes (X, Y, Z, C and A).
- Safety system and brakes in all linear axes (X, Y and Z).
- Drive units efficiently protected by bellows.
- Easily accessible ground-level milling chamber facilitates loading and unloading with crane or forklift truck.

Additional equipment

- Dynamic Damping
- Automatic tool changer
- Minimum quantity spray dosing system
- Cooling system (wet operation)
- Tool measuring systems
- Workpiece measuring systems
- Chips and dust disposal systems
- Plane cover / Sound insulation enclosure
- Online Service
- and much more

TORQUE MOTORS IN C- AND A-AXIS

DIRECT MEASURING SYSTEMS IN C- AND A-AXIS

MILLING HEAD 4

C-axis
(Milling head rotary axis)

Pivoting angle:	550° (+/-275°)
Pivoting torque:	570 Nm
Clamping torque	3,000 Nm
Revolution:	360°/sec
Axis acceleration:	1,200°/sec²
Position accuracy:	15“ (0.0041°)
Position deviation:	10“ (0.0027°)

A-axis
(Spindle pivoting axis)

Pivoting angle:	220° (+/-110°)
Pivoting torque:	570 Nm
Clamping torque:	2,000 Nm
Revolution:	360°/sec
Axis acceleration:	1,200°/sec²
Position accuracy:	15“ (0.0041°)
Position deviation:	10“ (0.0027°)

High-frequency milling spindle 1

Tool holding fixture:	HSK63 A
max. power:	25 kW
max. rpm:	20,000 rpm
max. torque:	119 Nm

High-frequency milling spindle 2

Tool holding fixture:	HSK63 A
max. power:	39 kW
max. rpm:	24,000 rpm
max. torque:	32 Nm

High-frequency milling spindle 3

Tool holding fixture:	HSK63 A
max. power:	42 kW
max. rpm:	24,000 rpm
max. torque:	67 Nm

High-frequency milling spindle 4

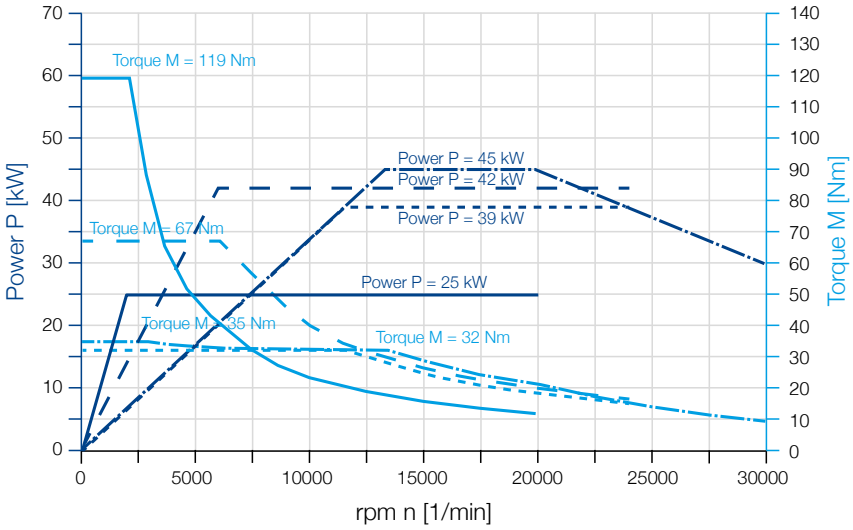
Tool holding fixture:	HSK63 A
max. power:	45 kW
max. rpm:	30,000 rpm
max. torque:	35 Nm

Milling head 4

High-frequency milling spindle
HSK63 A

with 25 kW, 20,000 rpm ——————
with 39 kW, 24,000 rpm - - - - - - -
with 42 kW, 24,000 rpm – – – –
with 45 kW, 30,000 rpm —·—·—·—

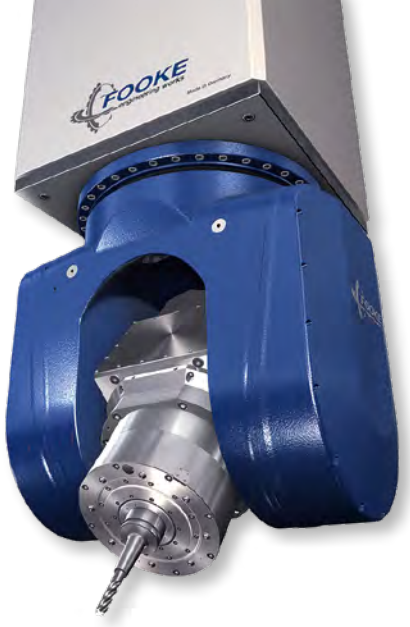
Spindle also available with other performance characteristics



MATERIAL

Plastics	Blockmaterials for modelling	Composite materials (CFRP/GRP)	Aluminium	Cast Iron	Steel
+	+	+	+	+	+

TORQUE MOTORS IN C- AND A-AXIS



DIRECT MEASURING SYSTEMS IN C- AND A-AXIS

MILLING HEAD 8

C-axis
(Milling head rotary axis)

Pivoting angle:	550° (+/-275°)
Pivoting torque:	3,000 Nm
Clamping torque:	6,000 Nm
Revolution:	360°/sec
Axis acceleration:	800°/sec²
Position accuracy:	15“ (0.0041°)
Position deviation:	10“ (0.0027°)

A-axis
(Spindle pivoting axis)

Pivoting angle:	220° (+/-110°)
Pivoting torque:	3,000 Nm
Clamping torque:	6,000 Nm
Revolution:	360°/sec
Axis acceleration:	800°/sec²
Position accuracy:	15“ (0.0041°)
Position deviation:	10“ (0.0027°)

High-frequency milling spindle 1

Tool holding fixture:	HSK100 A
max. power:	50 kW
max. rpm:	20,000 rpm
max. torque:	251 Nm

High-frequency milling spindle 2

Tool holding fixture:	HSK100 A
max. power:	63 kW
max. rpm:	15,000 rpm
max. torque:	300 Nm

High-frequency milling spindle 3

Tool holding fixture:	HSK63 A
max. power:	125 kW
max. rpm:	30,000 rpm
max. torque:	60 Nm

High-frequency milling spindle 4

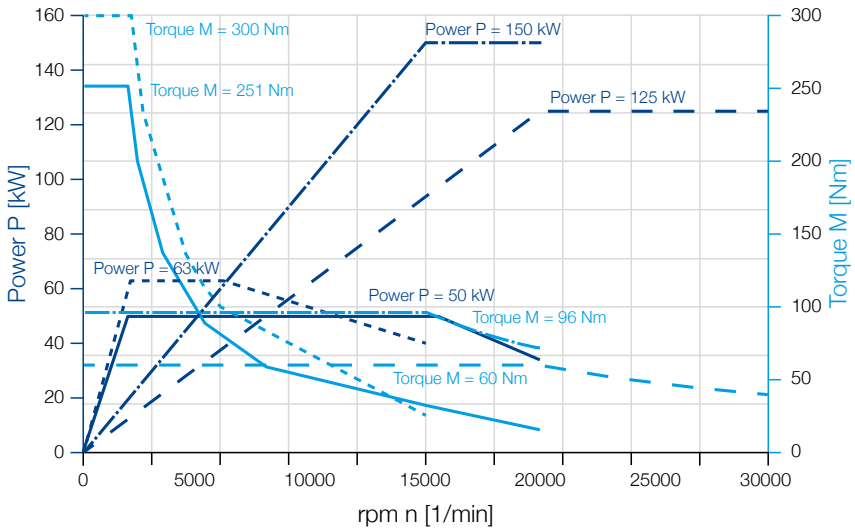
Tool holding fixture:	HSK100 A
max. power:	150 kW
max. rpm:	20,000 rpm
max. torque:	96 Nm

Milling head 8

High-frequency milling spindle
HSK100 A
with 50 kW, 20,000 rpm ———
with 63 kW, 15,000 rpm - - - - - - -
with 150 kW, 20,000 rpm —·—·—

High-frequency milling spindle
HSK63 A
with 125 kW, 30,000 rpm – – –

Spindle also available with other performance characteristics



MATERIAL

Plastics	Blockmaterials for modelling	Composite materials (CFRP/GRP)	Aluminium	Cast Iron	Steel
−	−	−	+	+	+

HIGH PRECISION WORM GEAR UNITS IN C- AND A-AXIS

DIRECT MEASURING SYSTEMS IN C- AND A-AXIS

MILLING HEAD 14

C-axis
(Milling head rotary axis)

Pivoting angle:	550° (+/-275°)
Pivoting torque:	1,000 Nm
Clamping torque:	2,000 Nm
Revolution:	90°/sec
Axis acceleration:	600°/sec²
Position accuracy:	15“ (0.0041°)
Position deviation:	10“ (0.0027°)

A-axis
(Spindle pivoting axis)

Pivoting angle:	200° (+/-100°)
Pivoting torque:	1,000 Nm
Clamping torque:	2,000 Nm
Revolution:	90°/sec
Axis acceleration:	600°/sec²
Position accuracy:	15“ (0.0041°)
Position deviation:	10“ (0.0027°)

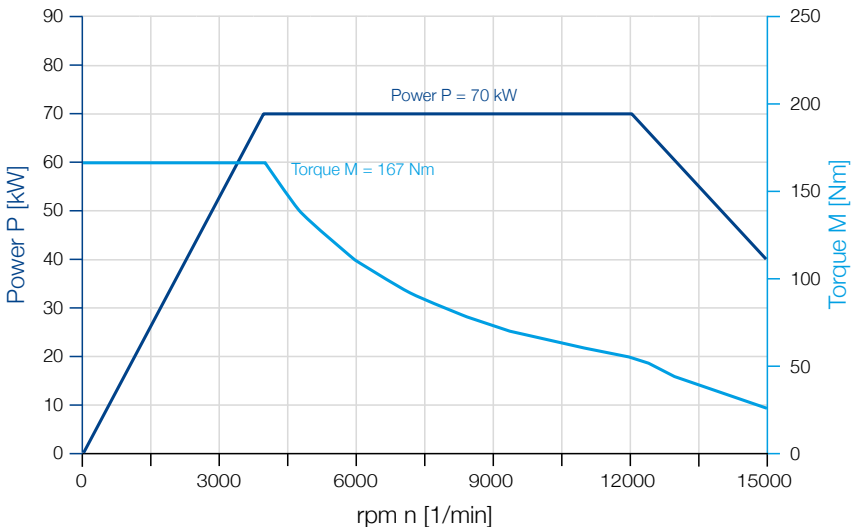
High-frequency milling spindle

Tool holding fixture:	HSK100 A
max. power:	70 kW
max. rpm:	15,000 rpm
max. torque:	167 Nm

Milling head 14

High-frequency milling spindle
HSK100 A

with 70 kW, 15,000 rpm



MATERIAL

Plastics	Blockmaterials for modelling	Composite materials (CFRP/GRP)	Aluminium	Cast Iron	Steel
−	−	−	+	+	+

COMPACT GANTRY MILLING MACHINE

ENDURA® 900LINEAR

CAN BE SET UP WITHOUT
SPECIAL FOUNDATION

LARGE MACHINING AREA
SMALL INSTALLATION SURFACE

COMPACT GANTRY MILLING MACHINE ENDURA® 900LINEAR

TECHNICAL DATA

Traverse paths

X-axis:	2,500 / 4,000 / 5,500 / 9,000 mm
Y-axis:	3,500 mm
Z-axis:	1,500 mm

Feed rate

X-axis:	5 - 65,000 mm/min
Y-axis:	5 - 65,000 mm/min
Z-axis:	5 - 65,000 mm/min

Acceleration

up to 3.5 m/sec^2

Positioning accuracy

in X (P)	0.015 mm
in Y (P)	0.015 mm
in Z (P)	0.015 mm

Positioning scatter band

in X ($P_{s\ Average}$)	0.010 mm
in Y ($P_{s\ Average}$)	0.010 mm
in Z ($P_{s\ Average}$)	0.010 mm

HIGHLIGHTS

- Large machining area
- Small installation surface
- Direct drive in all axes (linear- and torque motors)
- Can be set up without additional foundation

Equipment

- Rigid compact machine with enclosed machine bed.
- Resistant, highly dynamic linear motors in all linear axes (X, Y and Z).
- Direct measuring systems in all axes (X, Y, Z, C and A).
- Safety system and brakes in all linear axes (X, Y and Z).
- Drive units efficiently protected by bellows.
- Easily accessible ground-level milling chamber facilitates loading and unloading with crane or forklift truck.

Additional equipment

- Dynamic Damping
- Automatic tool changer
- Minimum quantity spray dosing system
- Cooling system (wet operation)
- Tool measuring systems
- Workpiece measuring systems
- Chips and dust disposal systems
- Plane cover / Sound insulation enclosure
- Online Service
- and much more

TORQUE MOTORS IN C- AND A-AXIS

DIRECT MEASURING SYSTEMS IN C- AND A-AXIS

MILLING HEAD 8

C-axis
(Milling head rotary axis)

Pivoting angle:	550° (+/-275°)
Pivoting torque:	3,000 Nm
Clamping torque:	6,000 Nm
Revolution:	360°/sec
Axis acceleration:	800°/sec²
Position accuracy:	15“ (0.0041°)
Position deviation:	10“ (0.0027°)

A-axis
(Spindle pivoting axis)

Pivoting angle:	220° (+/-110°)
Pivoting torque:	3,000 Nm
Clamping torque:	6,000 Nm
Revolution:	360°/sec
Axis acceleration:	800°/sec²
Position accuracy:	15“ (0.0041°)
Position deviation:	10“ (0.0027°)

High-frequency milling spindle 1

Tool holding fixture:	HSK100 A
max. power:	50 kW
max. rpm:	20,000 rpm
max. torque:	251 Nm

High-frequency milling spindle 2

Tool holding fixture:	HSK100 A
max. power:	63 kW
max. rpm:	15,000 rpm
max. torque:	300 Nm

High-frequency milling spindle 3

Tool holding fixture:	HSK63 A
max. power:	125 kW
max. rpm:	30,000 rpm
max. torque:	60 Nm

High-frequency milling spindle 4

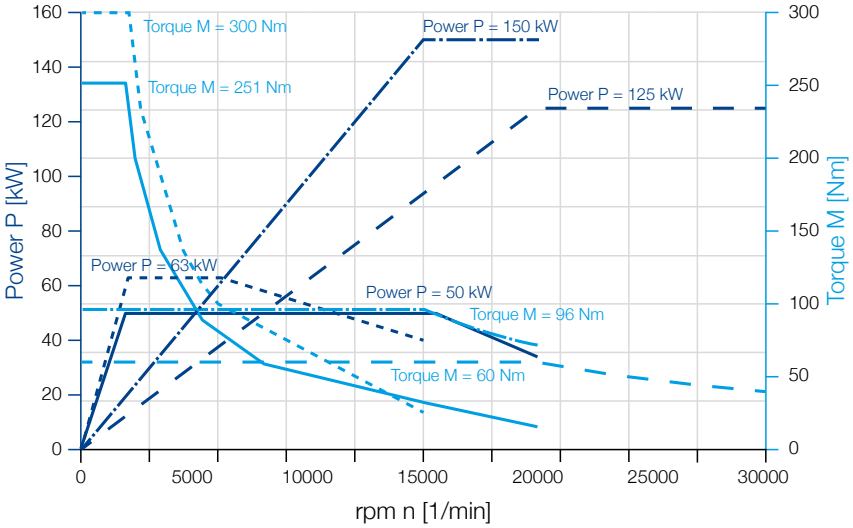
Tool holding fixture:	HSK100 A
max. power:	150 kW
max. rpm:	20,000 rpm
max. torque:	96 Nm

Milling head 8

High-frequency milling spindle HSK100 A
with 50 kW, 20,000 rpm ———
with 63 kW, 15,000 rpm - - - - - - -
with 150 kW, 20,000 rpm —·—·—

High-frequency milling spindle HSK63 A
with 125 kW, 30,000 rpm – – –

Spindle also available with other performance characteristics



MATERIAL

Plastics	Blockmaterials for modelling	Composite materials (CFRP/GRP)	Aluminium	Cast Iron	Steel
⊖	⊖	⊖	⊕	⊕	⊕

TORQUE MOTORS IN C- AND A-AXIS

DIRECT MEASURING SYSTEMS IN C- AND A-AXIS

MILLING HEAD 12

C-axis
(Milling head rotary axis)

Pivoting angle:	550° (+/-275°)
Pivoting torque:	2,500 Nm
Clamping torque:	5,500 Nm
Revolution:	360°/sec
Axis acceleration:	1200°/sec²
Position accuracy:	15“ (0.0041°)
Position deviation:	10“ (0.0027°)

A-axis
(Spindle pivoting axis)

Pivoting angle:	220° (+/-110°)
Pivoting torque:	1,100 Nm
Clamping torque:	6,900 Nm
Revolution:	360°/sec
Axis acceleration:	1200°/sec²
Position accuracy:	15“ (0.0041°)
Position deviation:	10“ (0.0027°)

High-frequency milling spindle 1

Tool holding fixture:	HSK100 A
max. power:	50 kW
max. rpm:	10,000 rpm
max. torque:	400 Nm

High-frequency milling spindle 2

Tool holding fixture:	HSK100 A
max. power:	60 kW
max. rpm:	15,000 rpm
max. torque:	300 Nm

High-frequency milling spindle 3

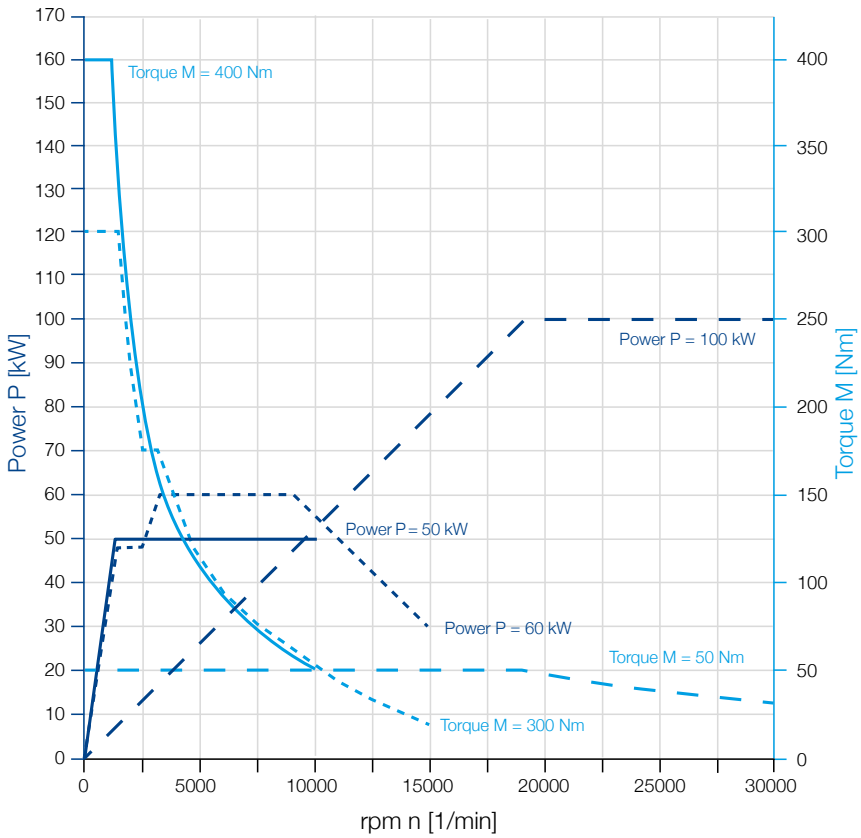
Tool holding fixture:	HSK63 A
max. power:	100 kW
max. rpm:	30,000 rpm
max. torque:	50 Nm

Milling head 12

High-frequency milling spindle HSK100A
with 50 kW, 10,000 rpm ——————
with 60 kW, 15,000 rpm - - - - - - -

High-frequency milling spindle HSK63A
with 100 kW, 30,000 rpm — — —

Spindle also available with other performance characteristics



MATERIAL

Plastics	Blockmaterials for modelling	Composite materials (CFRP/GRP)	Aluminium	Cast Iron	Steel
⊖	⊖	⊖	⊕	⊕	⊕

TORQUE MOTORS
IN C- AND A-AXIS

DIRECT MEASURING
SYSTEMS IN C- AND
A-AXIS

MILLING HEAD 15

C-axis
(Milling head rotary axis)

Pivoting angle:	550° (+/-275°)
Pivoting torque:	560 Nm / 1,139 Nm
Clamping torque:	3,000 Nm
Revolution:	360°/sec
Axis acceleration:	1,200°/sec²
Position accuracy:	15“ (0.0041°)
Position deviation:	10“ (0.0027°)

A-axis
(Spindle pivoting axis)

Pivoting angle:	220° (+/-110°)
Pivoting torque:	550 Nm / 1,100 Nm
Clamping torque:	2,160 Nm
Revolution:	360°/sec
Axis acceleration:	1,200°/sec²
Position accuracy:	15“ (0.0041°)
Position deviation:	10“ (0.0027°)

High-frequency milling spindle 1

Tool holding fixture:	HSK100 A
max. power:	60 kW
max. rpm:	16,000 rpm
max. torque:	160 Nm

High-frequency milling spindle 2

Tool holding fixture:	HSK63 A
max. power:	45 kW
max. rpm:	20,000 rpm
max. torque:	130 Nm

High-frequency milling spindle 3

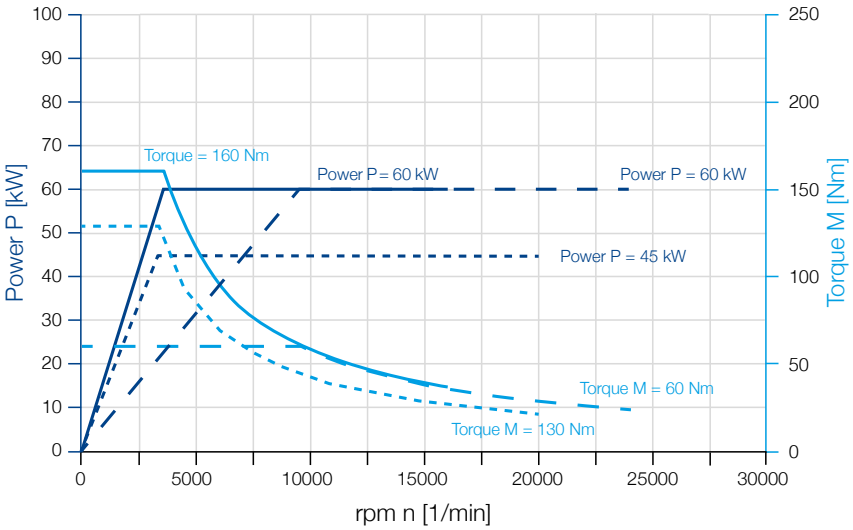
Tool holding fixture:	HSK63 A
max. power:	60 kW
max. rpm:	24,000 rpm
max. torque:	60 Nm

Milling head 15

High-frequency milling spindle
HSK100 A
with 60 kW, 16,000 rpm ———

High-frequency milling spindle
HSK63 A
with 45 kW, 20,000 rpm - - - - - - -
with 60 kW, 24,000 rpm – – –

Spindle also available with other performance characteristics



MATERIAL

Plastics	Blockmaterials for modelling	Composite materials (CFRP/GRP)	Aluminium	Cast Iron	Steel
+	+	+	+	+	+

TRAVELLING COLUMN

ENDURA® 1000LINEAR

TRAVELLING GANTRY MACHINE

SPECIALIST FOR LARGE-VOLUME WORKPIECES

TRAVELLING COLUMN ENDURA® 1000LINEAR

TECHNICAL DATA

Traverse paths

X-axis:	5,000 - 90,000 mm
Y-axis:	2,000 - 5,000 mm
Z-axis:	800 - 2,000 mm

Feed rate

X-axis:	5 - 55,000 mm/min
Y-axis:	5 - 65,000 mm/min
Z-axis:	5 - 65,000 mm/min

Acceleration

up to 5.0 m/sec²

Positioning accuracy

in X (P)	0.080 mm
in Y (P)	0.030 mm
in Z (P)	0.025 mm

Positioning scatter band

in X ($P_{s\ Average}$)	0.040 mm
in Y ($P_{s\ Average}$)	0.015 mm
in Z ($P_{s\ Average}$)	0.010 mm

HIGHLIGHTS

- For large-volume workpieces
- Ergonomic loading
- Travelling operator cabin for optimal process monitoring

Equipment

- Modular and extremely rigid machine with an intelligent hybrid design (steel, welded, cast iron and mineral casting components).
- Resistant, highly powerful linear motor
- Direct measuring systems in all axes (X, Y, Z, C and A).
- Safety system and brakes in all linear axes.
- Linear guiding devices and drive motors are efficiently protected by bellows.

Additional equipment

- Dynamic Damping
- Automatic tool changer
- Cooling system (wet operation)
- Tool measuring system
- Workpiece measuring system
- Chips and dust disposal systems
- Workpiece clamping systems
- Sound insulation enclosure
- Online Service
- and much more

TORQUE MOTORS IN C- AND A-AXIS

DIRECT MEASURING SYSTEMS IN C- AND A-AXIS

MILLING HEAD 4

C-axis
(Milling head rotary axis)

Pivoting angle:	550° (+/-275°)
Pivoting torque:	570 Nm
Clamping torque:	3,000 Nm
Revolution:	360°/sec
Axis acceleration:	1,200°/sec²
Position accuracy:	15“ (0.0041°)
Position deviation:	10“ (0.0027°)

A-axis
(Spindle pivoting axis)

Pivoting angle:	220° (+/-110°)
Pivoting torque:	570 Nm
Clamping torque:	2,000 Nm
Revolution:	360°/sec
Axis acceleration:	1,200°/sec²
Position accuracy:	15“ (0.0041°)
Position deviation:	10“ (0.0027°)

High-frequency milling spindle 1

Tool holding fixture:	HSK63 A
max. power:	25 kW
max. rpm:	20,000 rpm
max. torque:	119 Nm

High-frequency milling spindle 2

Tool holding fixture:	HSK63 A
max. power:	39 kW
max. rpm:	24,000 rpm
max. torque:	32 Nm

High-frequency milling spindle 3

Tool holding fixture:	HSK63 A
max. power:	42 kW
max. rpm:	24,000 rpm
max. torque:	67 Nm

High-frequency milling spindle 4

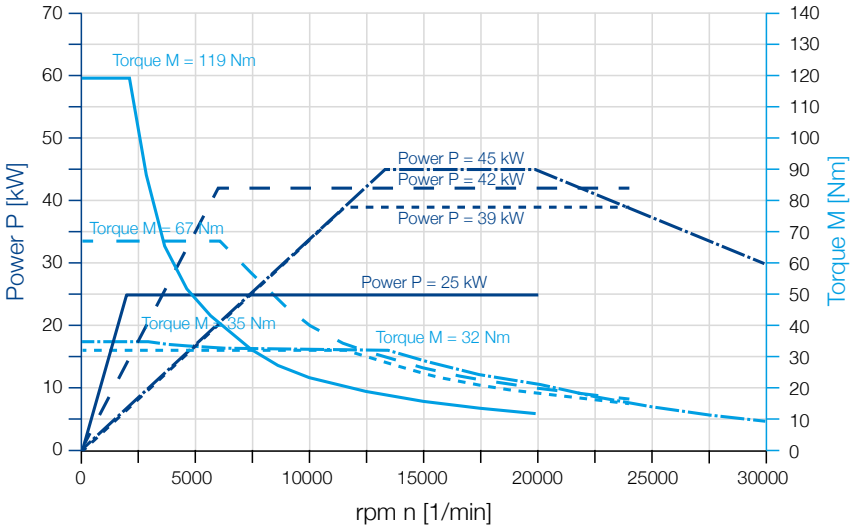
Tool holding fixture:	HSK63 A
max. power:	45 kW
max. rpm:	30,000 rpm
max. torque:	35 Nm

Milling head 4

High-frequency milling spindle
HSK63 A

with 25 kW, 20,000 rpm ———
with 39 kW, 24,000 rpm - - - - - -
with 42 kW, 24,000 rpm – – –
with 45 kW, 30,000 rpm —·—·—

Spindle also available with other performance characteristics



MATERIAL

Plastics	Blockmaterials for modelling	Composite materials (CFRP/GRP)	Aluminium	Cast Iron	Steel
+	+	+	+	+	+

HIGH PRECISION WORM GEAR UNITS IN C- AND A-AXIS

DIRECT MEASURING SYSTEMS IN C- AND A-AXIS

MILLING HEAD 6

C-axis
(Milling head rotary axis)

Pivoting angle:	550° (+/-275°)
Pivoting torque:	1,500 Nm
Clamping torque:	6,000 Nm
Revolution:	70°/sec
Axis acceleration:	800°/sec²
Position accuracy:	15“ (0.0041°)
Position deviation:	10“ (0.0027°)

A-axis
(Spindle pivoting axis)

Pivoting angle:	220°(+125°/-95°)
Pivoting torque:	1,500 Nm
Clamping torque:	6,000 Nm
Revolution:	70°/sec
Axis acceleration:	800°/sec²
Position accuracy:	15“ (0.0041°)
Position deviation:	10“ (0.0027°)

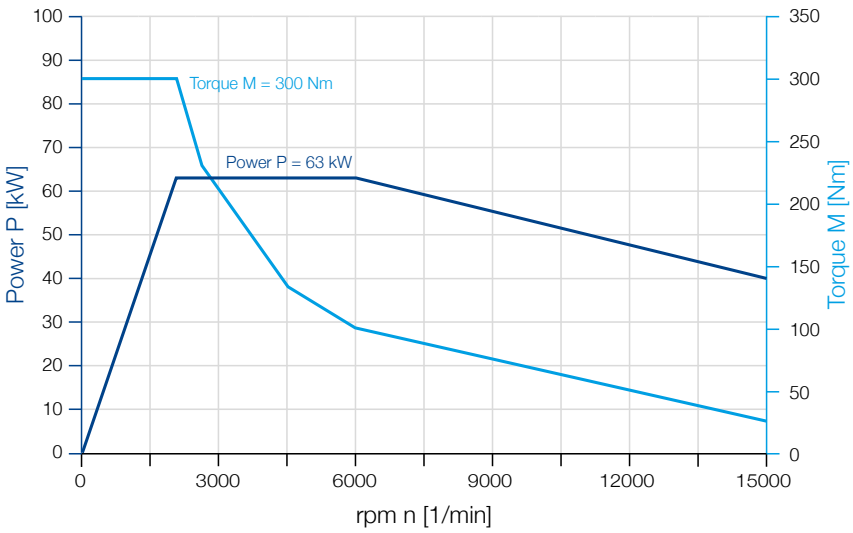
High-frequency milling spindle

Tool holding fixture:	HSK100 A
max. power:	63 kW
max. rpm:	15,000 rpm
max. torque:	300 Nm

Milling head 6

High-frequency milling spindle
HSK100 A

with 63 kW, 15,000 rpm



MATERIAL

Plastics	Blockmaterials for modelling	Composite materials (CFRP/GRP)	Aluminium	Cast Iron	Steel
⊖	⊖	⊖	⊕	⊕	⊕

GANTRY MILLING MACHINE

ENDURA® 7000LINEAR

THERMO-SYMMETRIC DESIGN

SPECIALIST FOR HIGH-PERFORMANCE MACHINING OF HIGH STRENGTH MATERIALS

GANTRY MILLING MACHINE ENDURA® 7000LINEAR

TECHNICAL DATA

Traverse paths

X-axis:	3,000 / 4,500 / 6,000 mm
Y-axis:	3,500 / 4,000 / 4,500 mm
Z-axis:	1,500 mm

Continuously variable feed rates

X-axis:	5 - 65,000 mm/min
Y-axis:	5 - 65,000 mm/min
Z-axis:	5 - 65,000 mm/min

Acceleration

up to 3.0 m/sec²

Positioning accuracy

in X (P)	0.015 mm
in Y (P)	0.015 mm
in Z (P)	0.015 mm

Positioning scatter band

in X ($P_{s\ Average}$)	0.010 mm
in Y ($P_{s\ Average}$)	0.010 mm
in Z ($P_{s\ Average}$)	0.010 mm

HIGHLIGHTS

- High-performance machining of high strength materials
- Compact design
- Large machining chamber
- Small installation area
- Can be set up without additional foundation

Equipment

- Naturally rigid compact machine with enclosed machine bed.
- Resistant, highly dynamic linear motors in all linear axes (X, Y and Z) and torque motors in the rotary axes (C and A).
- Direct measuring systems in all axes (X, Y, Z, C and A).
- Safety systems and brakes in all linear axes (X, Y and Z).
- Drive units efficiently protected by bellows.

Additional equipment

- Dynamic Damping
- Automatic tool changer
- Minimum quantity spray dosing system
- Cooling system (wet operation)
- Tool measuring systems
- Workpiece measuring systems
- Chips and dust disposal systems
- Emulsion mist suction unit
- Plane cover / Sound insulation enclosure
- Online Service
- and much more

TORQUE MOTORS IN C- AND A-AXIS

DIRECT MEASURING SYSTEMS IN C- AND A-AXIS

MILLING HEAD 8

C-axis
(Milling head rotary axis)

Pivoting angle:	550° (+/-275°)
Pivoting torque:	3,000 Nm
Clamping torque:	6,000 Nm
Revolution:	360°/sec
Axis acceleration:	800°/sec²
Position accuracy:	15“ (0.0041°)
Position deviation:	10“ (0.0027°)

A-axis
(Spindle pivoting axis)

Pivoting angle:	220° (+/-110°)
Pivoting torque:	3,000 Nm
Clamping torque:	6,000 Nm
Revolution:	360°/sec
Axis acceleration:	800°/sec²
Position accuracy:	15“ (0.0041°)
Position deviation:	10“ (0.0027°)

High-frequency milling spindle 1

Tool holding fixture:	HSK100 A
max. power:	50 kW
max. rpm:	20,000 rpm
max. torque:	251 Nm

High-frequency milling spindle 2

Tool holding fixture:	HSK100 A
max. power:	63 kW
max. rpm:	15,000 rpm
max. torque:	300 Nm

High-frequency milling spindle 3

Tool holding fixture:	HSK63 A
max. power:	125 kW
max. rpm:	30,000 rpm
max. torque:	60 Nm

High-frequency milling spindle 4

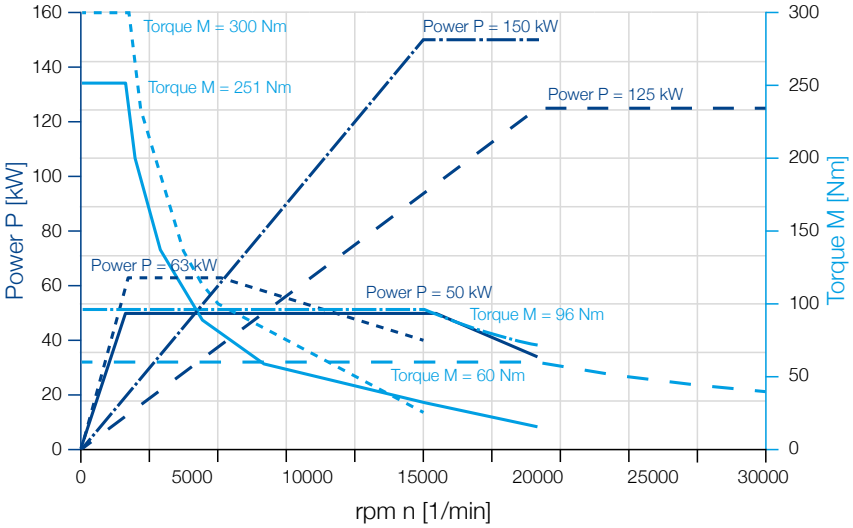
Tool holding fixture:	HSK100 A
max. power:	150 kW
max. rpm:	20,000 rpm
max. torque:	96 Nm

Milling head 8

High-frequency milling spindle
HSK100 A
with 50 kW, 20,000 rpm ———
with 63 kW, 15,000 rpm - - - - - - -
with 150 kW, 20,000 rpm —·—·—

High-frequency milling spindle
HSK63 A
with 125 kW, 30,000 rpm – – –

Spindle also available with other performance characteristics



MATERIAL

Plastics	Blockmaterials for modelling	Composite materials (CFRP/GRP)	Aluminium	Cast Iron	Steel
⊖	⊖	⊖	⊕	⊕	⊕

TORQUE MOTORS IN C- AND A-AXIS

DIRECT MEASURING SYSTEMS IN C- AND A-AXIS

MILLING HEAD 12

C-axis
(Milling head rotary axis)

Pivoting angle:	550° (+/-275°)
Pivoting torque:	2,500 Nm
Clamping torque:	5,500 Nm
Revolution:	360°/sec
Axis acceleration:	1200°/sec²
Position accuracy:	15“ (0.0041°)
Position deviation:	10“ (0.0027°)

A-axis
(Spindle pivoting axis)

Pivoting angle:	220° (+/-110°)
Pivoting torque:	1,100 Nm
Clamping torque:	6,900 Nm
Revolution:	360°/sec
Axis acceleration:	1200°/sec²
Position accuracy:	15“ (0.0041°)
Position deviation:	10“ (0.0027°)

High-frequency milling spindle 1

Tool holding fixture:	HSK100 A
max. power:	50 kW
max. rpm:	10,000 rpm
max. torque:	400 Nm

High-frequency milling spindle 2

Tool holding fixture:	HSK100 A
max. power:	60 kW
max. rpm:	15,000 rpm
max. torque:	300 Nm

High-frequency milling spindle 3

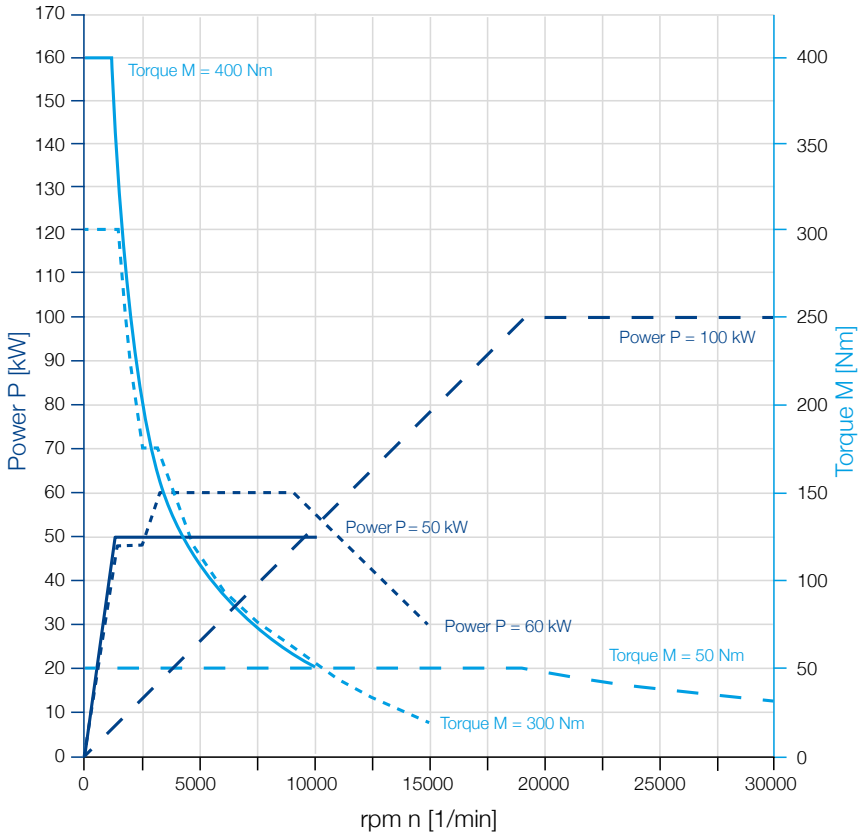
Tool holding fixture:	HSK63 A
max. power:	100 kW
max. rpm:	30,000 rpm
max. torque:	50 Nm

Milling head 12

High-frequency milling spindle HSK100A
with 50 kW, 10,000 rpm ——————
with 60 kW, 15,000 rpm - - - - - - -

High-frequency milling spindle HSK63A
with 100 kW, 30,000 rpm – – –

Spindle also available with other performance characteristics



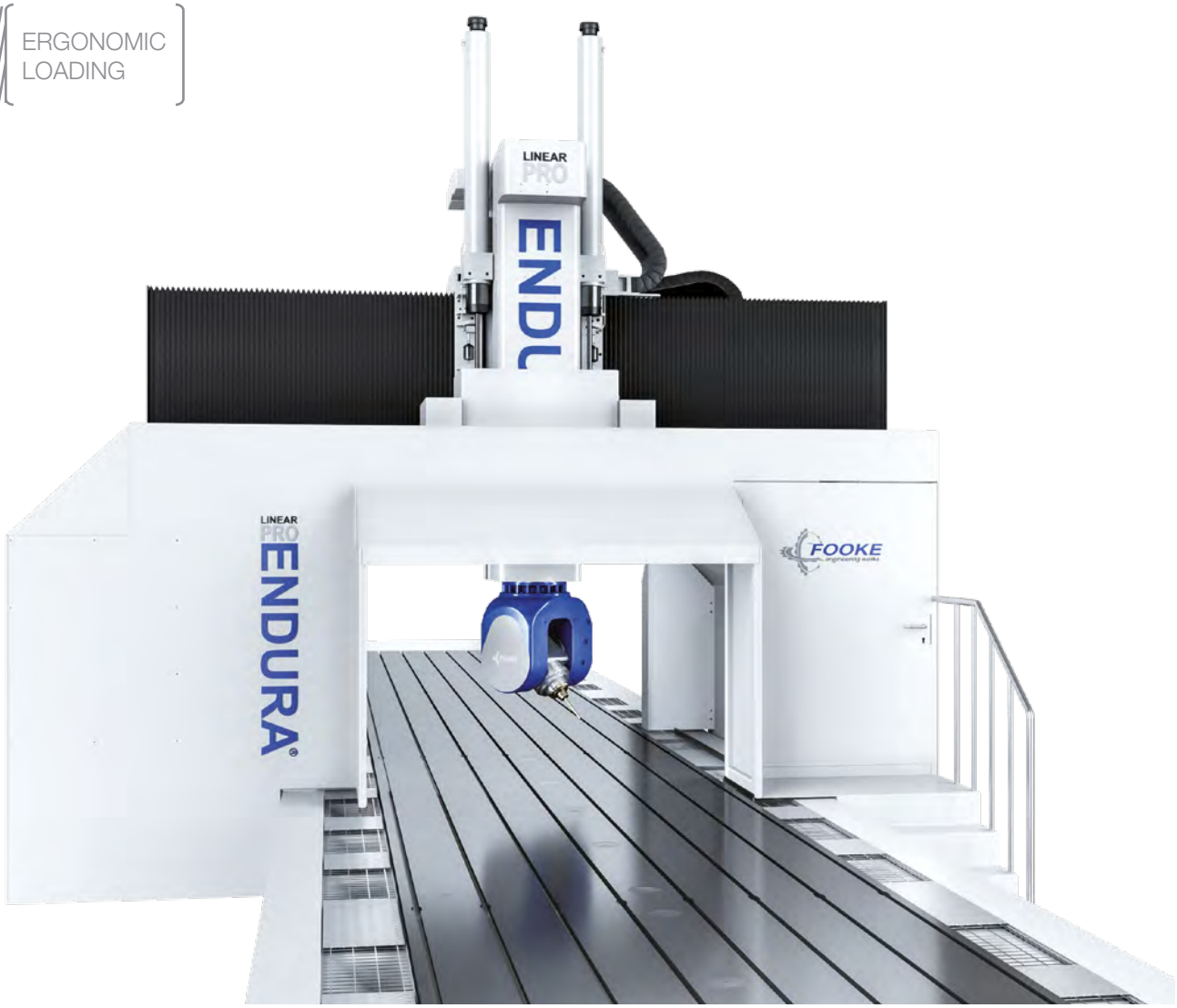
MATERIAL

Plastics	Blockmaterials for modelling	Composite materials (CFRP/GRP)	Aluminium	Cast Iron	Steel
⊖	⊖	⊖	⊕	⊕	⊕

LONG BED MILLING MACHINE

ENDURA® PRO LINEAR

ERGONOMIC LOADING



SPECIALIST FOR HIGH-PERFORMANCE CUTTING OF PROFILE STRUCTURE ELEMENTS

LONG BED MILLING MACHINE ENDURA® PRO LINEAR

TECHNICAL DATA

Traverse paths

X-axis:	6,000 - 60,000 mm
Y-axis:	1,600 / 2,400 / 3,500 mm
Z-axis:	1,000 / 1,500 mm

Feed rate

X-axis:	5 - 55,000 mm/min
Y-axis:	5 - 65,000 mm/min
Z-axis:	5 - 65,000 mm/min

Acceleration

up to 3.5 m/sec²

Positioning accuracy

in X (P)	0.030 mm
in Y (P)	0.020 mm
in Z (P)	0.015 mm

Positioning scatter band

in X ($P_{s\ Average}$)	0.015 mm
in Y ($P_{s\ Average}$)	0.010 mm
in Z ($P_{s\ Average}$)	0.010 mm

HIGHLIGHTS

- Monoblock machine bed construction, modularly expandable
- Highest cutting rates in connection with a stable milling process, especially during extreme roughing: Minimal wear of the milling cutting edge
- Up to 11.0 l / min material removal rate
- Ergonomic loading
- Secondary workpiece machining area for process-parallel loading and unloading

Equipment

- Long-bed milling machine in Gantry construction
- Inherently rigid machine table construction in monoblock design
- Certified impact resistant vertical blinds
- Optimal chip conveyance solution
- Wear free, high dynamic linear motors in Y- and Z-axis and torque motors in C- and A-axis
- Direct measuring systems in Y-, Z-, C- and A-axis

Additional equipment

- Dynamic Damping
- Automatic tool changing systems
- Tool measuring systems
- Workpiece measuring systems
- Dust and chip disposal systems
- Safety systems for free accessibility
- Video monitoring of machine interior
- Various tool clamping applications
- Intelligent workpiece clamping solutions
- Online Service
- and much more

TORQUE MOTORS
IN C- AND A-AXIS

DIRECT MEASURING
SYSTEMS IN C- AND
A-AXIS

MILLING HEAD 4

C-axis
(Milling head rotary axis)

Pivoting angle:	550° (+/-275°)
Pivoting torque:	570 Nm
Clamping torque:	3,000 Nm
Revolution:	360°/sec
Axis acceleration:	1,200°/sec²
Position accuracy:	15“ (0.0041°)
Position deviation:	10“ (0.0027°)

A-axis
(Spindle pivoting axis)

Pivoting angle:	220° (+/-110°)
Pivoting torque:	570 Nm
Clamping torque:	2,000 Nm
Revolution:	360°/sec
Axis acceleration:	1,200°/sec²
Position accuracy:	15“ (0.0041°)
Position deviation:	10“ (0.0027°)

High-frequency milling spindle 1

Tool holding fixture:	HSK63 A
max. power:	42 kW
max. rpm:	24,000 rpm
max. torque:	67 Nm

High-frequency milling spindle 2

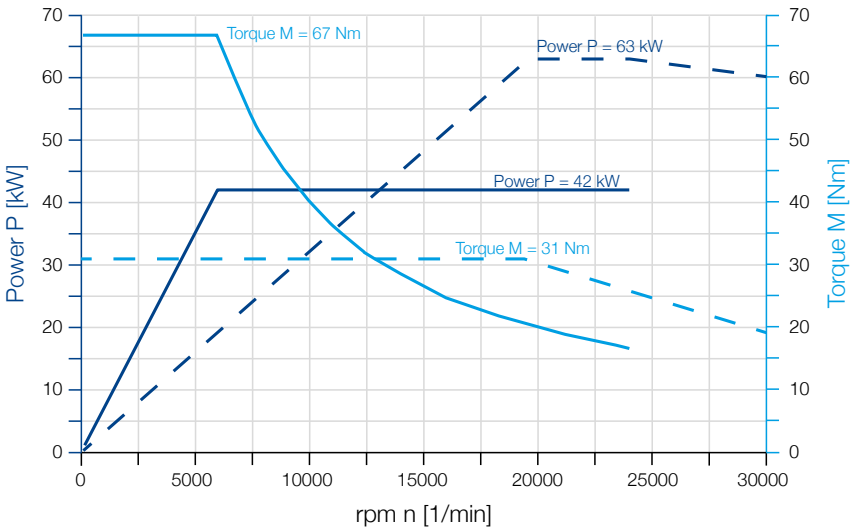
Tool holding fixture:	HSK63 A
max. power:	63 kW
max. rpm:	30,000 rpm
max. torque:	31 Nm

Milling head 4

High-frequency milling spindle
HSK63 A

with 42 kW, 24.000 U/min ——
with 63 kW, 30.000 U/min – – –

Spindle also available with other performance characteristics



MATERIAL

Plastics	Blockmaterials for modelling	Composite materials (CFRP/GRP)	Aluminium	Cast Iron	Steel
⊖	⊖	⊕	⊕	⊖	⊖

TORQUE MOTORS IN C- AND A-AXIS

DIRECT MEASURING SYSTEMS IN C- AND A-AXIS

MILLING HEAD 11

C-axis (Milling head rotary axis)	
Pivoting angle:	550° (+/-275°)
Pivoting torque:	350 Nm
Clamping torque:	840 Nm
Revolution:	300°/sec
Axis acceleration:	600°/sec²
Position accuracy:	15“ (0.0041°)
Position deviation:	10“ (0.0027°)

A-axis (Spindle pivoting axis)	
Pivoting angle:	220° (+/-110°)
Pivoting torque:	350 Nm
Clamping torque:	840 Nm
Revolution:	300°/sec
Axis acceleration:	600°/sec²
Position accuracy:	15“ (0.0041°)
Position deviation:	10“ (0.0027°)

High-frequency milling spindle 1	
Tool holding fixture:	HSK63 A
max. power:	20 kW
max. rpm:	30,000 rpm
max. torque:	21.5 Nm

High-frequency milling spindle 2	
Tool holding fixture:	HSK63 A
max. power:	34 kW
max. rpm:	24,000 rpm
max. torque:	40 Nm

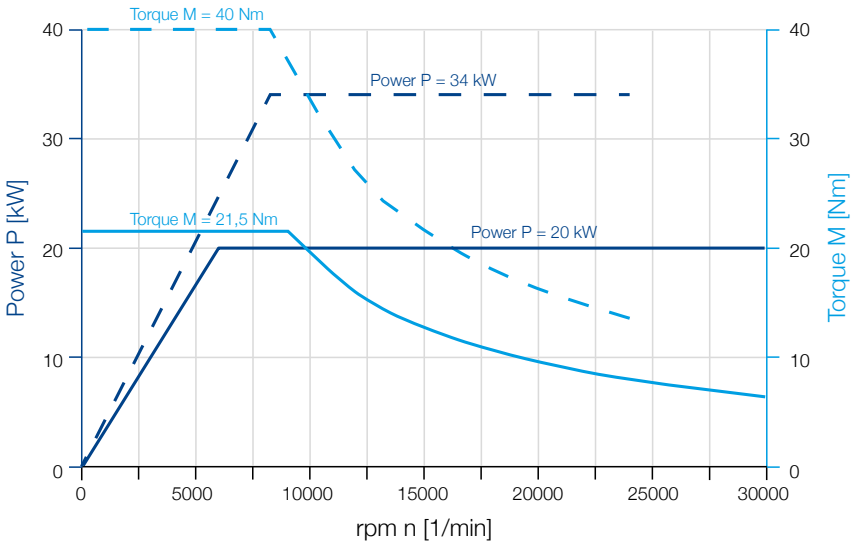
Milling head 11

High-frequency milling spindle HSK63A

with 20 kW, 30,000 rpm ——

with 34 kW, 24,000 rpm – – –

Spindle also available with other performance characteristics



MATERIAL

Plastics	Blockmaterials for modelling	Composite materials (CFRP/GRP)	Aluminium	Cast Iron	Steel
⊖	⊖	⊕	⊕	⊖	⊖

HIGH PRECISION WORM GEAR UNITS IN C- AND A-AXIS

DIRECT MEASURING SYSTEMS IN C- AND A-AXIS

MILLING HEAD 14

C-axis
(Milling head rotary axis)

Pivoting angle:	550° (+/-275°)
Pivoting torque:	1,000 Nm
Clamping torque:	2,000 Nm
Revolution:	90°/sec
Axis acceleration:	600°/sec²
Position accuracy:	15“ (0.0041°)
Position deviation:	10“ (0.0027°)

A-axis
(Spindle pivoting axis)

Pivoting angle:	200° (+/-100°)
Pivoting torque:	1,000 Nm
Clamping torque:	2,000 Nm
Revolution:	90°/sec
Axis acceleration:	600°/sec²
Position accuracy:	15“ (0.0041°)
Position deviation:	10“ (0.0027°)

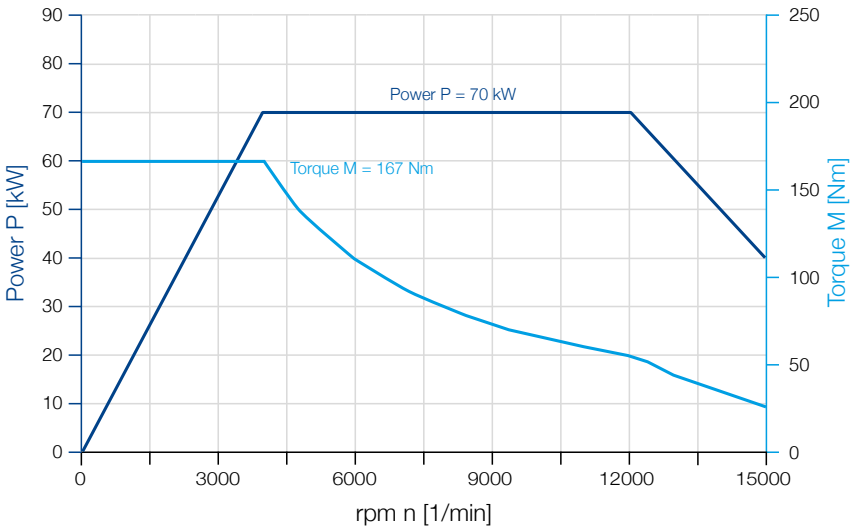
High-frequency milling spindle

Tool holding fixture:	HSK100 A
max. power:	70 kW
max. rpm:	15,000 rpm
max. torque:	167 Nm

Milling head 14

High-frequency milling spindle
HSK100 A

with 70 kW, 15,000 rpm



MATERIAL

Plastics	Blockmaterials for modelling	Composite materials (CFRP/GRP)	Aluminium	Cast Iron	Steel
⊖	⊖	⊖	⊕	⊕	⊕

TORQUE MOTORS IN C- AND A-AXIS

DIRECT MEASURING SYSTEMS IN C- AND A-AXIS

MILLING HEAD 15

C-axis
(Milling head rotary axis)

Pivoting angle:	550° (+/-275°)
Pivoting torque:	560 Nm / 1,139 Nm
Clamping torque:	3,000 Nm
Revolution:	360°/sec
Axis acceleration:	1,200°/sec²
Position accuracy:	15“ (0.0041°)
Position deviation:	10“ (0.0027°)

A-axis
(Spindle pivoting axis)

Pivoting angle:	220° (+/-110°)
Pivoting torque:	550 Nm / 1,100 Nm
Clamping torque:	2,160 Nm
Revolution:	360°/sec
Axis acceleration:	1,200°/sec²
Position accuracy:	15“ (0.0041°)
Position deviation:	10“ (0.0027°)

High-frequency milling spindle 1

Tool holding fixture:	HSK63 A
max. power:	45 kW
max. rpm:	20,000 rpm
max. torque:	130 Nm

High-frequency milling spindle 2

Tool holding fixture:	HSK63 A
max. power:	60 kW
max. rpm:	24,000 rpm
max. torque:	60 Nm

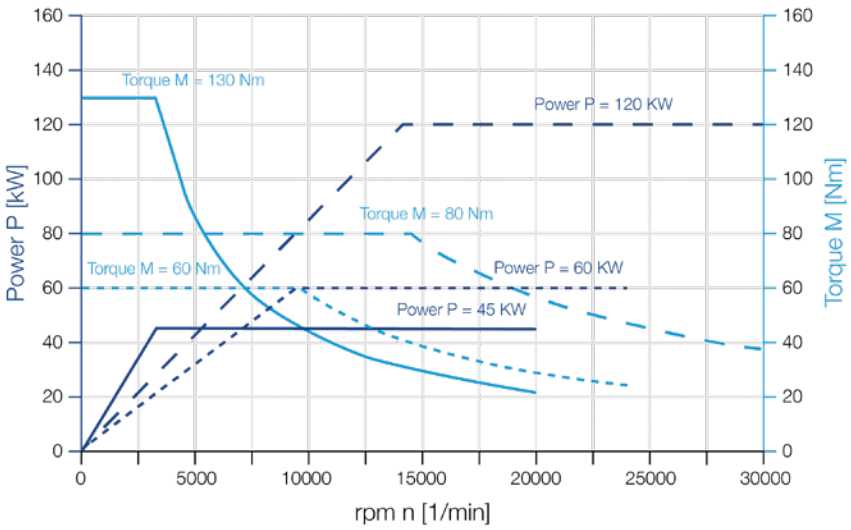
High-frequency milling spindle 3

Tool holding fixture:	HSK63 A
max. power:	120 kW
max. rpm:	30,000 rpm
max. torque:	80 Nm

Milling head 15

High-frequency milling spindle
HSK63 A
with 45 kW, 20,000 rpm ———
with 60 kW, 24,000 rpm - - - - - - -
with 120 kW, 30,000 rpm — — —

Spindle also available with other performance characteristics



MATERIAL

Plastics	Blockmaterials for modelling	Composite materials (CFRP/GRP)	Aluminium	Cast Iron	Steel
⊖	⊖	⊕	⊕	⊕	⊕

PLATE MILLING MACHINE

ENDURA® 800

FOR PRECISION ALUMINIUM
PLATE MANUFACTURE

FACE MILLING MACHINE

PLATE MILLING MACHINE ENDURA® 800

TECHNICAL DATA

Traverse paths

X-axis:	3,000 - 20,000 mm
Y-axis:	fixed
Z-axis:	ca. 400 mm

Feed rate

X-axis:	5 - 60,000 mm/min
Z-axis:	5,000 mm/min

Acceleration

up to 1.0 m/sec²

Setting accuracy

in Z (P) 0.010 mm

Surface roughness (R_a)

0.28 µm - 0.4 µm

Specifications with milling tools

Cutting width:	ae	up to 3,000 mm
Cutting depth:	ap	0.1 – 2.0 mm
Cutter diameter:	D	1,800 mm - 3,100 mm
Pitch:	fz	0.5 mm
Tooth pitch:		15° / 30°
Speed:	n	max. 500 1/min
Cutting speed:	Vc	max. 4,000 m/min

HIGHLIGHTS

- For extensive aluminium workpieces
- Ergonomic loading
- Surface quality < 0.4 µm
- Milling tools up to Ø 3,100 mm

FOOKE – ALL-ROUND SERVICE

We use a professional and flexible FOOKE service concept to meet your requirements and constantly provide you with optimum support.

Machine out of action?

Our competent service staff will handle your error reports in person and implement all necessary measures to solve it.

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FS MAINTENANCE
Repairs/servicing | 24h service | maintenance | inspection | machine cleaning

FS ROTATION
Spindle service | spindle store | spindle sales

FS GEOMETRY
Measuring | aligning

FS MACHINES
General overhaul | retrofitting | appraisal | machine relocation | sales

FS CONNECT
Remote service | telephone service

FS TRAINING
Training | production support | PLC and NC programming

NEAR YOU WORLDWIDE

Head office

GERMANY
FOOKE GmbH
Raiffeisenstr. 18-22
46325 Borken

+49 2861 8009-01
+49 2861 8009-800
info@fooke.de
www.fooke.de

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08/2022