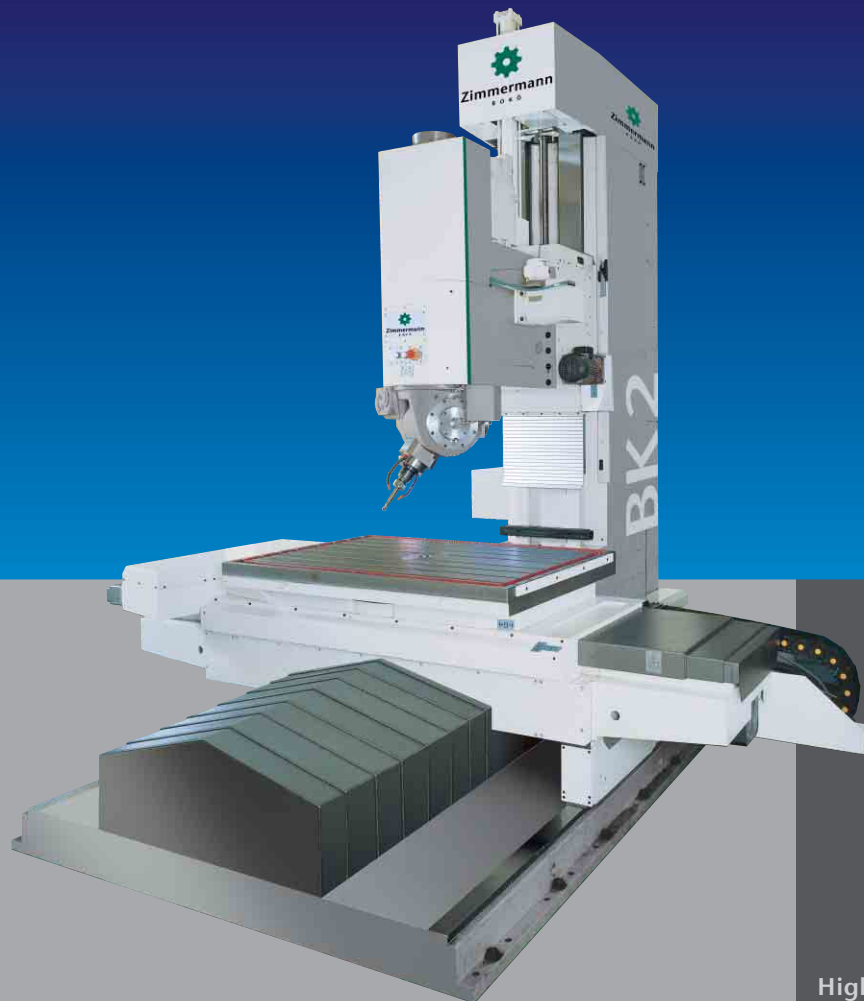




Zimmermann
B O K Ö

CNC
Bed Type Milling Machines

BK4.3.2

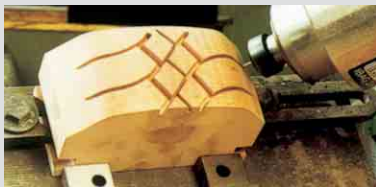


High Performance
Milling Technology

BK 4 · 3 · 2

The Machine Concept

Modern jig, pattern and toolmaking requires highly adaptable machine tools which are capable of cost-effectively machining all kinds of materials, to the highest degree of precision.



The Zimmermann-Bokö BK bed-type milling machine range is a proven vertical milling machine concept with 3 to 6 CNC axes. It is based on a single column bed-type design with an optional rotary table. This design permits efficient machining of highly complex components in a single setup.

The modular machine concept includes a variety of milling heads and spindles with a choice of control systems from different manufacturers together with a wide range of optional equipment.

Impressively high precision and superb surface finish in most common materials is achieved through the highly developed overall design and the rigidity of the machine castings.

The three models – BK 2, BK 3 and BK 4 – offer a wide choice of different working areas. A particular feature is the good reach of the milling head, permitting a generous working range in the Y-axis. In addition individually customised versions are also possible.

The BK machine range is used principally for jig and toolmaking, in the automobile and aerospace industries – in fact wherever specially robust and at the same time accurate and fast machines are required for the most demanding machining tasks.

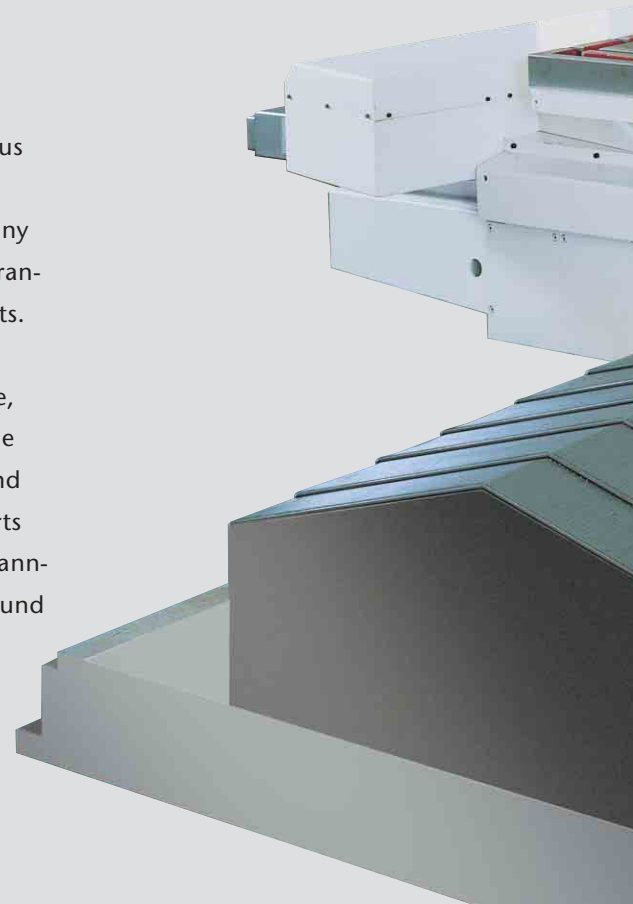
Many hundreds of the previous WF and VH models are in use worldwide and even after many years of hard service still guarantee excellent machining results.

High value retention, long life, cost effectiveness, dependable Zimmermann-Bokö service and ready availability of spare parts all add up to make Zimmermann-Bokö BK range machines a sound investment.

2-axis fork head (VH) with integrated milling spindle.

NC controlled, rotary machine table (optional).

Cross table with X- and Y-axis drive systems.





Z-axis drive via servomotor, toothed belt and vertical ball screw drive.

Hydraulic cylinder for weight compensation in the Z-axis (BK 4 and BK 3).

Flat guideway in the Z-axis permitting a good vibration reduction even with large working radius of spindle head.

Z-axis ball screw drive.

VH milling head with integrated drive, positioning and measuring systems.

Servomotor for driving the C-axis.

Fixed, single vertical column with guides and drive for the vertical slide.

Type BK2 with 2-axis VH 2 fork head.

BK 4 · 3 · 2 Milling Units

Vertical milling head (B-axis)

The milling head can be continuously swivelled through 90 ° in both directions. Swivelling is performed by a worm drive with hand wheel. The setting angle can be read via a vernier scale or using an optional digital display.

Instead of the standard gear spindle head, the milling head can alternatively be equipped with a high-frequency spindle.

The milling head can also be supplied with an additional NC controlled B-axis. The spindle can be automatically swivelled and positioned within a range of $\pm 90^\circ$. Tool length compensation is performed automatically. The B-axis is laid out as an additional simultaneous axis and – together with the optional rotary NC table – permits full 5-side machining.



Vertical milling head with $\pm 90^\circ$ continuous swivel B-axis.



VH 2 fork head with unlimited rotation in the C-axis.

An optional mechanical W-axis offers the possibility to advance in the tool direction without control interpolation independent of the B-axis position.

2-axis fork head (VH 2)

The advanced VH milling head is the result of over 14 years experience in the development and manufacture of fork heads for 5-axis simultaneous machining. This robust, accurate and versatile milling head opens up the whole range of machining possibilities offered by the BK machine.

The milling spindle is mounted in a fork head which can be swivelled $+95^\circ/-45^\circ$ to the vertical position by numerical control (A-axis). The bush contact connection used in the C-axis permits unlimited rotation in both directions. Thus the milling cutter can remain constantly engaged – retraction and restarting is not necessary. Perfect surface finishes are the result and non-productive time is greatly reduced.

Both rotational axes are full simultaneous NC-axes.

The generously dimensioned overall size and the design of the axial drives using pre-loaded worm drives assure accurate positioning in the A- and C-axis via closed-loop control.

The entire drive head unit is liquid-cooled and laid out to cope with heavy-duty rough machining of steel or castings.

2-axis fork head (VH 4)

Compared to the smaller VH 2 milling head, the top model VH 4 has a swivel range of $\pm 100^\circ$ in the A-axis.

In addition, the A-axis can be hydraulically clamped for heavy-duty roughing operations.

As well as the internal coolant supply in the milling tool, when the spindle is running it is also possible to switch to external coolant or compressed-air cooling (in the 25 kW version).

The two milling heads VH 2 and VH 4 are available in three different power ranges.



Milling spindle drive motor.

Bush contact connection (permitting full rotation of the C-axis).

C-axis measuring unit.

Milling drive measuring unit.

Spindle head.

Milling drive force transmitted by 3-part drive belts.

Servomotor for positioning the milling head in the C-axis.

C-axis backlash-free precision drive.

C-axis worm drive gear.

C-axis worm gear, fixed to the milling head.

A-axis worm drive gear.

Servomotor for positioning the milling head in the A-axis.

A-axis backlash-free precision drive.

A-axis worm gear, fixed to the fork head.

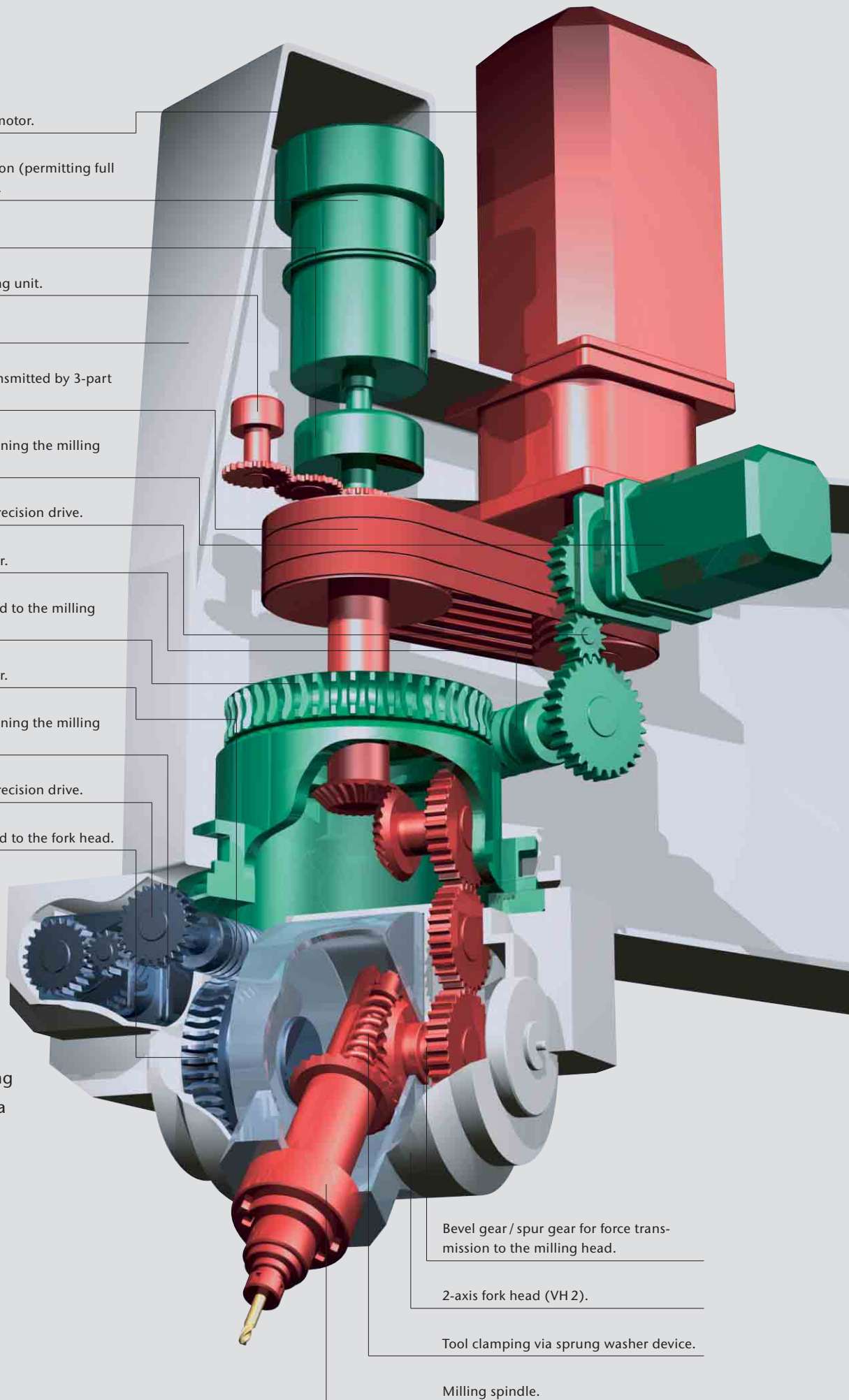
The optional rotary NC table extends the milling head concept by a sixth axis.

Bevel gear / spur gear for force transmission to the milling head.

2-axis fork head (VH 2).

Tool clamping via sprung washer device.

Milling spindle.



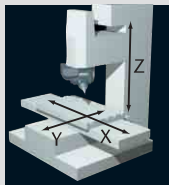
BK 4 · 3 · 2

Technical Description

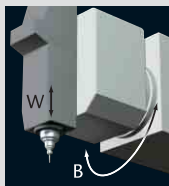
The BK range is a modular machine concept where the different working areas, control systems and milling heads can be combined at will according to requirements.

Drive Axes

BK milling machines can be supplied with up to 6 CNC controlled axes:



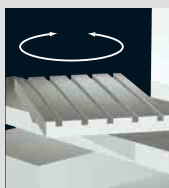
BK machines have three powered linear axes (X, Y, Z).



Vertical milling head with automatic positioning B-axis (separate or simultaneous positioning) and optional W-axis.



2-axis fork head (VH) with simultaneously controlled A- and C-axis.



Optional rotary table adds a further NC axis to the machine.

Construction

The machine has a basic single column design with an optional rotational clamping table. The machine bed, column, spindle head, cross slides and the machining table are all made of grey cast iron. This design assures the high stability and rigidity of the machine, thus making it ideally

suitable for heavy-duty machining of all kinds of materials.

Axial Drives

Independent of the control system used, all axes are equipped with Siemens »Simodrive« drives. The Z-axis of BK 4/BK 3 is equipped with a hydraulic cylinder to compensate the weight of the Z-slide and the milling head.

The linear guides of the X- and Y-axes as well as the flat guides of



the Z-axis are all designed as pre-loaded roller rotation guides. The feed movement of the axes is by means of ball screws with preloaded double nuts. The linear guides, drives and measuring systems of the lower X- and Y-axis are protected against dirt and swarf by telescopic covers.

Measuring Systems

The linear X, Y and Z axes are equipped with Heidenhain direct glass-scale measuring systems. These are protected from dirt by a barrier of pressurised air (Compressed air must be made available).

Optional Equipment

- Coolant unit
- Minimal quantity lubrication
- Protective cover
- Tool changer for 12, 24 or 32 tools
- Chip removal equipment
- Measuring probe

Ideal five-side machining of complex components.



- Tool measuring
- Others

Control Systems

BK machines can basically be equipped with a number of different types and makes of control systems.

Modern controllers offer functions such as »Look Ahead«, jolt limiting, spline interpolation as well as 5- (or 6-) axis control. Optional routines for measuring and digitizing are also available. As a rule, BK machines are usually supplied with Siemens, Heidenhain or Fidia controllers but other systems can be fitted on request.



BK machines can be supplied with controllers of different types and makes.

The optional rotary table equips the machine with a sixth axis.



BK 4 · 3 · 2

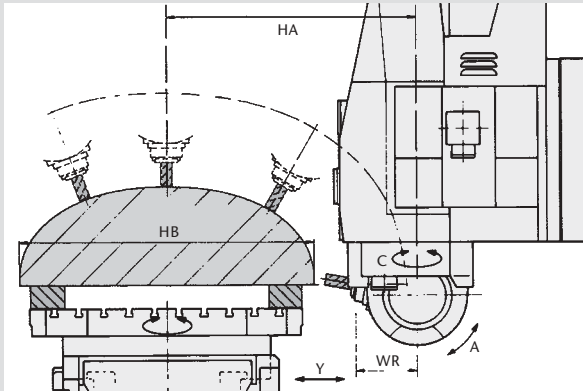
Technical Data

Technical data	BK 4	BK 3	BK 2
Work area with vertical head			
X-axis	2 400 mm	1 800 mm	1 500 mm
Y-axis	1 200 mm	1 200 mm	1 000 mm
Z-axis	1 360 mm*	1 360 mm*	975 mm
B-axis	± 90°	± 90°	± 90°
W-axis (optional)	300 mm	300 mm	300 mm
Rotary table axis	±	±	±
Work area fork head			
X-axis	2 400 mm	1 800 mm	1 500 mm
Y-axis	1 700 mm	1 700 mm	1 500 mm
Z-axis	1 200 mm*	1 200 mm*	975 mm
A-axis (25 kW spindle)	± 100°	± 100°	
A-axis (14 kW spindle)	+95°/–45°	+95°/–45°	+95°/–45°
C-axis	±	±	±
Rotary table axis	±	±	±
Clamping table – fixed			
Length	2 950 mm	2 350 mm	1 900 mm
Width	1 200 mm	1 200 mm	1 000 mm
T-slot	18 ^{H7}	18 ^{H7}	18 ^{H7}
Max. loading	5 000 kg	4 000 kg	3 500 kg
Clamping table – NC rotary table			
Length	1 800 mm	1 800 mm	1 500 mm
Width	1 200 mm	1 200 mm	1 000 mm
T-slot	18 ^{H7}	18 ^{H7}	
Max. loading	5 000 kg	4 000 kg	3 500 kg
Feed drives			
Max. linear axis feedrates (depending on contour)	20 000 mm/min.	20 000 mm/min.	20 000 mm/min.
Rotational speed of the rotary axes	1 440°/min.	1 440°/min.	1 440°/min.
Accuracy	Axis		
to VDI / DGQ 3441			
Positional accuracy	X, Y, Z	P = 0,02 mm	P = 0,02 mm
Repeatability	X, Y, Z	Ps = 0,01 mm	Ps = 0,01 mm
Positional accuracy	A, C	P = 10" = 0,00277°	P = 10" = 0,00277°
Repeatability	A, C	Ps = 8" = 0,00222°	Ps = 8" = 0,00222°
Dimensions			
Length without control cabinet	approx. 6 000 mm	approx. 5 000 mm	approx. 5 000 mm
Width without control cabinet	approx. 5 000 mm	approx. 5 000 mm	approx. 5 000 mm
Height without control cabinet	approx. 4 700 mm	approx. 4 700 mm	approx. 3 600 mm
Weight			
Total weight with vertical head	approx. 21 500 kg	approx. 20 000 kg	approx. 11 000 kg
Total weight with fork head VH	approx. 22 500 kg	approx. 21 000 kg	approx. 12 000 kg

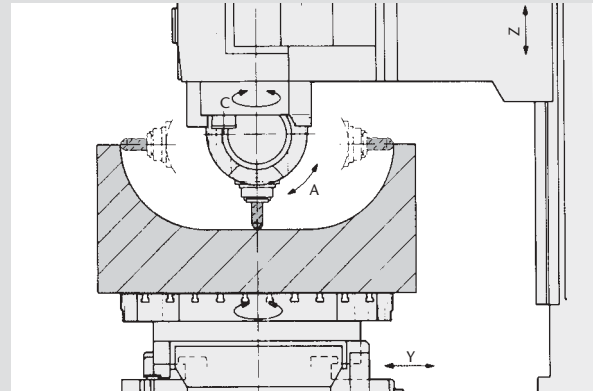
*other options possible.

Subject to technical changes.

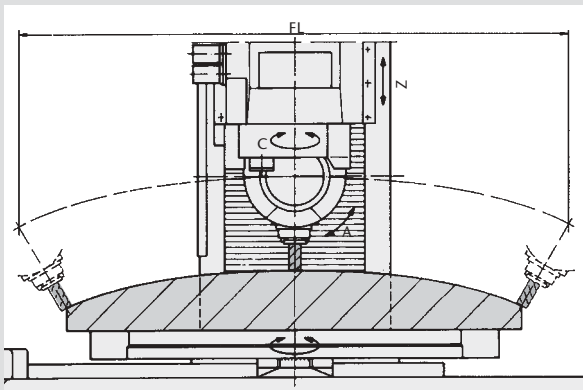
Work Area with 2-Axis Fork Head VH



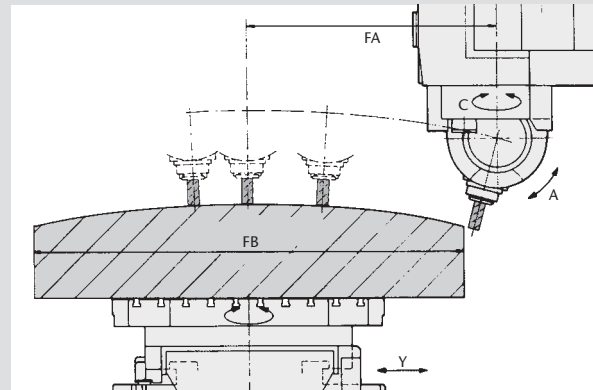
Complete machining in a single setup. Length of the milling cutter 200 mm. After the first half of the part has been machined it is turned through 180° by the NC control for the second half of the machining operation.



Milling of concave components in a single setup, with or without table movement.



With lightly curved workpieces, either convex or concave, machining can be done with the milling cutter normal to the surface over the entire length of the machine.



With flat shapes, the integrated rotary table together with the tool normal to the surface makes it possible to machine very large workpieces.

Workpiece sizes	BK 4 (with VH 4)	BK 3 (with VH 4)	BK 2 (with VH 2)
High version			
HB Part width	1 260 mm	1 260 mm	1 100 mm
HA Part distance	1 100 mm	1 100 mm	1 000 mm
WR Tool radius	270 mm	270 mm	250 mm
Flat version			
FL Part length	2 400 mm	1 800 mm	1 500 mm
FB Part width	2 200 mm	2 200 mm	2 000 mm
FA Part distance	1 100 mm	1 100 mm	1 000 mm

BK 4 · 3 · 2

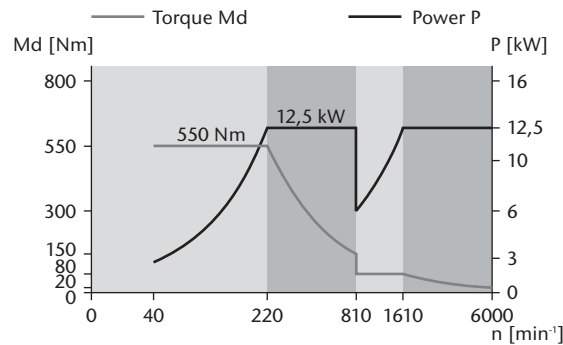
Milling Heads

Vertical milling head (12,5 kW)

with step wheel gears,
automatic gear changing.

Axis drives:

- B-axis manual or NC
- B-axis and W-axis NC



Technical data

Max. spindle power	12,5 kW
Max. spindle speed	6 000 min ⁻¹
Max. torque	550 Nm
Switched on time	60 %
Constant power from	220 min ⁻¹
Constant torque to	220 min ⁻¹
Tool holder	SK 50
Tool clamping	spring
Tool release	hydraulic
Swivel axis – spindle nose approx.	275 mm
Internal / external coolant supply	optional

Available for

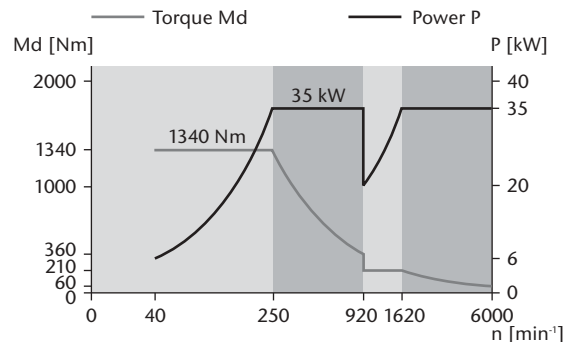
BK 4
BK 3
BK 2

Vertical milling head (35 kW)

with step wheel gears,
automatic gear changing.

Axis drives:

- B-axis manual or NC
- B-axis and W-axis NC



Technical data

Max. spindle power	35 kW
Max. spindle speed	6 000 min ⁻¹
Max. torque	1 340 Nm
Switched on time	60 %
Constant power from	250 min ⁻¹
Constant torque to	250 min ⁻¹
Tool holder	SK 50
Tool clamping	spring
Tool release	hydraulic
Swivel axis – spindle nose approx.	440 mm
Internal / external coolant supply	optional

Available for

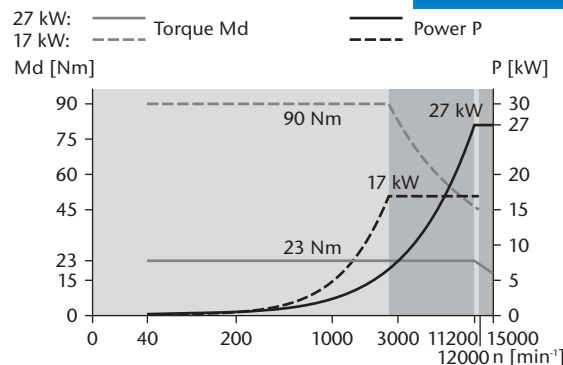
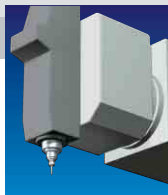
BK 4
BK 3

Vertical milling head (27 kW)

with motor spindle.

Axis drives:

- B-axis manual or NC
- B-axis and W-axis NC



Technical data

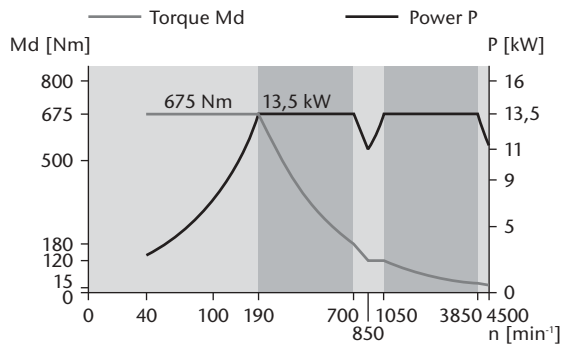
Max. spindle power	17 kW	27 kW
Max. spindle speed	12 000 min ⁻¹	15 000 min ⁻¹
Max. torque	90 Nm	23 Nm
Switched on time	60 %	60 %
Constant power from	1 800 min ⁻¹	11 200 min ⁻¹
Constant torque to	1 800 min ⁻¹	11 200 min ⁻¹
Tool holder	SK 50	HSK 63 A
Tool clamping	spring	spring
Tool release	hydraulic	hydraulic
Swivel axis – spindle nose approx.	440/275 mm	440/275 mm
Internal / external coolant supply	optional	optional

Available for

BK 4	BK 4
BK 3	BK 3
BK 2	BK 2

2-axis fork head VH 2 (13,5 kW)

with step wheel gears,
automatic gear changing.
Axis drives:
■ A-axis and C-axis NC



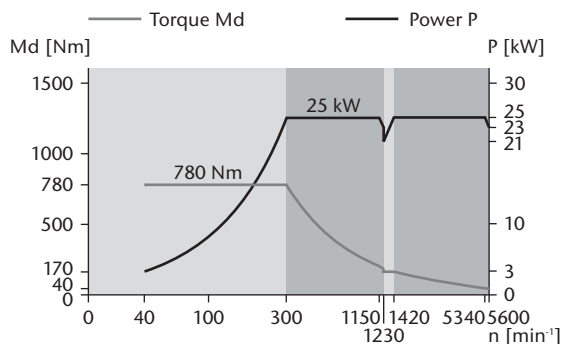
Technical data

Max. spindle power	13,5 kW
Max. spindle speed	4 500 min^{-1}
Max. torque	675 Nm
Switched on time	60 %
Constant power from	190 min^{-1}
Constant torque to	190 min^{-1}
A-axis torque approx.	5 000 Nm
C-axis torque approx.	5 000 Nm
Tool holder	SK 50
Tool clamping	spring
Tool release	hydraulic
Swivel axis – spindle nose approx.	250 mm
Internal / external coolant supply	optional

Available for	BK 4
	BK 3
	BK 2

2-axis fork head VH 4 (25 kW)

with step wheel gears,
automatic gear changing.
Axis drives:
■ A-axis and C-axis NC



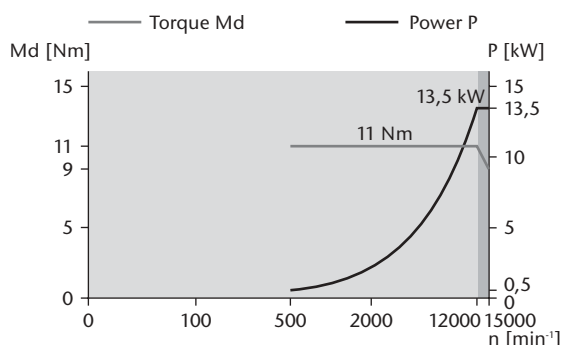
Technical data

Max. spindle power	25 kW
Max. spindle speed	5 600 min^{-1}
Max. torque	780 Nm
Switched on time	60 %
Constant power from	300 min^{-1}
Constant torque to	300 min^{-1}
A-axis torque approx.	8 000 Nm
C-axis torque approx.	8 000 Nm
Tool holder	SK 50
Tool clamping	spring
Tool release	hydraulic
Swivel axis – spindle nose approx.	270 mm
Internal / external coolant supply	optional

Available for	BK 4
	BK 3

2-axis fork head VH 4 (13,5 kW)

with motor spindle.
Axis drives:
■ A-axis and C-axis NC



Technical data

Max. spindle power	13,5 kW
Max. spindle speed	15 000 min^{-1}
Max. torque	11 Nm
Switched on time	60 %
Constant power from	12 500 min^{-1}
Constant torque to	12 500 min^{-1}
A-axis torque approx.	8 000 Nm
C-axis torque approx.	8 000 Nm
Tool holder	HSK 63 A
Tool clamping	spring
Tool release	hydraulic
Swivel axis – spindle nose approx.	250 mm
Internal / external coolant supply	optional

Available for	BK 4
	BK 3



High Performance
Milling Technology



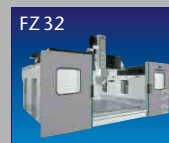
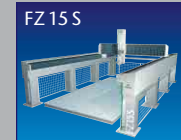
Styrofoam
Milling Technology



The long-term experience of Zimmermann-Bokö in the development and production of CNC milling machines is based on the large number of machines installed worldwide.

Specialisation and a high innovation pace lead to the technical head start.

A diversation and finely classified programme of numerous machine types enable the choice of the perfect machine for every targeted application area.



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