



Zimmermann
B O K Ö

CNC Portal Milling Machine

FZ 40



High Performance
Milling Technology

FZ 40

The machine concept

Highly sophisticated CNC milling machines are required in the modern tool, mould and model making industry.

The characteristic features of most workpieces to be processed in tools, forms and models include large dimensions, increasingly complex free form surfaces and highest quality when it comes to surfaces and precision. It is rare for the same part to occur twice, and the number of variants is constantly growing.

How can these challenges be met?

FZ 40 in gantry design perfectly combines the advantages of a machine with:

- Large travelling distances.
- Good accessibility.
- Flexible capability.
- 5-sided and 5-axis processing of workpieces.
- Roughing and finishing on one machine.
- Greatest possible dynamic performance.
- High stability.

FZ 40 rounds off Zimmermann's range of gantry milling machines with fixed table at the top end of the scale, and sets new standards when it comes to stability, machining performance, precision and profitability.

Roughing and finishing on one machine – not a contradiction?

The development of the FZ 40 was based on the principle idea of building a machine which can be used for both roughing and finishing. This appears contradictory at first, with roughing tasks needing the greatest possible stability and rigidity – criteria demanding a heavy machine, whereas a heavy machine is not wanted for economical use of HSC finishing. Here the emphasis is on lightly moved masses and the greatest possible dynamic performance.

In developing the FZ 40 machine, we succeeded to combine extreme rigidity and high dynamic behaviour.

Advantages of this system:

- Complete processing of a workpiece on one machine.
- Highly profitable.
- Takes up little space.
- Reduces tooling times.
- Greater precision, as the tool does not need to be re-aligned before finishing.

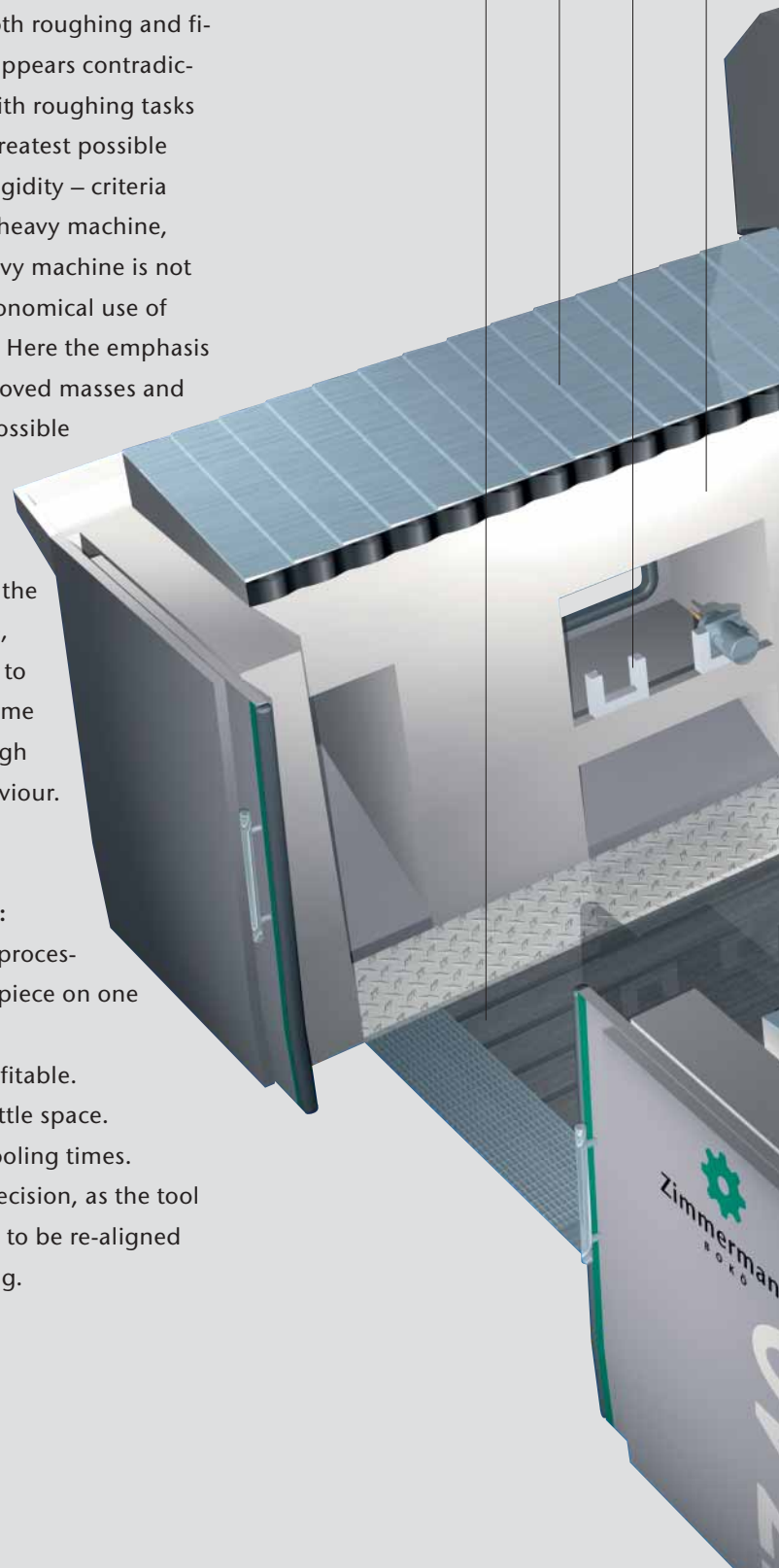
Milling head with two rotary axes.

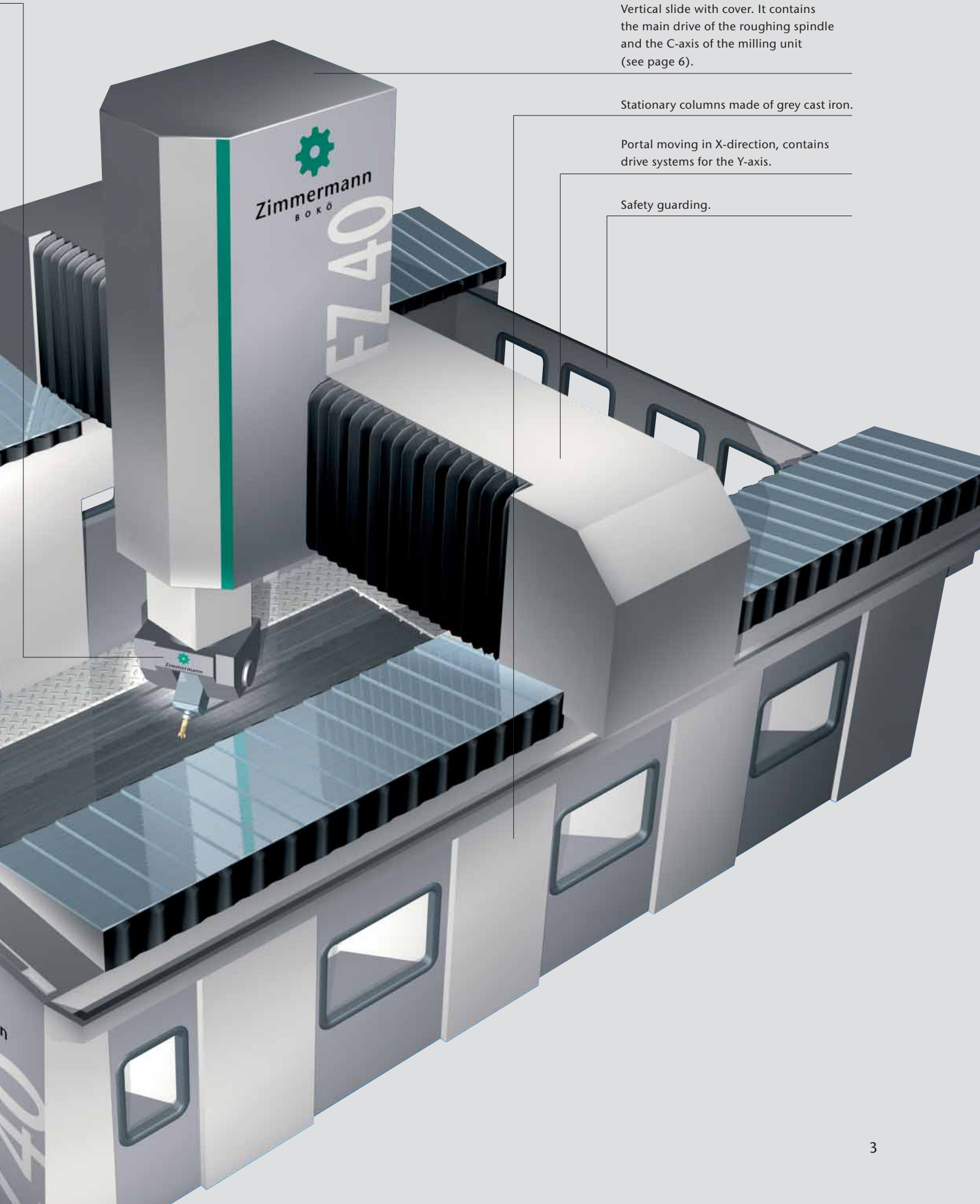
Longitudinal driving above with drive systems for the X-axis, guide and measuring systems.

Spindle storage station.

Lamella coverings of the drive systems.

Clamping table.





Vertical slide with cover. It contains the main drive of the roughing spindle and the C-axis of the milling unit (see page 6).

Stationary columns made of grey cast iron.

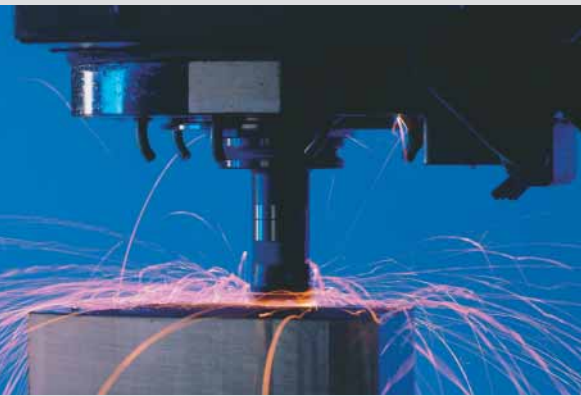
Portal moving in X-direction, contains drive systems for the Y-axis.

Safety guarding.

FZ 40

Vertical slide and milling head unit

The precondition for roughing and finishing on one machine is an especially developed unique spindle change system - thus achieving optimum flexibility and



the best possible capacity utilization of the FZ 40.

Two different milling spindles are available and can be fitted into the milling head in a pick-up procedure. They are built into the milling head in a cartridge principle. On changing the spindles, the roughing spindle is stored semi-automatically in a storage station between two gantry columns and replaced by the high-frequency motor spindle for finishing. When using the finishing spindle, the main drive is uncoupled from the Z-slide.

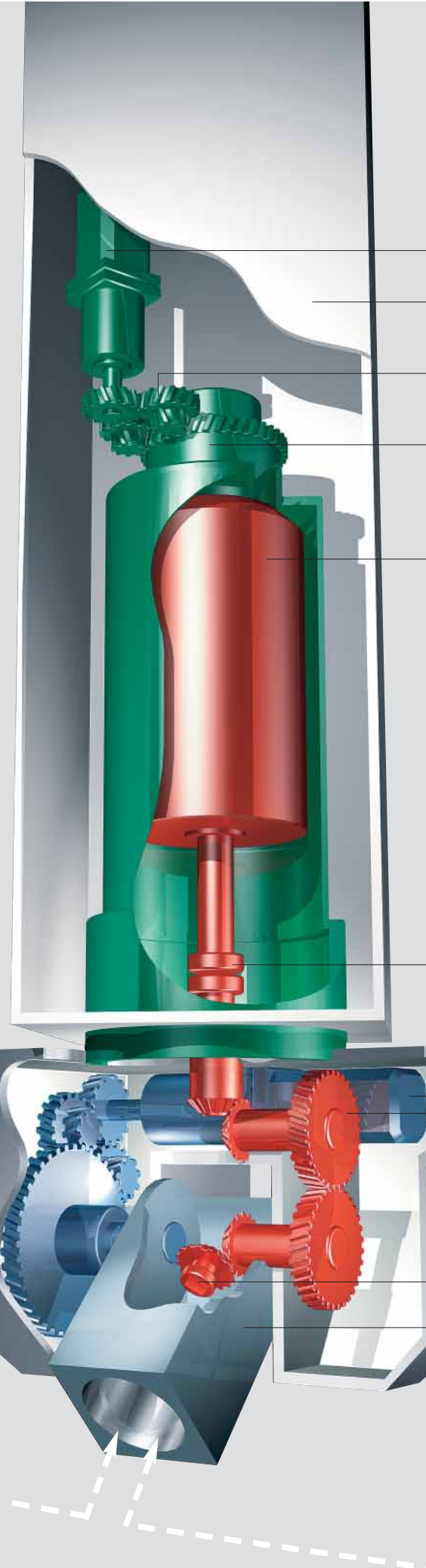
Finishing spindle for HF machining.

HF-motor for finish machining.



The whole changing procedure only takes a few minutes.

The main drive of the roughing spindle is located in the vertical slide and is liquid-cooled, as is the whole milling head. A bevel/spur gear is responsible for power transmission. The roughing spindle produces 25 kW at 100% ED (optionally 30 kW) and can be driven at a speed of up to 8 000 rpm. The optional high-frequency spindle produces 17 kW (100% ED) and achieves a maximum of 23 600 rpm. The torque of the A-axis is 4 200 Nm (C-axis: 3 200 Nm). For heavy roughing, the A-axis can be clamped with a Hirth-gear in steps of 5° in addition.



Servo motor for positioning the milling head in the C-axis.

Vertical slide.

Backlash free precision gear.

C-axis of the milling head.

Main drive of the roughing spindle.



Spindle storage station with finishing spindle.

Metal-bellow coupling for roughing spindle drive.

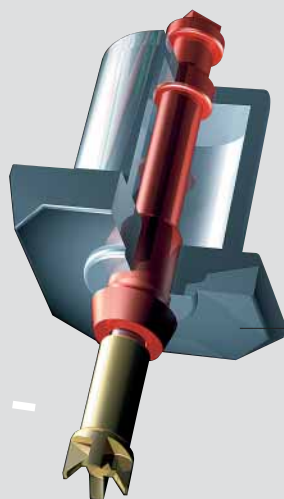
Milling head.

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

Bevel / spur gear for power transmission to the roughing spindle.

Coupling for power transmission to the roughing spindle.

Swivel housing for an alternate use of the roughing and of the finishing spindle.



Roughing spindle with coupling for power transmission of the main drive.

High Speed Cutting

With the high-frequency spindle the FZ 40 can perform highly profitable finishing.

HSC pre-requisites:

- Stable, vibration damping machine frame.
- Quick, dynamic and vibration-stiff axes drives.
- High frequency spindle with HSK tool clamping system.
- Tools and tapers suitable for high speed machining.
- Rapid machine control.
- Complete guarding of the work place.

Advantages of the high speed cutting (HSC) with the FZ 40 result in a **remarkable competitive advantage:**

- High surface quality minimises manual re-finishing.
- Low cutting power increases the life-time of the machine and of the tools.
- Low heat input in the work-piece, heat emission through the chips.
- High rate of metal removal.
- Reduction of the machining time.
- Reduction of the production costs.

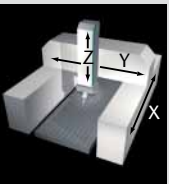
FZ 40

Technical specification

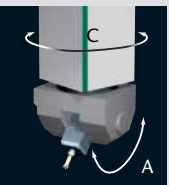
The CNC gantry milling machine FZ 40 is a modular machine concept for combining many different working areas, controls and milling heads.

Drive axes

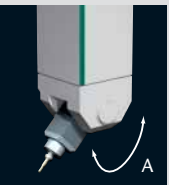
FZ 40 is available as 5-axis, 3+1 and 3-axis version:



Three linear axes (X, Y, Z) are driven with the FZ 40 machine in principle.



With the 5-axis machine 2 rotary axes (A and C) are driven in the milling head in addition.



The 3+1-axis machine has 3 linear axes together with 1 automatically positioning clamped axis (A-axis).



The most simple design of the FZ 40 series is a 3-axis version with a rigidly integrated vertical motor spindle. (e.g. 50 kW/240 Nm)

Design

The sandwich design with alternating cast and welded structures achieves optimum vibration damping. Gantry columns, gantry slide and the cross slide are cast structures; the longitudinal beam, the gantry and the vertical slides are welded steel components with generously dimensioned ribbings.

The drive, guide and measuring systems have been moved upwards to reduce the mass being moved, thus increasing rigidity. All guide, drive and measuring

- ▼ Automatic tool changer.
- ▼▼ Roller rotation guides and digital feed servo drives.



The 5-axis milling head version with the inserted roughing spindle.

systems are in a protected location outside the contamination and chip zone.

The clamping table permanently anchored to the foundations and the gantry moving in X-direction make it possible to process workpieces regardless of weight.

The whole machine has been subject to strength tests and optimised in complicated FEM tests.

All linear axes have pre-tensioned linear roller bearings size 55 in the X axis and 45 in the Y and Z axis. For each axis there are 6 (Y-axis 8) guide carriages installed (X-axis left and right). The feed movement of the axes is produced by ball screws size 80 / 63.

The machine is rated for roughing of steel and cast iron.

Together with the spindle change concept and the high-frequency spindle, the machine can also be used for finish machining.

Foundation and erection

Stable foundations are required for erection of the CNC portal milling machine FZ 40.

The fixation of the columns and the clamping table is made by foundation anchors which are cast into the foundation. Only in connection with the foundation maximum stability and accuracy are guaranteed.

Controls and drives

The basic version of the machine is equipped with digital feed servo drives make Siemens.

In principle it is possible for different makes and types of controls to be combined with FZ 40 machines. Modern controls offer functions such as "look ahead", jolt limiting, spline interpolation and 5-axis machining. Optional systems for measuring and digitising are available. As a rule, FZ 40 machines are equipped with controls made by Siemens, Heidenhain or Fidia; other makes are possible on special request.



The FZ 40 can be combined with different makes and types of numerical controls.



FZ 40

Equipment and Options

Equipment and Options	5 axis	3 + 1 axis
Cooling system	■	■
Cooling unit for milling head and main drive	■	■
Switch cabinet air-conditioning	■	■
Safety guarding	■	■
Tool changer 12-, 15-, 30-, 50- or 120-fold	■	■
Chip conveyer	■	■
Minimum quantity cooling	■	■
Measuring touch probe	■	■
Tool measuring	■	■
Digitising	■	■
A-axis as positioning clamped axis	■	
Roughing spindle	■	
Simultaneous A-axis	■	
Simultaneous C-axis	■	
Storage station for milling spindles	■	
High-frequency spindle	■	■
Special voltage	■	■
Special painting	■	■

■ Standard
■ Option

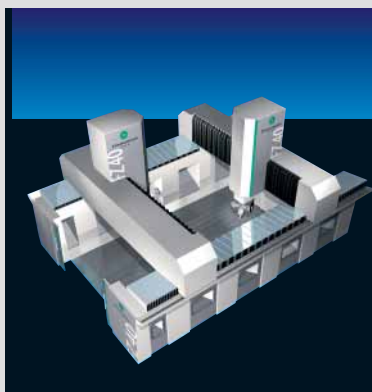
FZ 40 Special versions

The modular conception of the FZ 40 allows highly specialized machine variations for customised applications. With such individualised machines, excellent economical and efficient production processes can be realised.

The stiff and oversized design of the X-beams and the columns gives the flexibility for special configurations of the machine.

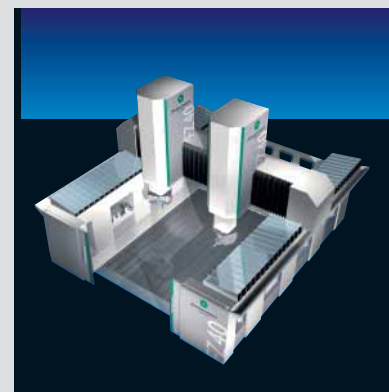
FZ 40 "Tandem"

- Two similar bridges.
- Saves one machine.
- Simultaneous machining with two milling heads.
- Independant machining of one or two workpieces.
- Requires less space.
- Reduces processing and lead times by almost 50%.



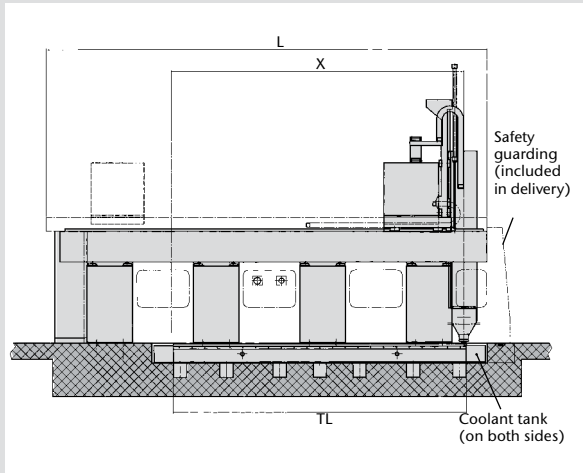
FZ 40 "Duo"

- One bridge, 2 milling heads.
- Saves one machine.
- Simultaneous machining with two milling heads.
- Machining of two similar or two symmetric parts.
- Requires less space.
- Reduces processing and lead times by almost 50%.

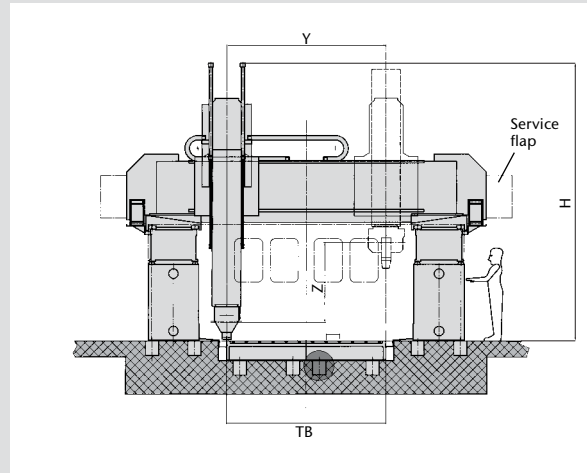


FZ 40

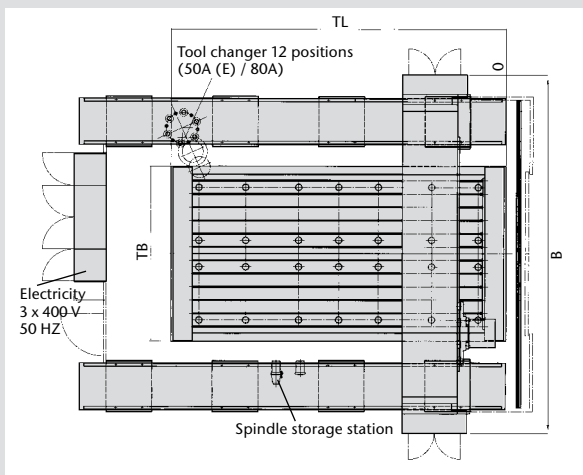
Erection plans and dimensions



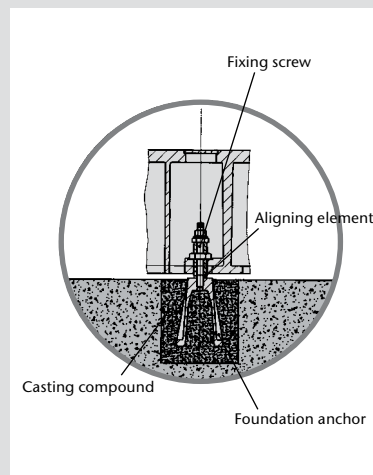
FZ 40 from the right-hand side with the machine bed installed at floor level. Safety guarding not marked.



FZ 40 from the front side. The fixing of the machine to the foundation can be seen in the drawing beneath.



FZ 40 from the top.



Fixing the machine to the foundation.

Dimensions		min.	max.
X	Working range X-axis	3 000 mm	10 000 mm
Y	Working range Y-axis	2 000 mm	4 000 mm
Z	Working range Z-axis	1 000 mm	2 000 mm
L	Total length of machine	6 800 mm	13 800 mm
B	Total width of machine	5 800 mm	7 800 mm
H	Total height of machine	4 700 mm	6 700 mm
TL	Length of table	3 000 mm	10 000 mm
TB	Width of table	2 000 mm	4 000 mm

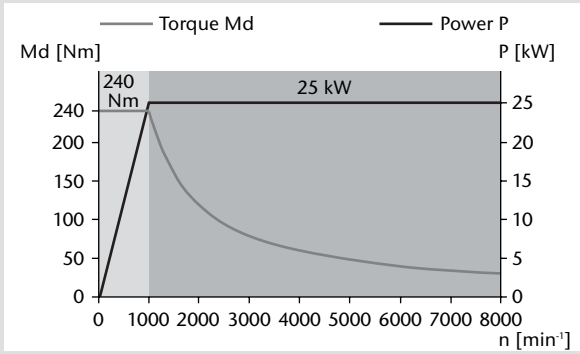
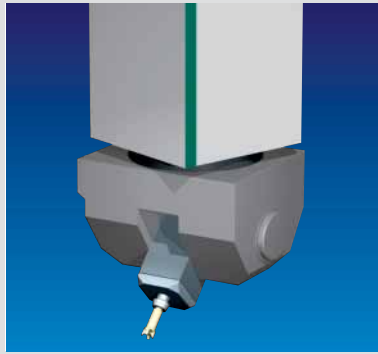
All dimensions given are the maximum and minimum examples of the FZ 40 machine.
Special sizes on request.

FZ 40

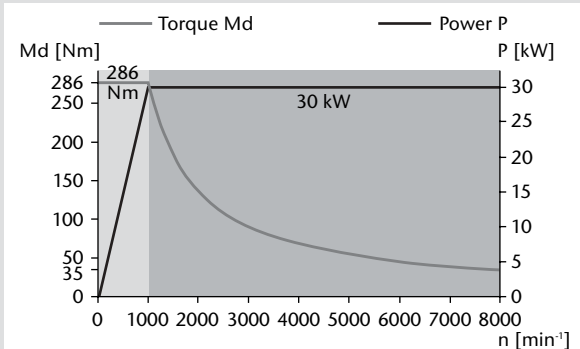
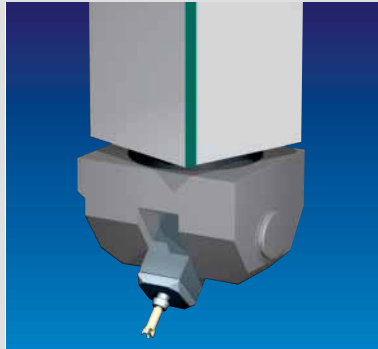
Technical data

Technical data		FZ 40	Technical data		FZ 40
Working ranges			Milling unit		
X-axis		3 000 – 10 000 mm	5-axis version		
Y-axis		2 000 – 4 000 mm	Roughing spindle 25 kW		25 kW from 1000 rpm
Z-axis		1 000 – 2 000 mm	Output S1 100% ED		
A-axis		± 95°	Torque S1 100% ED		240 Nm
C-axis		± 200°	Speed		8 000 rpm
Table size			Tool holder		HSK 80 A or SK 50
Length		3 000 – 10 000 mm	Distance swivel axis to spindle nose		330 mm
Width		2 000 – 4 000 mm	Roughing spindle 30 kW		30 kW from 1000 rpm
Height		350 mm	Output S1 100% ED		
Max. work-table loading		30 000 kg/m ²	Torque S1 100% ED		286 Nm
T-slots (longitudinal)		22 ^{H12}	Speed		8 000 rpm
Distance T-slots		250 mm	Tool holder		HSK 80 A or SK 50
Feed drives			Distance swivel axis to spindle nose		493 mm/330 mm
Feed linear axes		0 – 20 000 mm/min.	High-frequency spindle		17 kW from 12 000 rpm onwards
Rotation speed rotary axes		50°/s	Output S1 100% ED		
Acceleration linear axes		2,5 m/s ²	Torque S1 100% ED		13,7 Nm
Accuracy			Speed		23 600 rpm
Positioning	Axis	to VDI / DGQ 3441	Tool holder		HSK 50 A
accuracy	X	P = 30 μm	Distance swivel axis to spindle nose		493 mm
Repeatability	Y, Z	P = 20 μm	3+1-axis version		25 kW
Repeatability	X	Ps = 15 μm	Output S1 100% ED		
Repeatability	Y, Z	Ps = 10 μm	Torque S1 100% ED		40 Nm
Resolution of measuring systems	A, C	0,0001°	Speed		28 000 rpm
Positioning accuracy	A, C	P = 15" = 0,0041°	Tool holder		HSK 63 F (HSK 50 A)
Repeatability	A, C	Ps = 10" = 0,0027°	Distance swivel axis to spindle nose		352 mm
			Tool clamping		spring clamp
			Tool unclamping		hydraulic
			Spindle changing time		approximately 5 min.

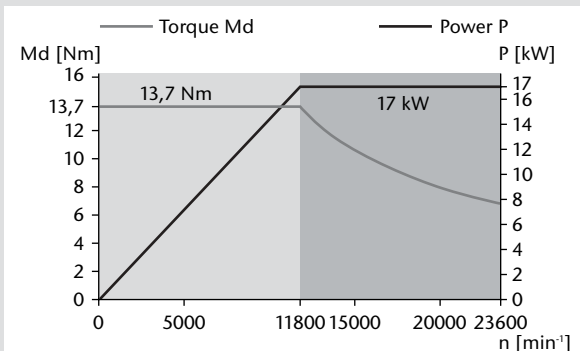
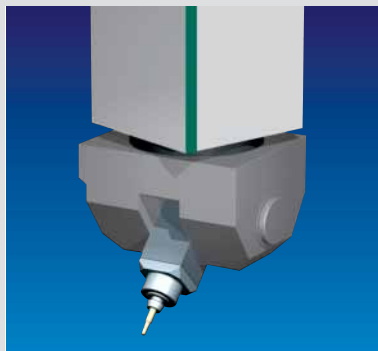
Milling head
with roughing
spindle
25 kW
5-axis



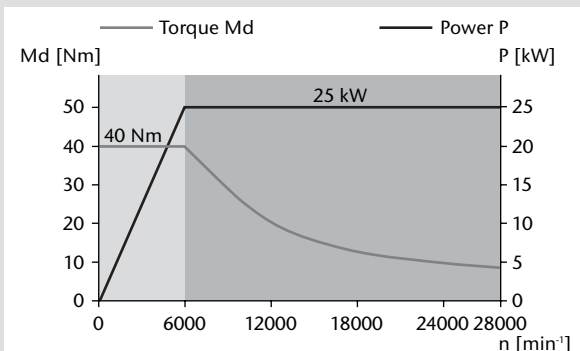
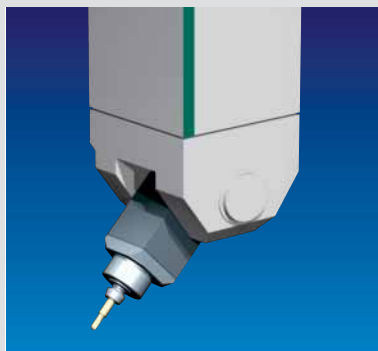
Milling head
with roughing
spindle
30 kW, optional
5-axis



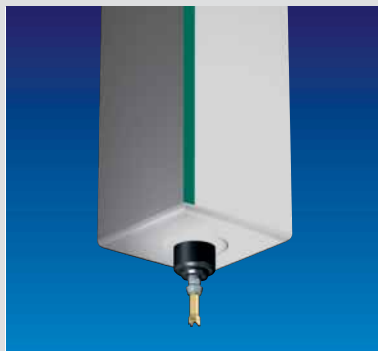
Milling head
with finishing
spindle
17 kW
5-axis



Milling head
with rigidly
integrated fi-
nishing spindle
25 kW
3+1-axis



Vertical motor
spindle
3-axis



Technical data on demand.



High Performance
Milling Technology

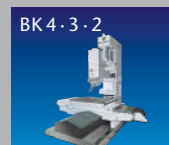


Styrofoam
Milling Technology



Zimmermann-Bokö stands for CNC portal milling technique. 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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