



Zimmermann

CNC Portal Milling Machine

FZ 38



High Performance
Milling Technology

FZ 38

The Linear Machine – Three Levels of Dynamics

With the FZ 38, by using direct drives for all axes, Zimmermann demonstrates its expertise in the demanding area of drive technology.

In machining of large parts in modern tooling, die and pattern making as well as the aircraft industry, the maximum chip rate together with the demand for high dynamic performance and speed is at the top of the list of requirements.

With the FZ 38, Zimmermann presents a technically mature and integral linear machine, designed for highly dynamic operation of the linear drives.

1 Dynamic level one: High performance

The most important reason for using linear motors is to increase productivity. The FZ 38 achieves extremely high chip rates of up to 4 500 cm³/min (with aluminium).

Feed rates of up to 60 m/min in the linear axes and spindle speeds up to 30 000 min⁻¹ enable genuine HSC machining. The new VH 5 torque milling head enables feed rates in the rotary axes of up to 360°/s. Other performance criteria – besides the reduced acceleration and deceleration ramp times – are the higher rapid

travel speeds that allow also faster tool change.

Crucial with this outstanding performance, however, is the achieved accuracy and surface quality. And this is exactly where the FZ 38 sets new standards. The linear drives ensure very high performance with a high Kv-factor, enabling a low drag distance and high positioning accuracy even at rapid feed rates.

Linear driven X- and Y-axis with separate cooling circuits and a comprehensive safety concept in case of power failure

Protection of linear drives by fine dust covers and chip deflectors

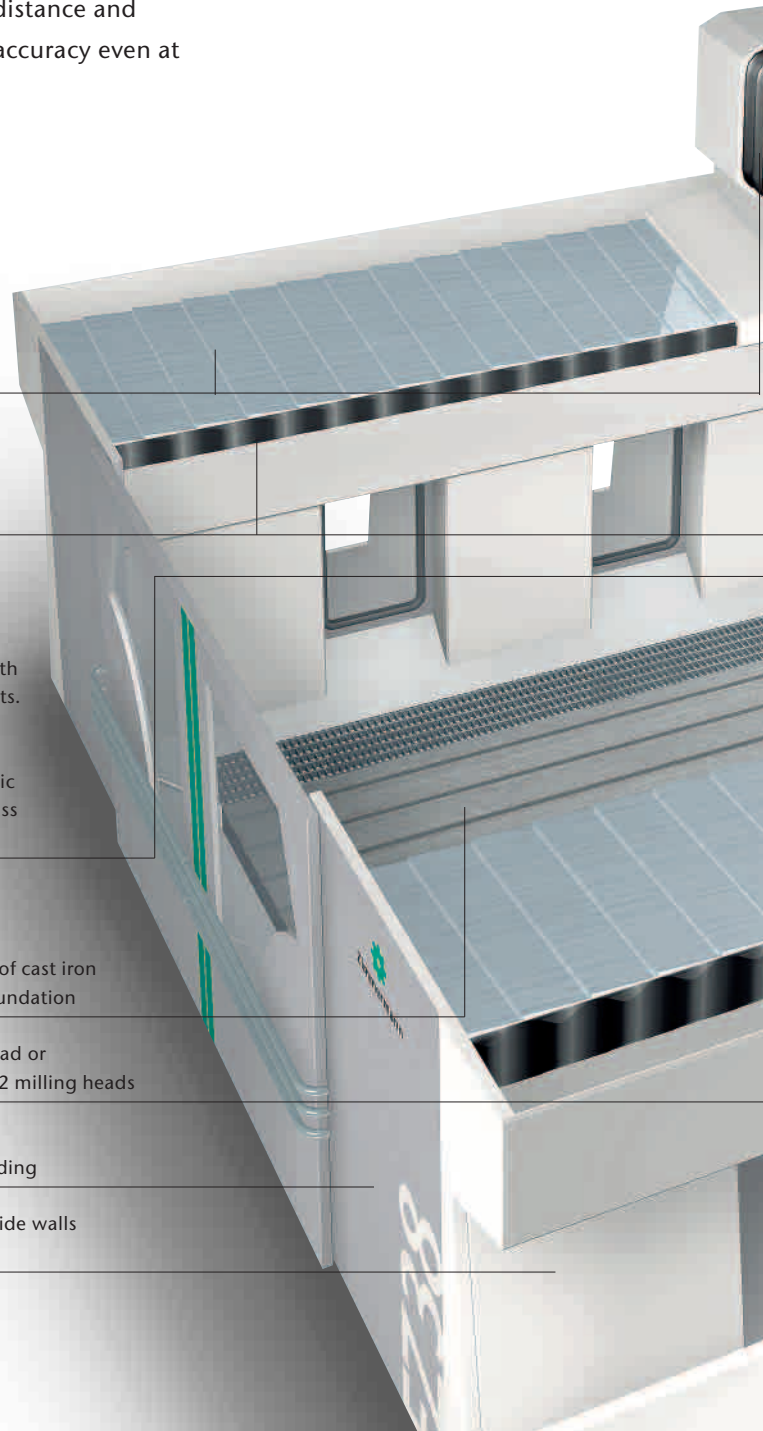
Linear driven Z-axis with separate cooling circuits. Clamping heads for protection in case of power failure. Hydraulic counterweights for mass compensation

Clamping table made of cast iron directly fixed to the foundation

VH 5 torque milling head or alternatively VH 3 / VH 2 milling heads

Integrated safety guarding

Grouted, trapezoidal side walls with enlarged base



2 Dynamic level two: The technical basis

The system specific elimination of the backlash and elasticity of the drive unit is one of the essential preconditions for the achievable power and accuracy values, nevertheless, the employment of direct drives requires a special design of the machine. Here Zimmermann's wide experience in developing structurally rigid machines is the decisive factor.

A mechatronic analysis of the whole system by Zimmermann in cooperation with external scientific institutes specialising in FEM analysis led to an innovative, reliable and high performance overall solution.

■ Optimised side walls

The trapezoidal side walls of FZ 38 have been calculated specifically with the dynamics of the linear drives in mind. With their large bases they offer optimum damping against vibrations from the dynamic feeds and load changes. The side walls are filled with a cement-like, fibre-reinforced compound, leading to high structural rigidity and thermal stability.

Drive concepts

Decades of experience at the forefront of technological development in the field of portal milling machines has made Zimmermann an expert on the various drive concepts.

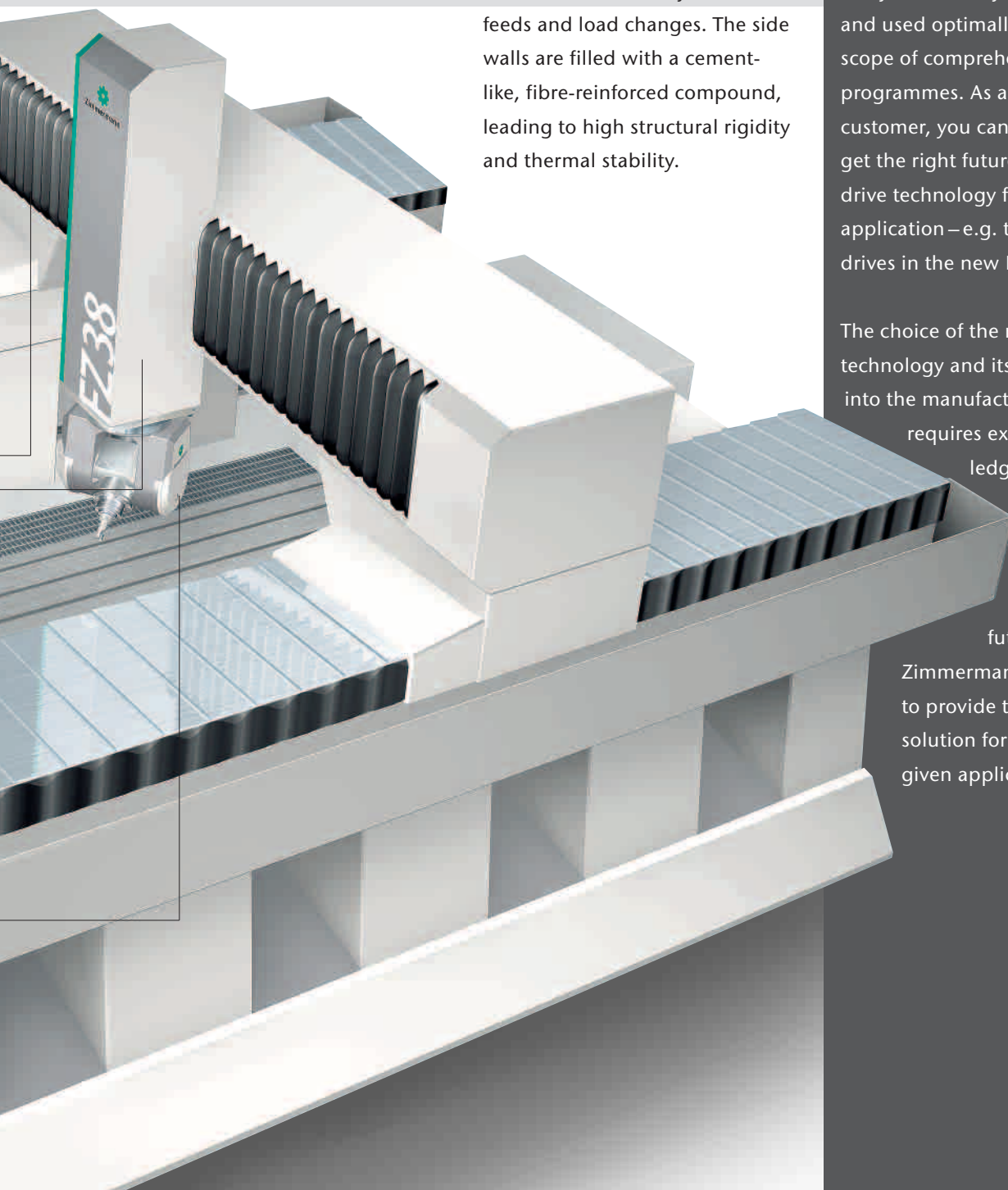
Current technological trends in the field of drives – such as linear and torque motors as well as proven technologies such as rack-and-pinion drive systems and ball screw systems are objectively assessed by Zimmermann and used optimally within the scope of comprehensive machine programmes. As a Zimmermann customer, you can be certain to get the right future-oriented drive technology for your special application – e.g. the linear drives in the new FZ 38.

The choice of the right drive technology and its integration into the manufacturing process requires extensive know-

ledge based on a multitude of complex criteria.

Thus, in the future too,

Zimmermann will be able to provide the best drive solution for the customer's given application.



■ Torsion-free portal

The portal is one of the outstanding components of the FZ38: Structurally it is extremely rigid and able to absorb the high dynamic movements of the machine without warping – and at the same time it has been so reduced in mass as to avoid unnecessarily impairing acceleration. The key advantage: considerable reduction of the pendulum effect. The portal runs on double linear guides on each side and both sides are driven. Zimmermann combines decades of experience at the forefront of technological development of portal milling machines with extensive process knowledge.

■ Drive arrangement

All linear drives are positioned in a clever way to take optimal account of the weight and

magnetic forces acting on the machine structure. Overhead drives, specially designed chip deflectors and compressed air barriers reliably prevent the drives being hit by flying chips.

3 Dynamic level three: Cost-effectiveness

As well as the benefit of the high chip rate, the overall economic advantage of the FZ38 is a product of many other factors:

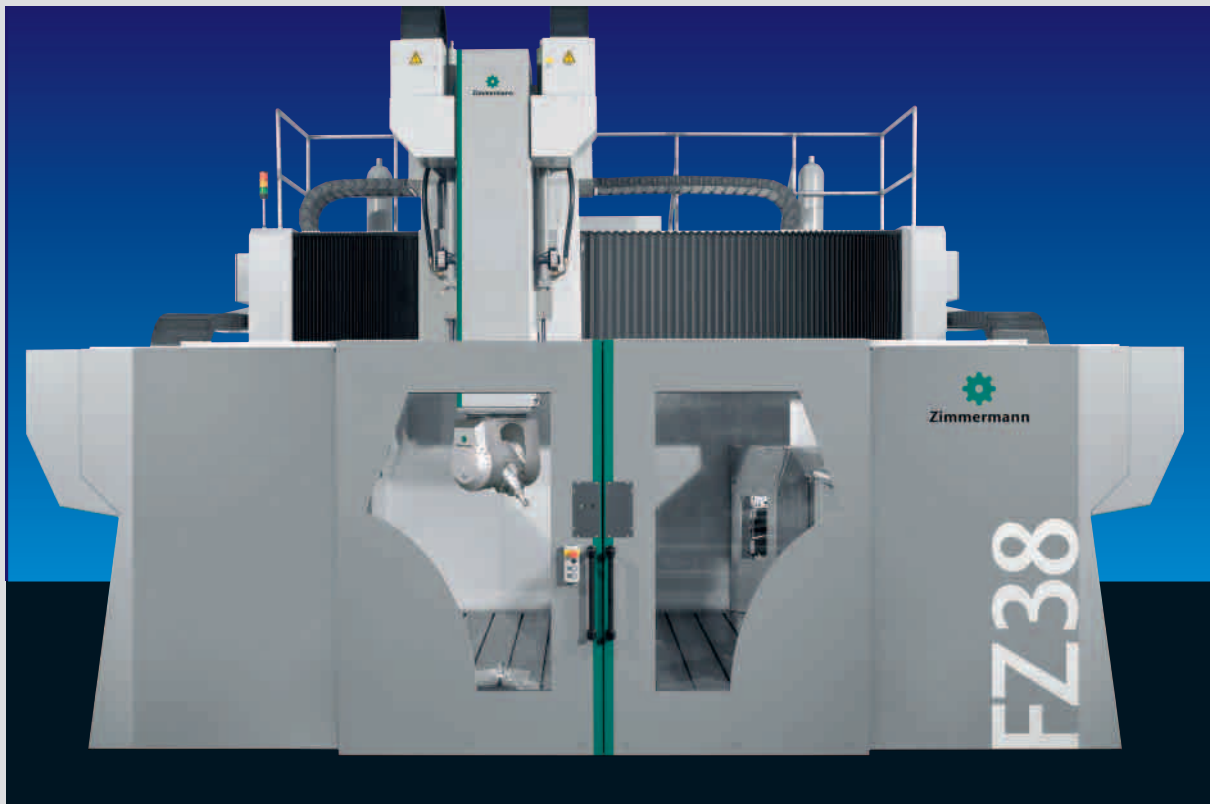
- The high precision of the machine substantially reduces the need for manual reworking of finished surfaces or may even eliminate it completely.
- Thanks to the high feed rates, non-productive times such as re-positioning, tool orientation and tool changing can be reduced.
- The availability of the FZ38 is also very high. This is largely due



▲ Linear drive in the upper X-axis.

to the non-contact direct drives which are free of backlash and wear, keeping maintenance low and making them last longer.

Against this background, the slightly increased investment costs of a linear machine can be offset by high utilisation within a very short period.



Already today the machine is optimally prepared for future developments in the tool industry of tomorrow.

Decisive for the overall cost reflection is naturally the possibility of complete machining offered by the FZ 38. Even large workpieces can be completely machined on five sides in one setup. This saves both time and money.




Application areas

Due to the high stability and rigidity, constantly moved masses and highly dynamic linear drives, the FZ 38 is ideal for HSC machining of all materials used in tool making, die and pattern making as well as in the aircraft industry:

- Machining of aluminium at extremely high feed rates
- Composite materials
- HSC machining of heavy materials such as steel and cast iron
- Extreme and rapid changes in direction
- Maximum contour accuracy
- Superfinishing

The use of a linear machine is generally advantageous in the following situations:

- Where a reduction of non-productive time is needed for economical reasons (chip-to-chip times e.g.) frequent tool changes and long distances between the workpiece and the tool changer.
- High utilisation and high numbers of parts.
- Where genuine HSC machining is possible based on the material used, the tools and the milling contours.
- Where flat, drawn out milling contours permit high machining speeds.
- For large working ranges in the X-axis and relatively short ones in the Y- and Z-axis.

Comparison of drive technology	  		
	BALL SCREW	RACK & PINION	LINEAR MOTOR
Feedrate	■	■	■
Acceleration	■	■	■
Surface finish	■	■	■
Noise level	■	■	■
Power requirement	■	■	■
Safety after power failure ²	■	■	■
Life cycle	■	■	■
Crash behaviour	■	■	■
Ease of service	■	■	■
Investment costs	■	■	■
Repair costs	■	■	■
Cost-effectiveness (low utilisation)	■	■	■
Cost-effectiveness (high utilisation)	■	■	■

¹ The comparative statements refer to typical models and fields of application and depend on the particular technical equipment. No guarantee is given for the accuracy of these statements.

² Solved optimally for the FZ 38 with specially designed, additional safety equipment.

Better ■ ■ ■ ■ ■ Worse

VH 5 Milling Head with Torque Drive – Pure High Tech

The new VH 5 milling head represents the technical state-of-the-art in high-speed machining. It is the optimum high tech head for the FZ 38 with regard to genuine, continuous simultaneous machining.

Dynamics

The combination of relatively low weight with torque drives enables a maximum dynamics.

High speed unlimited

The “fastest” head in the Zimmermann range. Equipped with torque drives, this Head / Machine combination achieves astonishing overall machining times. On the one hand the direct machining time benefits from the high head speeds, on the other hand very low non-productive times can be achieved with the VH 5 during approach and withdrawal, repositioning, etc.

Intelligent extraction system

The VH 5 is equipped with a unique, integrated extraction system. The system is based on internal extraction. The particular highlight is a suction hood controlled by its own NC-axis. This enables efficient extraction even with the most complicated contours. This is a great advantage particularly for critical

materials where chips and dust are concerned such as carbon fibre.

Fields of application

The VH 5 torque driven milling head is ideally suited to the linear machine FZ 38, especially where

extreme movements of the head are required within a short space of time as in simultaneous machining. Equipped with the fast VH 5 head and in combination with the extremely dynamic X-, Y-, and Z-axes the FZ 38 is able to achieve high overall speeds.



Features

Torque drives
Torque A-axis 650 Nm and C-axis 700 Nm
Weight only 530 kg
Standard spindle with up to 52 kW / 45 Nm or 24 000 min ⁻¹
NC-axis for dust extraction
Hydraulic clamping of the A- and C-axes
Rotary speed A- and C-axes of 360° / s
Coolant / MQL externally and through the tool
Direct optical measuring system

VH 3 and VH 2 – The All-Purpose Milling Heads

These high-performance milling heads are suitable for a wide range of milling applications on the FZ 38. All-rounders in the best sense – powerful and cost-effective.

Universal application

The VH 3 and VH 2 series has been specially designed for modern 5-axis simultaneous machining. High holding torques in the A- and C-axes ensure reliable and accurate path control. Fast drives and very strong high-performance spindles facilitate high machining rates during HSC machining. Precision worm and wheel drives ensure accuracy and damping.

Unlimited Power

Torque of up to 2 000 Nm is available in the rotary axes and The milling spindles provide power up to 60 kW or 95 Nm for the VH 3 head and 45 kW or 67 Nm for the VH 2. This is more than enough for all machining tasks.

VH 3 and VH 2 – two models from the same family

The VH 2 is based on the same design as the VH 3 but it is considerably lighter and smaller and thus has a smaller interference contour. The advantage of the VH 3, on the other hand, is that

more powerful spindles can be employed.

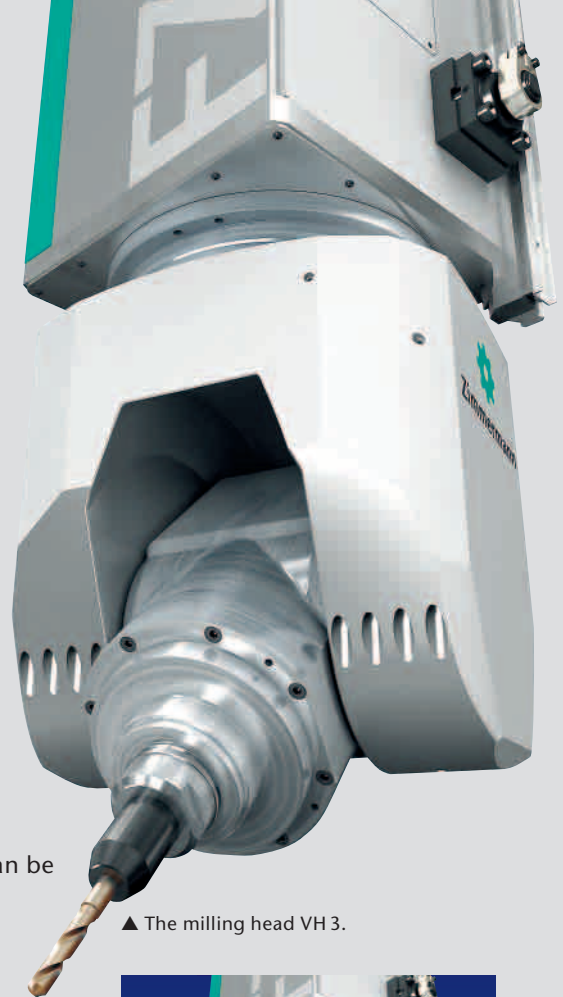
A new design

The VH 3 and VH 2 model series has been completely upgraded:

- Small interference contour for better access.
- Water-cooled worm and wheel drive for higher accuracy and elimination of thermal influences.
- Higher swivel speeds for faster overall machining times.
- Clamping of rotary axes for more rigidity during rough machining.
- Automatic grease relubrication for long-life cycle and cost effectiveness

Fields of application

The ideal model series where a wide range of machining applications needs to be covered by one head. Today rapidly changing tasks are common and difficult to plan in advance. With the extremely versatile VH 3 and VH 2 model ranges, the FZ 38 is perfectly prepared for all eventualities.



▲ The milling head VH 3.



▲ The milling head VH 2.



Features

Precision worm and wheel drive (water-cooled)
Standard spindles with up to 60 kW and 95 Nm (VH 3) and 45 kW or 67 Nm (VH 2)
Univers. high-performance head
Hydraulic clamping of the A- and C-axes
Coolant / MQL externally and through the tool
Optical direct measuring system
Grease relubrication

FZ 38

Technical Description



- Low moved masses
- High structural rigidity
- High dynamics and surface quality

Design

The FZ 38 is a modular machine concept that allows different work areas, milling heads and spindles as well as control systems to be combined with each other. The machine has fixed side walls, a clamping table fixed to the foundation and an overhead portal driven on both sides and moving in the X-direction. The workpiece does not have to be moved and machining is thus independent of the workpiece weight. Constant moving masses (portal, cross- and Z-slide, milling head) lead to consistent dynamic behaviour, a prerequisite for optimal surface finish and for the use of linear drives.



▲ Strong clamping head for effective protection of the Z-axis in case of power failure.



▲ The Z-slide – extremely rigid design while still light in weight.

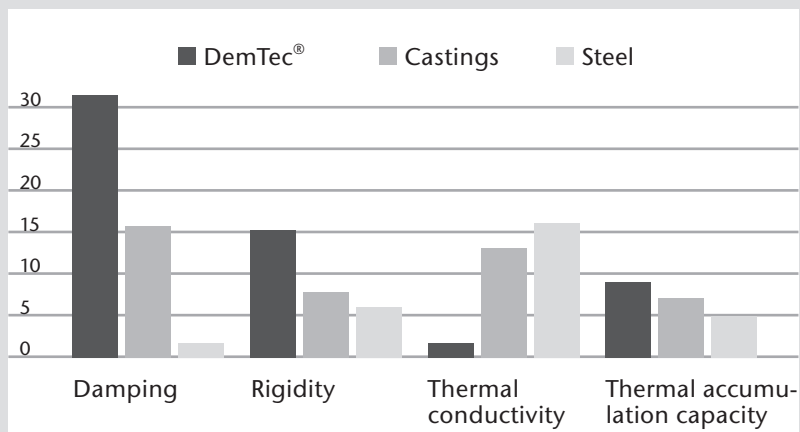
Machine frame and guiding

The machine bed is made of grey cast iron. The side walls, portal and Z-slide are of welded steel construction. The trapezoidal side walls are filled with a special, fibre-reinforced DemTec® concrete. The guides, drives and measuring systems of the X-, Y- and Z-axes are protected against dirt by micro-dust bellow covers. Problems of contamination due to the magnetism of the linear motors have been designed out by providing the overhead drives on the X-axis with special protective shields.

Axis drives

- Irrespective of the control system used, all linear axes are equipped with the latest Siemens digital linear motors. When stationary, the machine is kept in position by brake shoes (X- and Y-axis) or clamping heads (Z-axis).
- A hydraulic counterbalance is provided on the Z-axis for mass compensation.
- The linear guides are designed as pre-loaded linear guides in the X- Y- and Z-axes with up to 8 guide carriages per axis.

► Comparison of different structural materials for the side walls based on the most important functional criteria.



Safety concept

In the event of a power failure, the Z-slide is protected effectively by strong clamping heads and the X- and Y-axes by brake shoes. All axis are slowed down by energy recovery using the generator effect.

Cooling

The linear drives with their precision cooling units and individual cooling circuits for solenoid and motor elements are effectively separate from the machine.

Measuring systems

The three linear axis X, Y and Z have direct longitudinal measuring systems with Heidenhain glass scales. The measuring systems are protected from dirt by a compressed air barrier. The rotary axes A and C are equipped with high-resolution angular measuring systems.

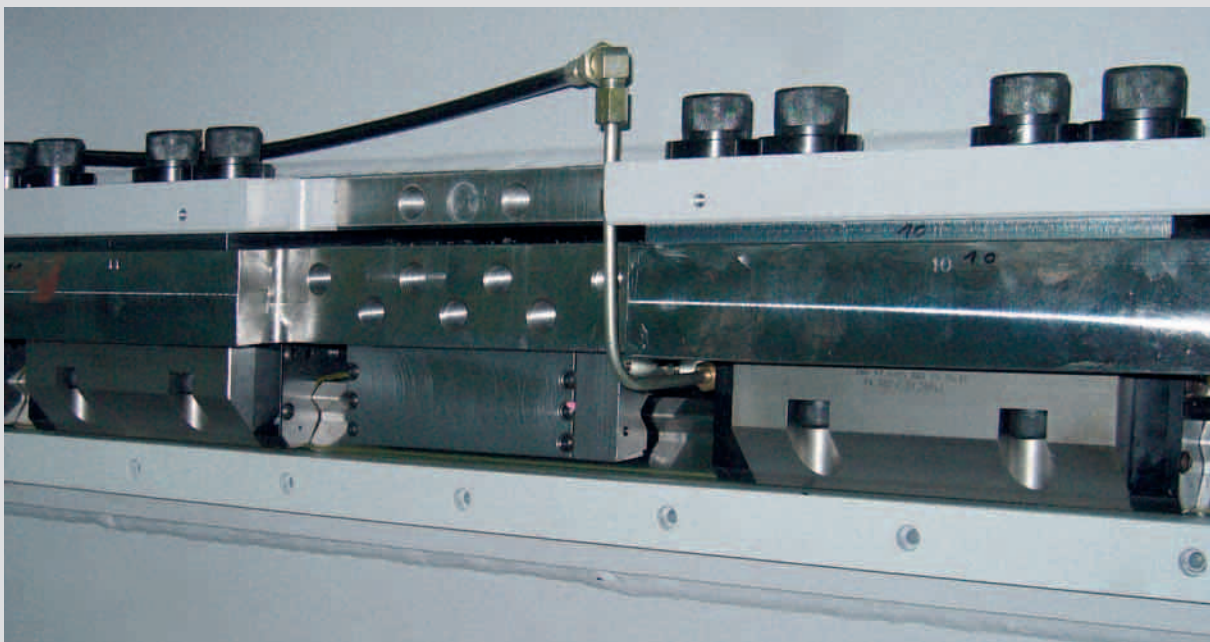
Accuracy

The machine dynamics and the extremely high inherent rigidity ensure high precision, even during finishing at high speeds and feed rates.

Control systems

Different makes and types of control system can be used with the FZ 38. Modern control systems offer such functions as “look ahead”, stick-slip limitation, spline interpolation as well as a 5-axis machining capacities. Systems for measuring and digitalising are available as options. For optimum integration into your production environment, you can choose from a number of different control systems.

▼ Brake shoes (on the X- and Y-axis) keep the machine in position at standstill.



FZ 38

Technical Data

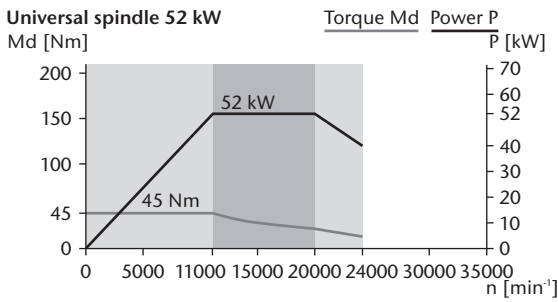
Machine	FZ 38		
Working range			
X-axis	3 000 – 10 000 mm ¹		
Y-axis	2 500 – 3 000 mm ¹		
Z-axis	1 000 – 1 500 mm ¹		
Worktable size			
Length	3 000 – 10 000 mm		
Width	2 500 – 3 000 mm		
Height	350 mm		
Max. worktable load	30 000 kg/m ²		
T-slots (longitudinal)	18 ^{H12} (optional 18 ^{H8})		
Distance T-slots	250 mm		
Feed rates			
Feed rate X- and Y-axes	up to 60 000 mm/min.		
Feed rate Z-axis	up to 60 000 mm/min.		
Acceleration of linear axes	up to 5 m/s ²		
Accuracy²			
Positioning accuracy X-axis	0,030 mm		
Positioning accuracy Y-, Z-axes	0,020 mm		
Repeatability X-axis	0,015 mm		
Repeatability Y-, Z-axes	0,010 mm		
Milling head	VH5	VH3	VH2
Swivel ranges			
A-axis	± 110°	± 110°	± 110°
C-axis ■	± 275°	± 275°	± 275°
C-axis ■	± 360° / ∞	± 360° / ∞	± 360° / ∞
Performance			
Torque A-axis	650 Nm	1 000 Nm	800 Nm
Torque C-axis	700 Nm	1 000 Nm	800 Nm
Acceleration A-, C-axes	800 °/s ²	300 °/s ²	300 °/s ²
Feed rates A-, C-axes	360 °/s	90 °/s max., 60 °/s perm.	90 °/s max., 60 °/s perm.
Accuracy²			
Positioning accuracy A-, C-axes	16" = 0,0044°	15" = 0,0041°	15" = 0,0041°
Repeatability A-, C-axes	12" = 0,0033°	10" = 0,0027°	10" = 0,0027°
Axes clamping			
Clamping A-axis	hydraulic	hydraulic	hydraulic
Clamping C-axis	hydraulic	spring loaded	spring loaded
Holding torque A-, C-axes	2 000 Nm	2 000 Nm	1 600 Nm
Milling spindle	Universal sp.	Universal sp.	Universal sp.
Power S1 max. (100% ED)	52 kW	60 kW	45 kW
Torque S1 max. (100% ED)	45 Nm	95 Nm	67 Nm
Max. speed	24 000 min ⁻¹	22 000 min ⁻¹	25 000 min ⁻¹
Constant power range from	11 000 min ⁻¹	6 000 min ⁻¹	6 400 min ⁻¹
Tool holder			
Distance swivel axis – spindle nose	HSK 63 A 250 mm	HSK 63 A 300 mm	HSK 63 A 340 mm
Tool clamping	Spring clamp	Spring clamp	Spring clamp
Tool unclamping	hydraulic	hydraulic	hydraulic
Lubrication	Permanent grease	grease relubrication	grease relubrication

¹ Other dimensions on request

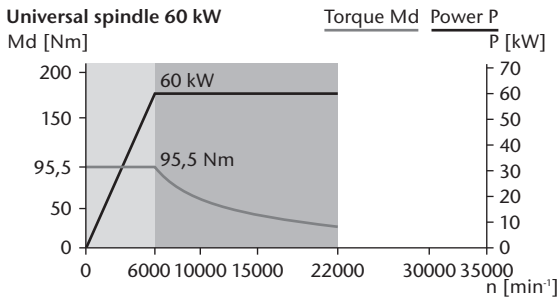
² According to VDI / DGQ 3441

We reserve the right to make technical changes.

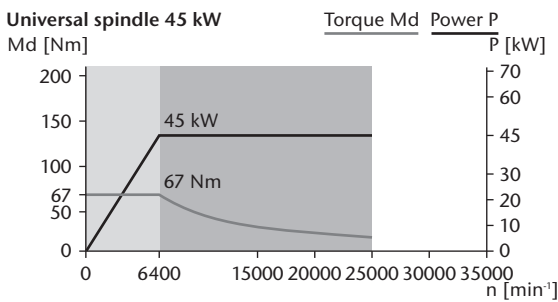
VH 5 Milling spindle performance diagrams



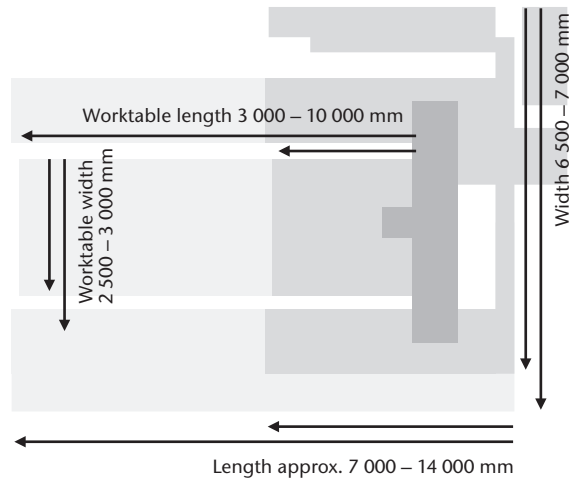
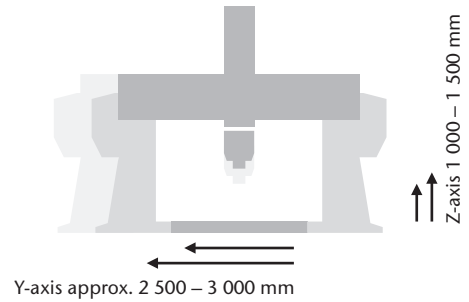
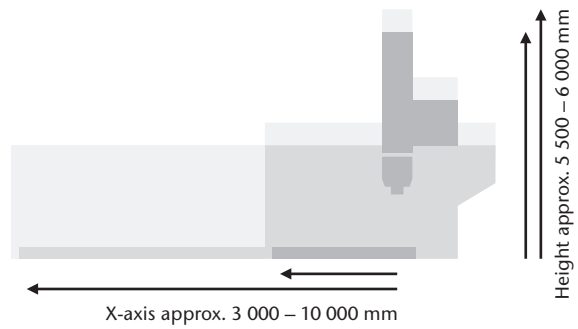
VH 3 Milling spindle performance diagrams



VH 2 Milling spindle performance diagrams



Dimensions



All dimensions shown are examples of the FZ 38 in the minimum or maximum configurations. Special variations within this range are also possible.

Options	FZ 38
Air-conditioned control cabinet	■
Safety guards	■
Simultaneous A-axis	■
Simultaneous C-axis	■
Coolant system	■
Minimal quantity lubrication	■
Internal coolant supply	■

■ Standard
 ■ Option

Options	FZ 38
Tool changer with 15 or 30 positions or more	■
Measuring touch probe	■
Tool measuring	■
Special voltage	■
Special painting	■
Chip conveyor	■
NC controlled extraction hood	■



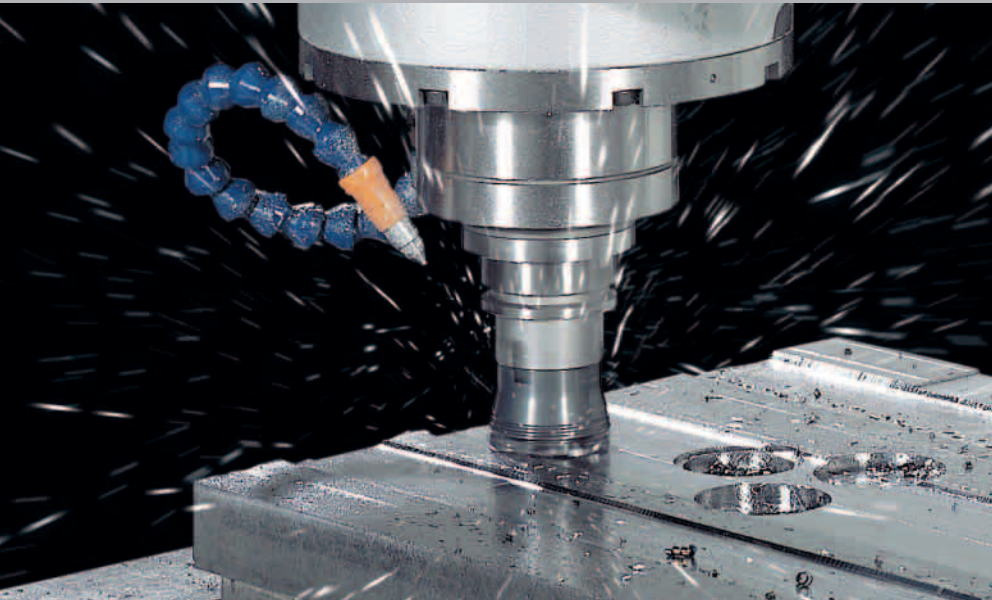
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High Performance
Milling Technology



Zimmermann
STYROTEC

Styrofoam
Milling Technology

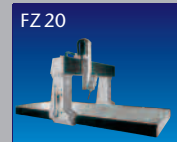


Zimmermann is synonymous with CNC portal milling machines on a big scale. Specialisation and our high rate of innovation has put our technology out in front worldwide.

A uniquely wide and finely tuned programme, including a large number of different machines and milling heads, enables you to choose the perfect machine for every application, thus offering you the ideal solution with regard to quality and cost-effectiveness.



FZ 50



FZ 20



FZ 42



FZ 15



FZ 38



FZ 37



FZ 35



FZ 32



FZ 30



FZ 25



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