

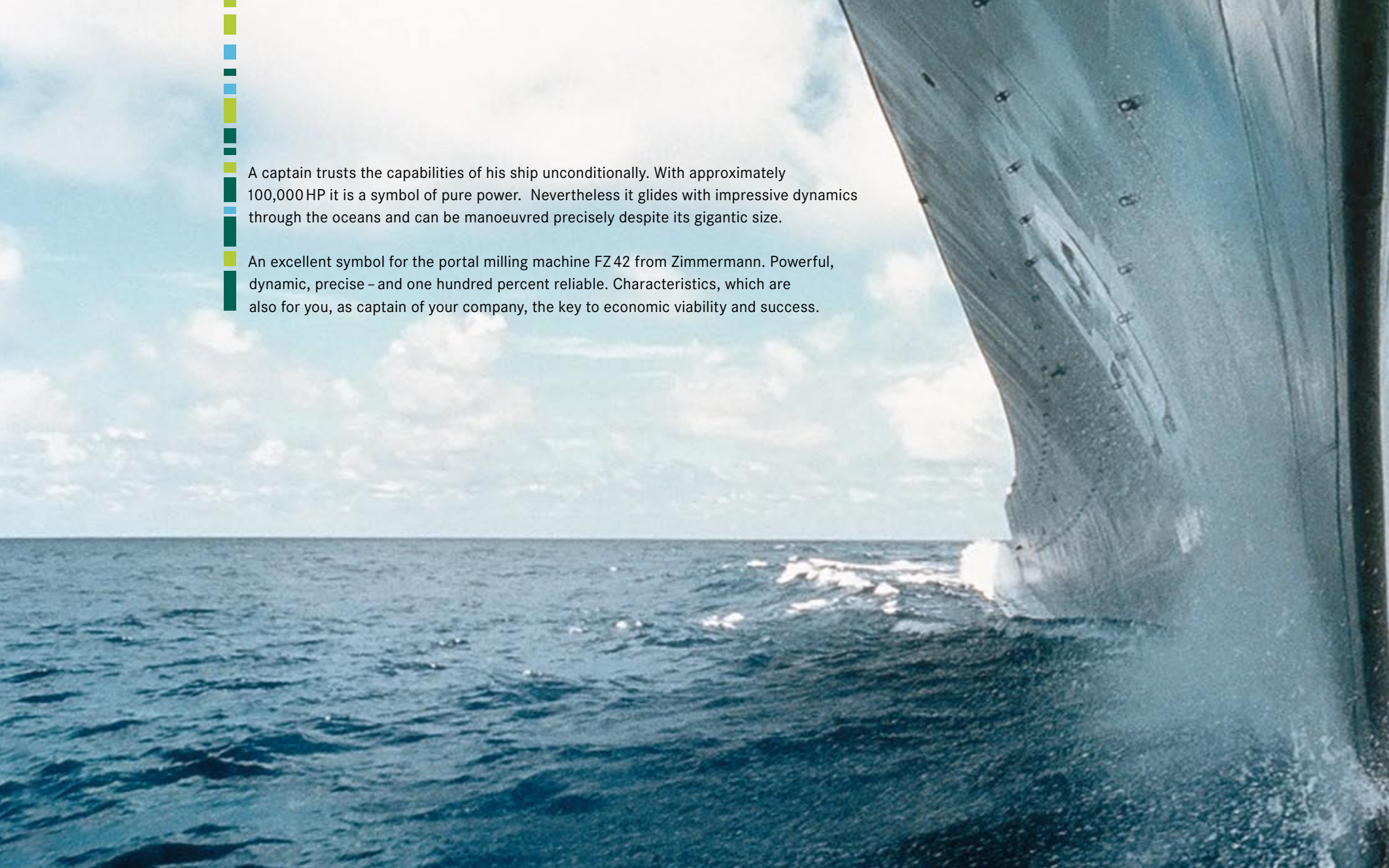


FZ42

Portal Milling Machine



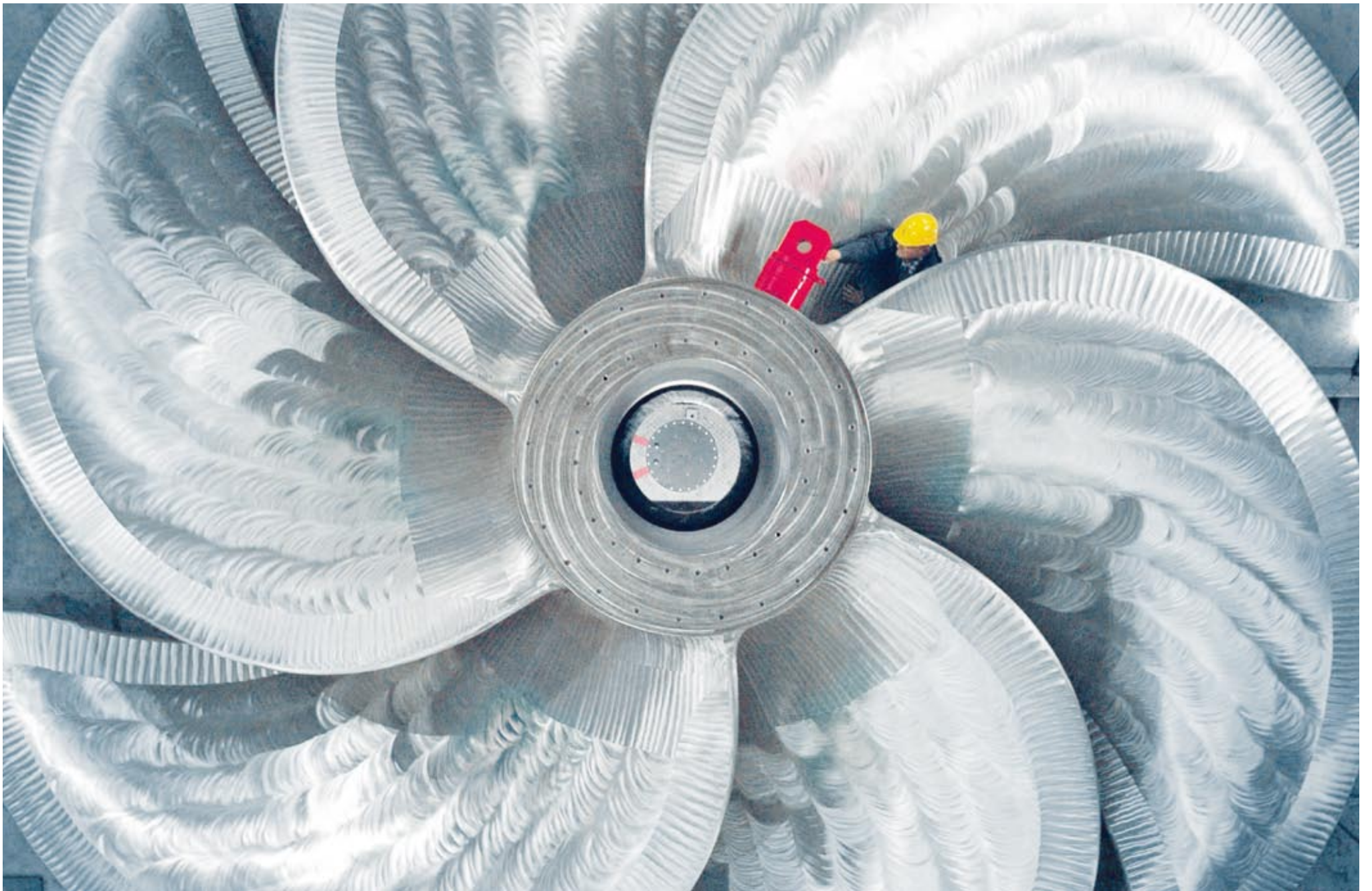
THE PORT **n**L TO SUCCESS



A captain trusts the capabilities of his ship unconditionally. With approximately 100,000 HP it is a symbol of pure power. Nevertheless it glides with impressive dynamics through the oceans and can be manoeuvred precisely despite its gigantic size.

An excellent symbol for the portal milling machine FZ 42 from Zimmermann. Powerful, dynamic, precise – and one hundred percent reliable. Characteristics, which are also for you, as captain of your company, the key to economic viability and success.





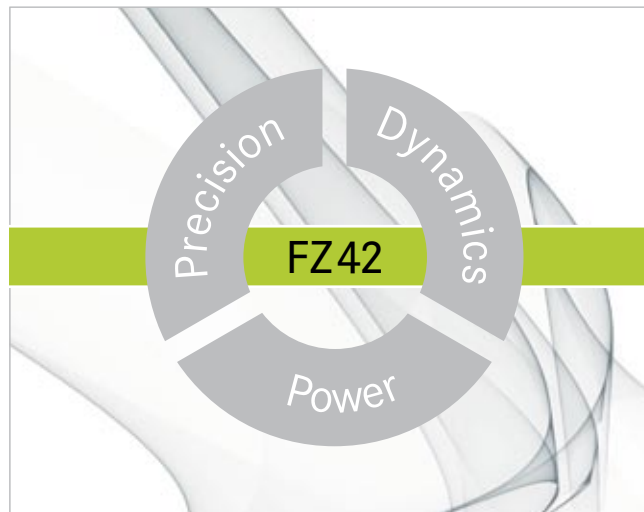
DYNAMICS, POWER AND PRECISION

A well-rounded trio of characteristics, a balanced combination of optimal conditions for the most demanding user of portal milling technologies. With the new generation of the FZ 42, it is now possible for this dream to become reality.

An enormously powerful portal milling machine which offers flexibility and is able to machine all heavy materials like steel, cast iron, or titanium.

At the same time the FZ 42 is a typical, high dynamic HSC machine. Feed rates and accelerations, as they are known within a huge working dimension only in compact machining centers, are now being performed in a large scale. Of importance is however, the end result. Users of the FZ 42 require high precision and surface quality.

In order to successfully combine these factors in an economic concept, Zimmermann explored new ways. Starting with an innovative, high precision option leading up to a spindle change system MuST® for complete processing in one clamping, the FZ 42 embodies a “state of the art” portal milling technology.





If your job doesn't allow for any compromises, the FZ 42 is the perfect machine for you

The FZ 42 is specialized to machine all heavy materials with high dynamics and, at the same time, achieve the highest accuracy. These characteristics make it the ideal machine for a wide range of applications in many different environments and for different applications.

- In the tool and die industry, precision machining of large-size press and stamping dies.
- In the mould making industry, especially in connection with machining large moulds and parts that require perfect surface quality.
- In the aircraft industry with big heavy pieces of steel, titanium, or demanding alloys.
- In the energy sector with large turbines.
- In the ship building industries in the processing of flaps, shafts, propellers, body parts



Complex moulds and dies from heavy materials.



Complete processing of cast iron and steel of large work pieces with highest accuracy and perfect surface quality for the machine tool industry.



Heavy roughing operations even in the tool and die industry for perfect dies and moulds.



Heavy roughing and finishing operations of titanium in one set-up utilizing the spindle exchange system MuST®.



Highest flexibility for drilling and milling operations.

Materials

- Titanium
- Steel
- Cast iron
- Light alloys



Overhead, weight-optimized and structurally rigid portal moving in the X-direction, for high dynamic performance and precision.

Rugged vertical slide with high bending strength for large Z-ranges

Milling head VH 6 with MuST® spindle change system

Backlash-free portal drives on both sides well away from the dirt zone, guided on both sides and broadened basis for optimized stability.

Worktable made of cast iron with T-slots, permanently anchored to the foundations.

Completely enclosed protective housing through closed side walls, back wall and a front sliding door with large inspection windows.

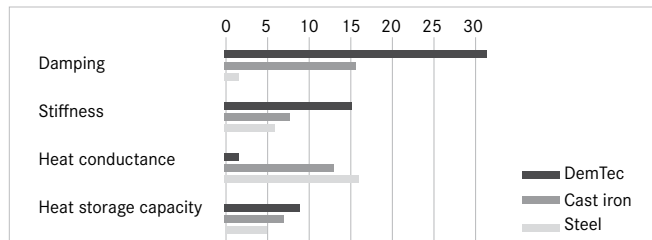
Compound-filled, trapezoidal side columns with large base.

The construction of the portal as a basis for an excellent milling machine

Portal milling machines are very versatile. The FZ42 is characterized by an excellent balance between extremely rigid design and very low moved masses. A for this class unique dynamic will be achieved due to the weight-optimization of the main assemblies as portal and Z-ram, in spite of its stiffness. The machine allows the machining of very large components with a very high cutting performance and an extreme accuracy.

The large travels and the large degrees of freedom of the rotary axes permit complete machining on a single setup. The harmonious balance between kinematics, drive technology and milling head design regarding geometry and rigidity leads to optimal dynamics and process quality. The result of this design is a unique combination of short machining times, high surface finish and highest cost-effectiveness.

Comparison of different materials for the side walls according to the most important criteria of functions.



Design of the side columns

To achieve an extremely rigid structure the side columns are made of welded and heat-treated steel and filled with fiber-reinforced special compound (DemTec). In this way, our long standing system supplier ensures easy assembly, adjustment, high long-term stability and practically no need for maintenance. The design ensures the highest possible vibration damping, oscillation and temperature stability so that high dimensional accuracy and surface quality can be achieved. The especially rigid structure ensures extremely good dynamic performance and excellent contour accuracy and is thus extremely clearly superior to conventional cast iron or welded steel constructions. The trapezoidal shape of the columns enlarges the base and is thus more stable against shear force, which appear while accelerating or while roughing.

The Portal

The overhead dynamically driven gantry portal enables 5-axis simultaneous machining and 5-sided machining with the highest precision and speed. The low moving masses ensure excellent dynamic performance.

Mechanical construction

To achieve the ideal machine structure, the dynamically rigid design was optimized in multi-level series of FEM calculations. Separate FEM calculations are carried out for each type of machine and each individual size. Analysis of the design is carried out using the latest mechatronic overall closed-loop simulation approach, taking into account the motors, drives and control system parameters.

Modular concept

From the start, the basic construction of the new FZ42 was designed to make it as easy as possible to adapt all the basic parameters to the customer's specific demands. Travels, work areas, options and much more can thus be configured flexibly.

The result of this design is a unique combination of performance, short machining times, flexibility, highest surface quality surface finish, excellent rigidity over a long period of time and thus all-in-all extremely cost-effective.

Highlights

- Rigid design of the portal with overhead driven portal and low moved masses
- Very large working areas with 10 000 x 5 000 x 2 000 mm and more
- High Dynamic Concept for machining of heavy materials with highest precision
- 5-axis and 5-side machining
- Linear feed rate until 60 000 mm/min.
- Large swivel ranges within the rotation axes
- Slim milling head with spindle changing system
- Optional high accuracy package

The intelligence is in the detail

Modularity

The FZ42 is extremely variable regarding working area, milling head options, control systems and -types as well as accessories and options and can be adapted individually to the customer's requirements.



Drive system

The FZ42 is equipped with very generously dimensioned mechanical components in the drive system with over-dimensioned motors and gear boxes.

It is a simultaneous 5-axis machine with a portal driven on both sides. The X-, Y- and Z-axis are equipped with highly precise, pre-loaded circulating roller bearings, double linear guidings in the X-axis as a standard, ensuring excellent linear movement of the portal.



The FZ42 is as a standard equipped with powerful rack and pinion drives in all three axes with each two electronically preloaded servo motors in X- and Y-axis and one in the Z-axis.



Compensation

The volumetric compensation system VCS-5ax from Siemens in the latest version of the 840D control system supports optimal compensation possibilities. The whole working area of the machine can be fully measured cost-effective within one day by means of a laser measuring system with all 24 possible errors. With very little effort the machine can be recalibrated once a year to compensate for errors and thus to restore the original accuracy both quickly and reliable.



Control systems

With the FZ42 different control systems can be combined (Siemens, Heidenhain, Fanuc, others on request). Therefore the machine can be integrated highly flexible into the production environment. A large number of functions like "Look ahead", stick-ship limitation, spline interpolation as well as 5-axis and HSC-machining are now included as a standard.

An almost unlimited number of options such as measuring probes, tool measurement and measuring software are available on request.



Protection against dirt

Due to its design the portal design is resistant against dirt, since all key components are positioned well away from the area where dirt can accumulate. Guides, drive and measuring systems are covered with dust-proof bellows to protect them from external influences. A wide range of systems for providing a compressed-air barrier, protective covers and extraction devices and systems are available.

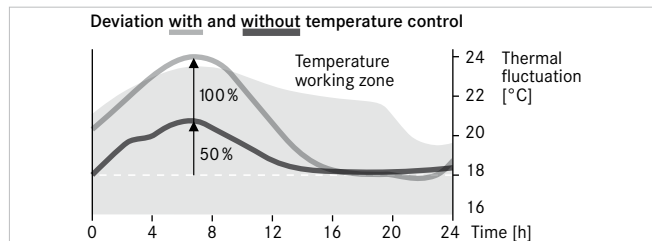
The three linear axis X, Y and Z are equipped with direct Heidenhain length measuring system. The measuring systems are pressurized to protect them against contamination. The rotary axis A and C are equipped with high-resolution angular measuring systems.



Maximum accuracy with the optional high accuracy package

The already high precision of the standard FZ 42 can be topped by means of the high accuracy package.

Due to the great masses of its side columns filled with fiber-reinforced special compound (DemTec) the FZ 42 is already a very precise machine compared with others of its class – and this can be enhanced even more. By means of specific measures, the physical accuracy of the machine can be increased in order to minimize potential environmental influences or those of peripheral equipment.



The grey surface shows the temperature sequence in a normal production hall during the course of a day. The grey curve shows the accuracy of the machine without temperature control. Making use of the temperature control this deviation can be reduced by 50%.

Optimization of temperature stability

Decisive for the precision of a milling machine is its temperature stability. For large machines without any housing a temperature control is nearly impossible. Already thermal fluctuations during a day add up in accuracy deficiency. Zimmermann solves the problem with a sophisticated temperature control system inside the machine.

Components

Temperature control

- Temperature control of the structural machine parts by means of cooling ducts in the portal and the Z-slide
- Independent cooling circuits for the A-axis, the C-axis and the spindle
- Temperature controlled hydraulic aggregate with cooling unit

Mechanical accuracy

- Grinded or scraped surfaces for the guideways at the Z-slide and the side columns
- Grinded base plates between side columns and portal as well as grinded cross slide
- High accuracy of components through smoothing, trimming and heat treatment during the manufacturing process

Additional features

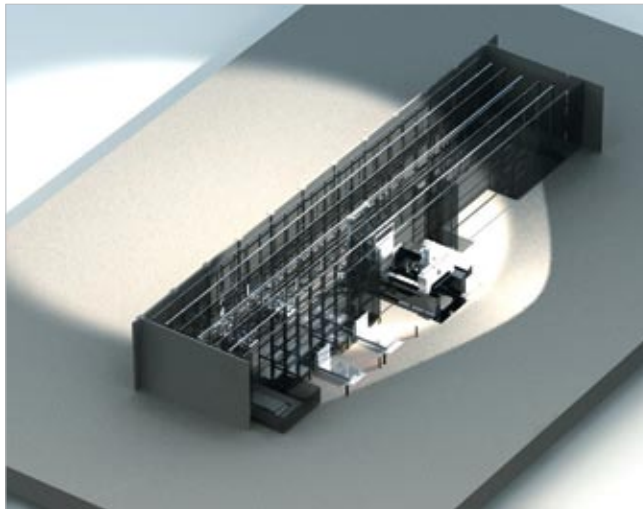
- Measuring system of the A- and C-Axis with double pitch
- Higher assembly precision
- On-site fine tuning

Individual system solutions for every application

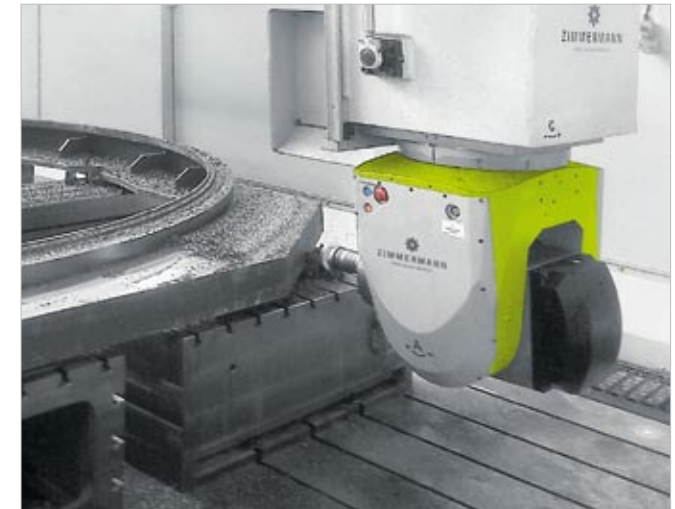
In addition to the basic machine itself, Zimmermann offers turn-key solutions to satisfy all additional technical requirements. We apply our technical expertise and tailor-made project management to the task: from the initial idea to the end of the project. Zimmermann supplies everything from a single source.

Examples are: Integrated production solutions with workpiece handling systems, tailor-made for individual part dimensions and manufacturing processes.

Projectmanagement and integration of the portal milling machine in a fully automatic flexible manufacturing system (FMS) and chain-linking to preceding and following manufacturing steps.



Increase of the flexibility for the manufacturing of cubic and round workpieces within one manufacturing cell.



The Milling Head VH 6 – Extreme in every respect

Extremely strong, extremely fast, extremely accurate, extremely flexible – and last not least extremely economical. The VH 6 designed by Zimmermann is the ultimate 2-axes milling head.

Pure force

For really tough milling operations you need pure power and an enormous torque. The drives completely based on zero-backlash torque motors ensure maximum dynamic behaviour and agility.

To assure this force transmission while at the same time keeping the head dimensions relatively small, the torque drive is provided with a reduction gear. This results in a slimmer head with a small interference contour in the lower area which is the only one of its kind on the market. Through the high drive torques, the rotary axes are perfectly suited for use as simultaneous axes or, closed loop controlled, they can be used for maintaining position. Moreover a hydraulic clamping of both axes is possible. Both drives are liquid cooled. The C-axis designed according to the Thermosandwich- prinzip® has a power cooler and a supplementary precision cooler.

Economy of time through torque drives



Besides the high torques this drive stands out due to extreme rapidity, high axial acceleration and hardly any wear. The advantages of this type of drives are evidenced particularly when the application requires a lot of repositioning and tool changes.

There are many milling strategies that need frequent movement of the milling head and at the same time the numerous modifications of the setting angle of the rotary axes. A fast milling head can massively reduce the overall machining time. Even more decisive, however, is that the machining time for normal 5-axis-machining requiring a frequent swivelling of the A-axis for about 30° is reduced by 15% up to 25%.

Fields of application

The unique combination of force, dynamics and flexibility makes the VH 6 ideally suitable for all fields of application where maximum performance is required. The VH 6 is specially designed for High Performance Cutting (HPC) of particularly hard and tough materials such as titanium, steel or cast iron. Its versatility makes it outstandingly economical and user friendly.

Maximum volumes

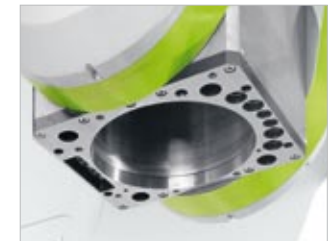
The responsiveness, agility and speed of the digital drive, coupled with the enormous driving force of the milling head and the right choice of spindle, lead to chip removal volumes in all materials, such as have never been seen before.

Greatest flexibility

A milling head for 5-sided machining of any materials, from roughing to superfinishing – and that under extremely economic conditions in one setup. This flexibility is achieved using the innovative Multiple Spindle Technology (MuST®) from Zimmermann.



Despite of extremely strong drives and the integrated spindle change system the VH 6 stands out by its extremely slim design and its minor interference contour in the decisive lower area of the fork.



One for all – due to the multiple spindle technology MuST® the VH 6 is extremely flexible and economical.



The MuST® Milling Head

The VH 6 milling head is equipped with Zimmermann's innovative Multiple Spindle Technology (MuST®). This system offers several key advantages:

- Roughing and subsequent finish machining of heavy materials such as titanium, steel and cast iron can be carried out on a machine in one setup. This reduces setup times and thus also production costs.
- Investment in a second machine is unnecessary.
- Potential for doing additional tasks other than milling in the same setup.
- Changing the spindle instead of the milling head offers advantages in terms of repeatability, reliability (fewer interfaces) and cost.
- The high finish machining precision of the machine is not affected by the HSC technology used for rough machining.

Modular system

- **Stage 1 – Manual (Standard)**
One spindle permanently mounted in the milling head. This variant is for rare spindle changes.
- **Stage 2 – Semi-automatic spindle change (Optional)**
A spindle change box is positioned by the operator by means of a crane. The economic solution for occasional spindle changes.
- **Stage 3 – Fully automatic spindle change (Optional)**
A spindle deposit stored in the side wall of the machine is automatically driven in the change position, the change is fully automatic. This is the solution for frequent spindle changes.

MuST® Milling spindles

There are four MuST® milling spindles of different specifications available for all types of applications: The spindles are equipped with vibrations sensors in order to avoid spindle damages e. g. due to unbalanced tools. The universal and finishing spindles are equipped with a cooling aggregate for water cooling and a temperature sensor for the bearing.

The mobile spindle change box for semi-automatic spindle change (option).



Spindle stored in the mobile spindle change box, ready for semi-automatic change.



Spindle station embedded in the side wall for the fully automatic spindle change of up to three spindles.

The machine is one side of the coin – service the other Zimmermann offers the complete package

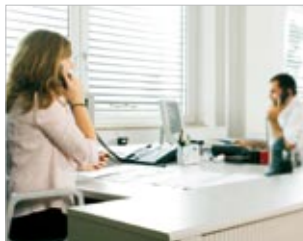
Anyone who purchases a portal milling machine from Zimmermann can depend on a reliable partnership in the long term. The professional support starts with a comprehensive and substantiated consulting at the time of investment and is being continued with a cooperative service during the complete life time cycle. Thus, the economic success of both partners is being secured in the long run.



Creative, unbureaucratic and cooperative project management together with the customer.



The high competence of the Zimmermann experts offers individual, customised and economic solutions.



The service-hotline is available for our customers even out of the regular working hours, in order to solve production relevant problems straight-forward.



Comprehensive service at site for maintenance, overhauling, retrofitting and repairs of Zimmermann machines. Ongoing support during the complete machine life time.

Our Service – Your Advantage

Benefit from numerous service packages for the maintenance and the increase of productivity of your Zimmermann milling machine:

- Postoptimisation of the machine to improve the dynamic behavior by up to 15 %
>> **considerable improvement of the operating efficiency of your existing machines**
- Spindle and milling head repairs are being executed by the subsidiary Gimbal
>> **short downtime**
- Sophisticated remote diagnosis, on-line correction service, specific repair guide via webcam
>> **quick error description, for shorter stand-still times, higher productivity**
- Creative, unbureaucratic and cooperative project management together with the customer
>> **higher productivity**
- Automatic information by SMS in case of errors
>> **unmanned shifts with stand-by service are possible**
- Laser measuring and geometrical check of the machine, performance verification
>> **valuable proof of accuracy that could be used for the company certification**
- Preventive maintenance
>> **avoidance of unscheduled standstill of the machine**

FZ 42

Technical Data

Machine		FZ 42
Working ranges		
X-axis		3 000 – 40 000 mm ^①
Y-axis		2 500 – 5 000 mm ^①
Z-axis		1 000 – 2 000 mm ^①
Table size		
Length		3 000 – 40 000 mm
Width		2 500 – 5 000 mm
Height		350 mm
Table load		max. 20 000 kg/m ² ^③
T-slots (longitudinal)		18 ^{H12} (optional 18 ^{H8})
Distance between T-slots		250 mm
Feed drives		
Feed X-, Y-axis		up to 60 000 mm/min.
Feed Z-axis		up to 60 000 mm/min.
Acceleration of linear axes		up to 5 m/s ²
Accuracies²		
Positioning accuracy	X-axis	0,030 mm ^②
Positioning accuracy	Y-, Z-axis	0,020 mm ^②
Repeatability	X-axis	0,015 mm ^②
Repeatability	Y-, Z-axis	0,010 mm ^②

^① Other dimensions on request

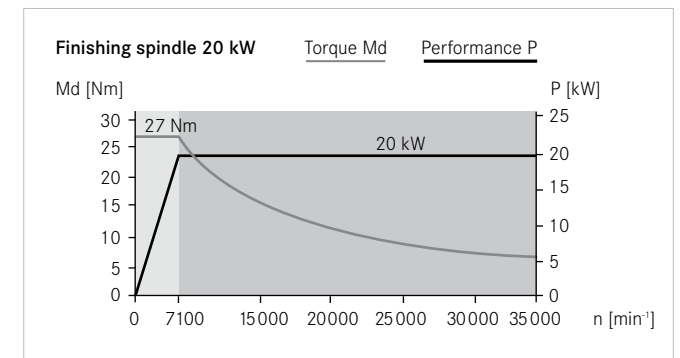
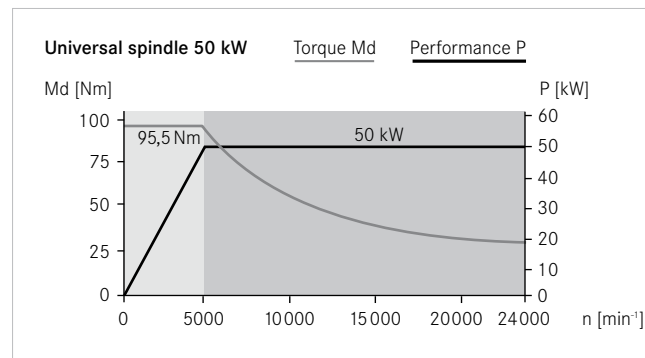
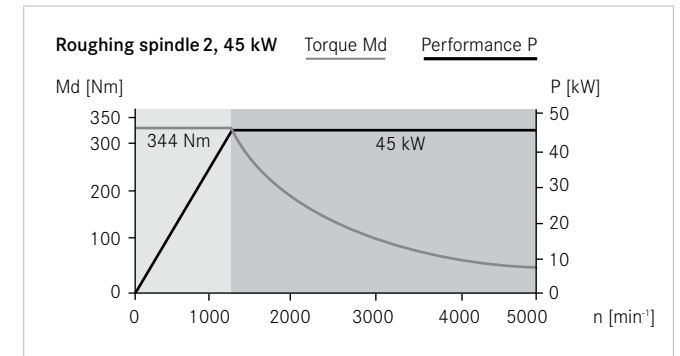
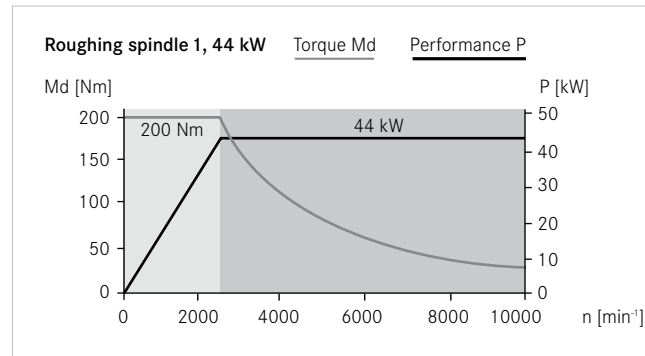
^② According to VDI 230 – 2 / DGQ 3441, based on basic machine, depending on the length

^③ Max. 15.000 kg/m², as reference for surface precision according to DIN 876

We reserve the rights to make technical changes

Milling spindle	Roughing spindle 1	Roughing spindle 2	Universal spindle	Finishing spindle
Performance S1 max. (100% ED)	44 kW	45 kW	50 kW	20 kW
Torque S1 max. (100% ED)	200 Nm	344 Nm	95,5 Nm	27 Nm
Max. speed	10 000 rpm	5 000 rpm	24 000 rpm	35 000 rpm
Constant performance	as from 2 100 rpm	as from 1 250 rpm	as from 5 000 rpm	as from 7 100 rpm
Tool holder	HSK 100 A	HSK 100 A	HSK 63 A	HSK 50 E
Swiveling axis – spindle nose	420 mm	420 mm	300 mm	300 mm
Tool clamping	spring clamp	spring clamp	spring clamp	spring clamp
Tool release	hydraulic	hydraulic	hydraulic	hydraulic

Milling spindle performance diagram



Milling head

VH 6

Swiveling range	
A-, C-axis	± 100°, ± 360°
Performance	
A-, C-axis torque	1 350 Nm
A-, C-axis clamping	3 000 Nm
Feed rate A-, C-axis	120°/s
Accuracies²	
Resol. of measuring syst. A-, C-axis	0,0001°
Positioning accuracy A-, C-axis	15"
Repeatability A-, C-axis	10"

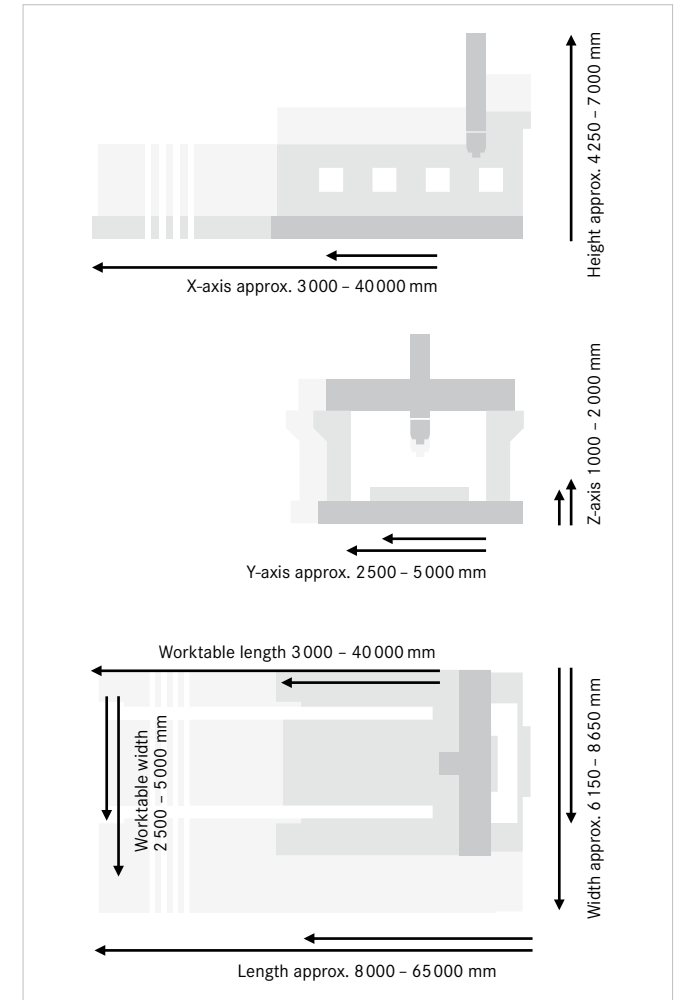
Equipment options

FZ 42

Simultaneous A-axis	■
Simultaneous C-axis	■
A, C-axis clamping	■
Control cabinet air-conditioning	■
Housings	■
Minimum quantity lubrication	■
Coolant system (internal, external)	■
Toolchanger Pickup 14, 28 positions	■
Chain magazine 80, 120 positions	■
Shelf magazine 200 positions	■
Measuring probe	■
Tool measurement	■
Special clamping	■
Special painting	■
Chip conveyors	■
Dust extraction	■
Clamping fixtures	■
Clamping table variants	■
Partitioned work area	■

■ Standard ■ Optional

Dimensions



All dimensions shown are examples for the FZ 42 in minimum or maximum design configurations. Special sizes deviating from this are also possible.




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