COMBINED DEEP DRILLING AND MILLING CENTERS

SAMAG
MACHINE TOOLS

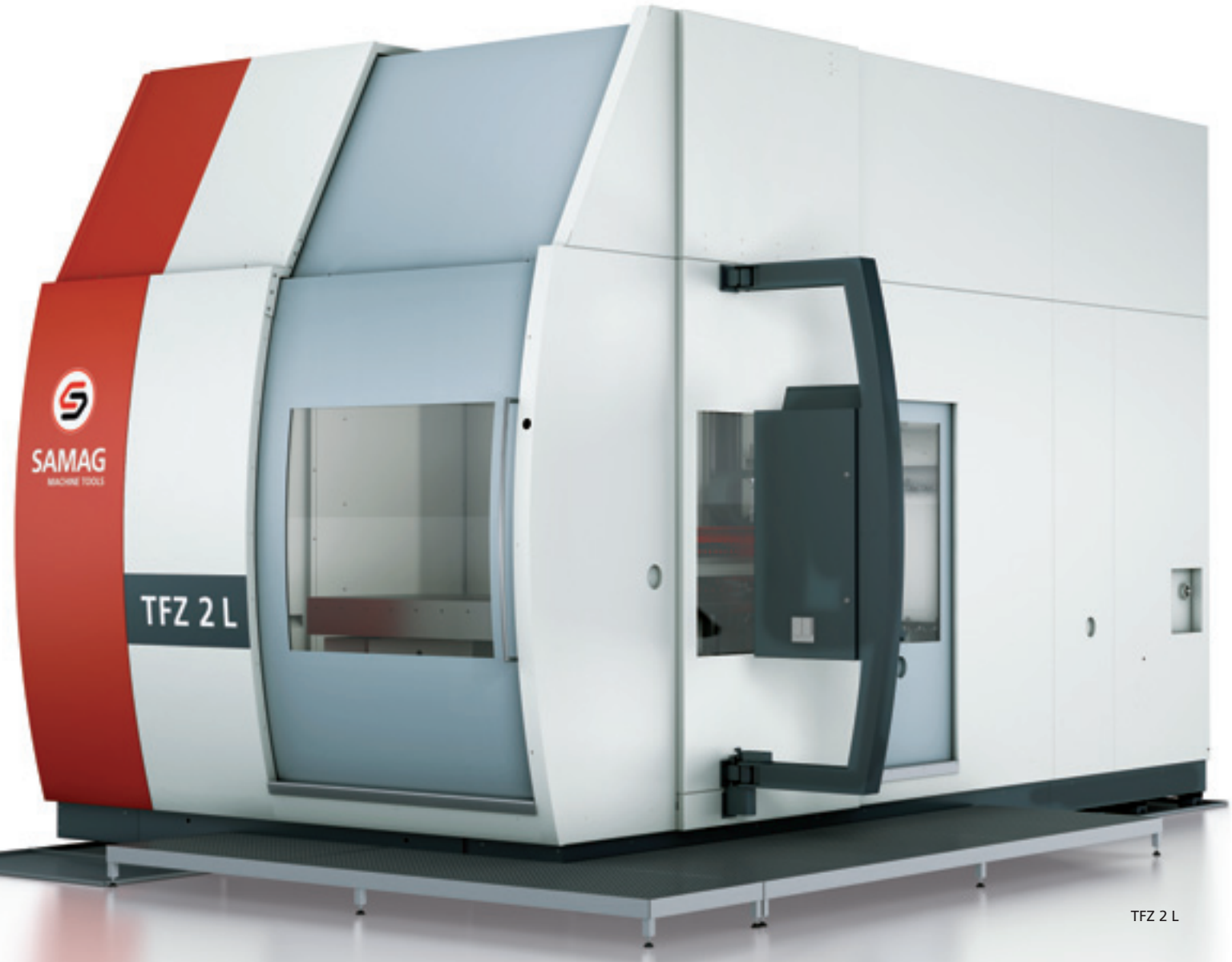
DIVERSE TASKS REQUIRE FLEXIBLE MACHINE CONCEPTS, SPECIAL QUESTIONS REQUIRE INDIVIDUAL SOLUTIONS AND EFFICIENT PRODUCTION REQUIRES SECURE PROCESS CHAINS, IN SHORT: TFZ FIT 2 TASK

With the very successful and established TFZ series, SAMAG has been a guarantor for task-specific solutions and customized machines for many years. At the same time, the well-designed machine structure of the TFZ allows for optimum deep drilling and highly dynamic milling with only one clamping and thus efficiency par excellence. The unique design principle assures optimum accessibility at any time, minimum distance between swivel bearing and machining point and extremely stable tool guiding for high-precision work, even in case of high transverse forces.

No matter on which aspects of the manufacturing process you place your emphasis, we are able to adjust our TFZ machine accordingly in technical terms and you can be sure that "your" TFZ solution will just fit perfectly, today and in the future.

TFZ – FIT 2 TASK

PERFECTLY EQUIPPED FOR ANY TASK! THE TFZ SERIES OFFERS INTELLIGENT SOLUTIONS FROM A TO Z.



TFZ 2 L

HOW THE FIT 2 TASK CONCEPT WORKS:

In addition to the workpiece size, the material and the machining time, many other factors play a decisive role when designing a TFZ machine. It is particularly important to precisely define the future machining tasks in order to optimize performance. If the machine is, for example, mainly used for deep drilling processes, or if an increased milling performance is required, extremely low tolerances must be complied with, or everything is important at once …

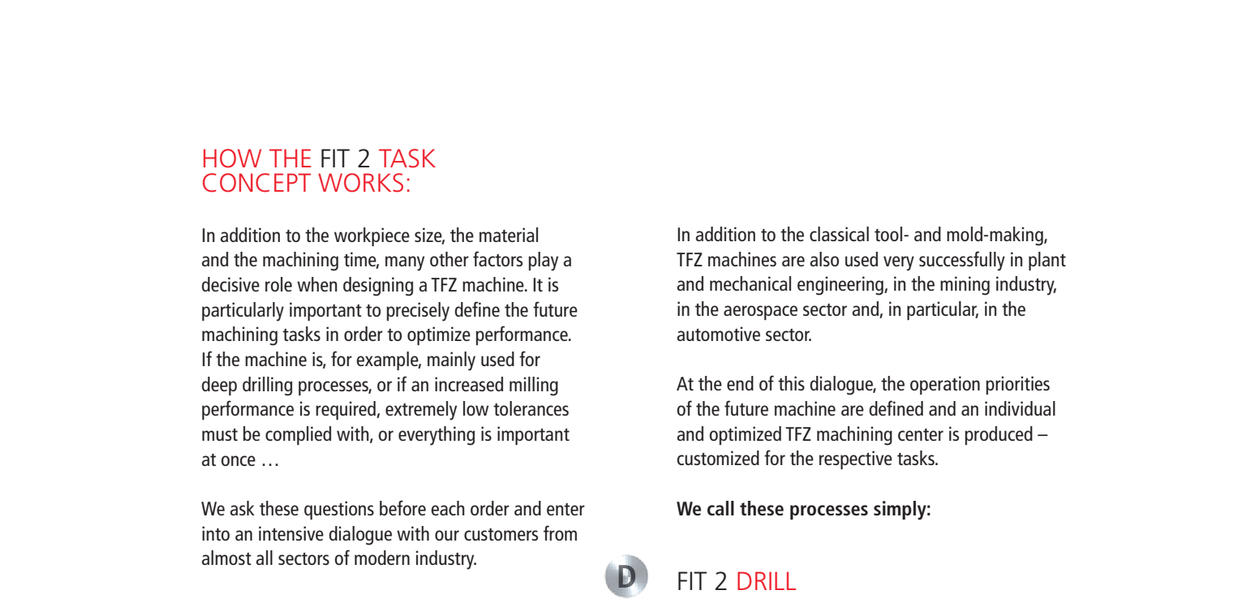
We ask these questions before each order and enter into an intensive dialogue with our customers from almost all sectors of modern industry.

In addition to the classical tool- and mold-making, TFZ machines are also used very successfully in plant and mechanical engineering, in the mining industry, in the aerospace sector and, in particular, in the automotive sector.

At the end of this dialogue, the operation priorities of the future machine are defined and an individual and optimized TFZ machining center is produced – customized for the respective tasks.

We call these processes simply:

- FIT 2 DRILL
- FIT 2 MILL
- FIT 2 ACCURACY



TFZ 4

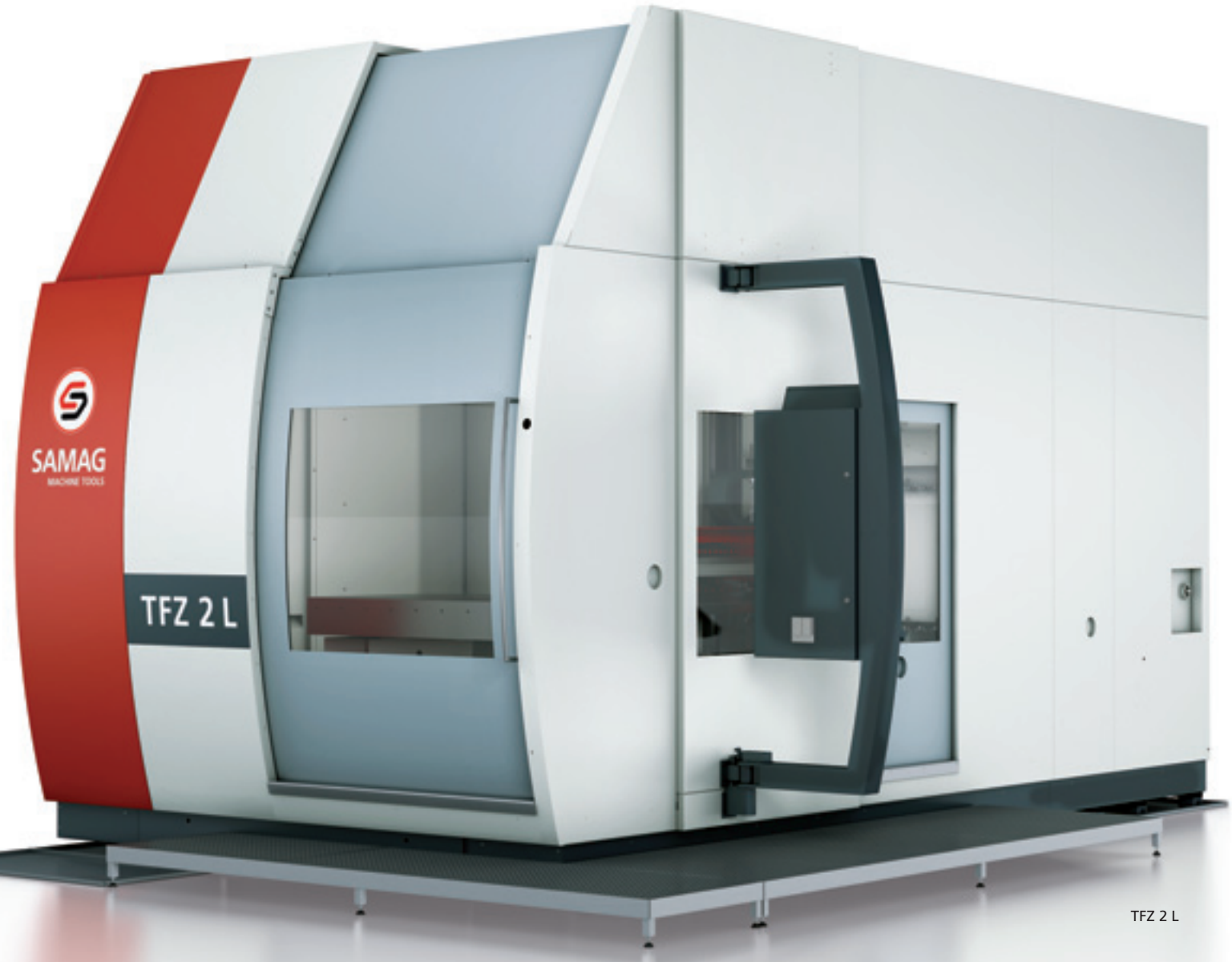
TFZ 3 L

TFZ 3

TFZ 2

TFZ – FIT 2 TASK

PERFECTLY EQUIPPED FOR ANY TASK! THE TFZ SERIES OFFERS INTELLIGENT SOLUTIONS FROM A TO Z.

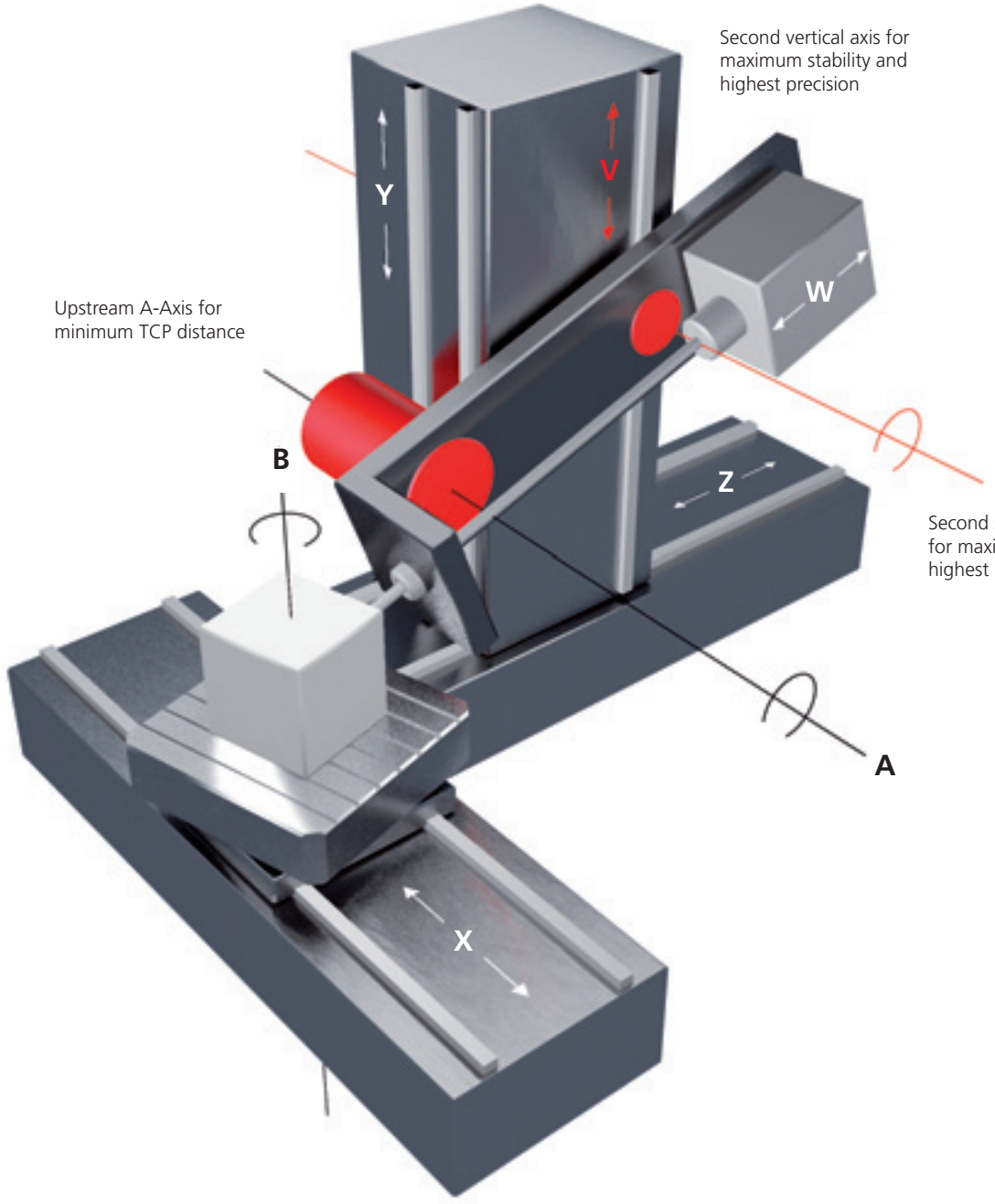


TFZ 2 L

POWER

POWER TOWER DESIGN
- Clear separation of all linear axes
- Minimum distance between swivel bearing and Tool-Center-Point (TCP distance)
- Minimum transverse forces
- Maximum rigidity

DOUBLE BALL SCREW DRIVE
- Drilling beam with 2 swivel bearings
- Drilling beam triple guide
- A-Axis, Swiveling ± 30°



TOWER DESIGN

STABILITY AND HIGHEST PRECISION DO NOT COME ABOUT BY CHANCE. THE PERFECTLY DESIGNED AXIS CONCEPT ALLOWS MINIMUM TCP DISTANCE AND MAXIMUM MACHINE RIGIDITY.

The POWER TOWER DESIGN is characterized by the compact design and the extreme rigidity. All components in the flow of forces are optimized statically and dynamically in every detail and thus ensure perfect work results. The clear separation of all linear axes guarantees permanent dimensional accuracy of all axis drives and sustainably prevents the overlapping of tolerances and their increase resulting from this.

Thanks to the large base of the Y-tower and the unique DOUBLE BALL SCREW DRIVE, we always achieve an optimum support of the drilling beam in the TFZ and, at the same time, an extremely short distance between swivel bearing and Tool-Center-Point (TCP distance) for maximum rigidity under high transverse forces. Furthermore, it is possible to efficiently produce very small workpieces in the 4-sided machining thanks to the large operating range.

Another advantage of the POWER TOWER DESIGN is the almost unlimited accessibility to the workpiece and the easy crane loading from the top.

POWER TOWER DESIGN KEEPS ITS PROMISES!

POWER TOWER DESIGN, the compact Y-tower, the geometry stands for stability and dynamics

TFZ 2 – even the smallest machine of the series has loading doors which open upwards, for an easy crane loading

DOUBLE BALL SCREW

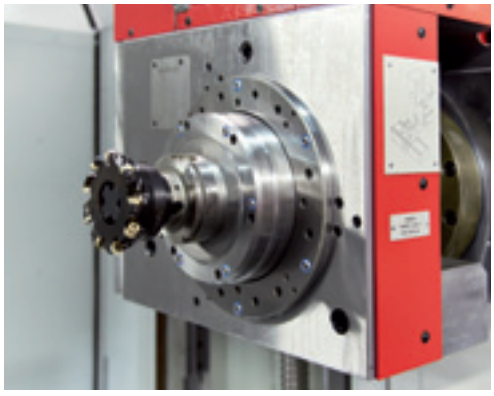
TWO IS BETTER THAN ONE! THIS IS WHY WE ATTACHED THE DRILLING BEAM TO TWO BALL SCREW DRIVES. THUS, RIGIDITY AND ACCURACY ARE UP TO 27 TIMES BETTER THAN IN CASE OF TRADITIONAL DRIVE CONCEPTS WITH OVERLAPPED Z-AXIS.

The particularly short distance in case of the unique DOUBLE BALL SCREW DRIVE by SAMAG significantly increases the rigidity and thus the machining accuracy immensely. Compared to the traditional drive concepts, the TFZ concept is up to 27 times stiffer and more precise.

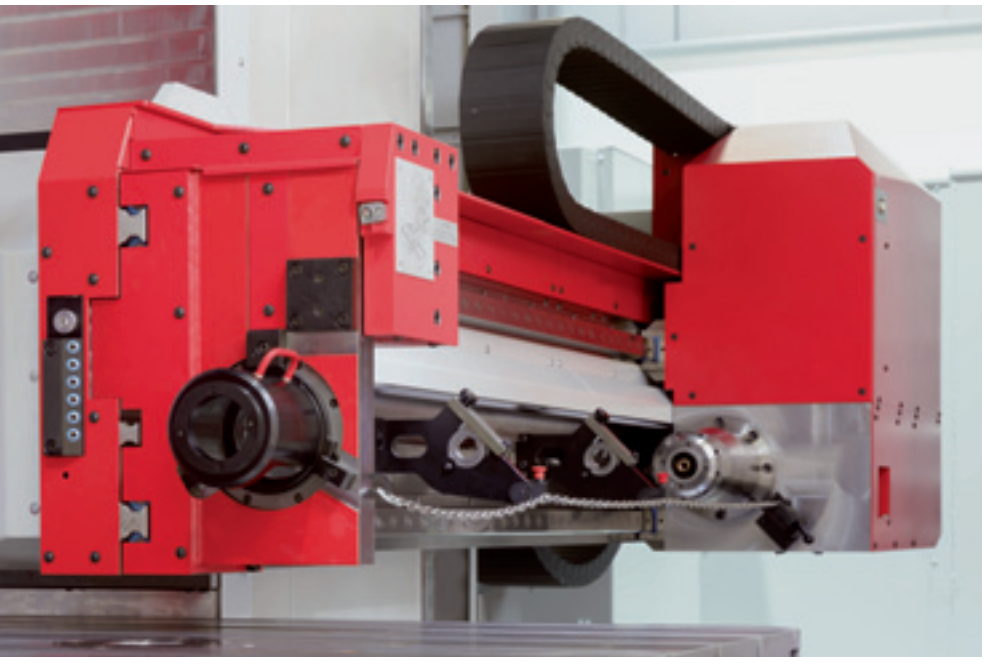
Reduction of the vibrations at the drilling and milling unit due to DOUBLE BALL SCREW DRIVE and POWER TOWER DESIGN, this is how it works:

- Second ball screw drive with additional guide and second swivel bearing on the rear rail (V)
- Upstream ball screw drive of the X-Axis, which is particularly strong and guided twice
- Minimum distance (*l*) between tool center point (TCP) and front swivel bearing (A)
- 1-spindle concept ensures short and stable tools with excellent accessibility to the workpiece and the machining point
- Generously dimensioned working spindle in order to achieve maximum performance parameters
- Rigid milling spindle with additional patented support
- Variable steady rest positioning system in order to increase the drilling accuracy with spacer between spindle and steady rests

TOWER POWER DESIGN & DOUBLE BALL SCREW DRIVE
Y-Tower or drill stands with deep drilling unit



1-spindle milling unit

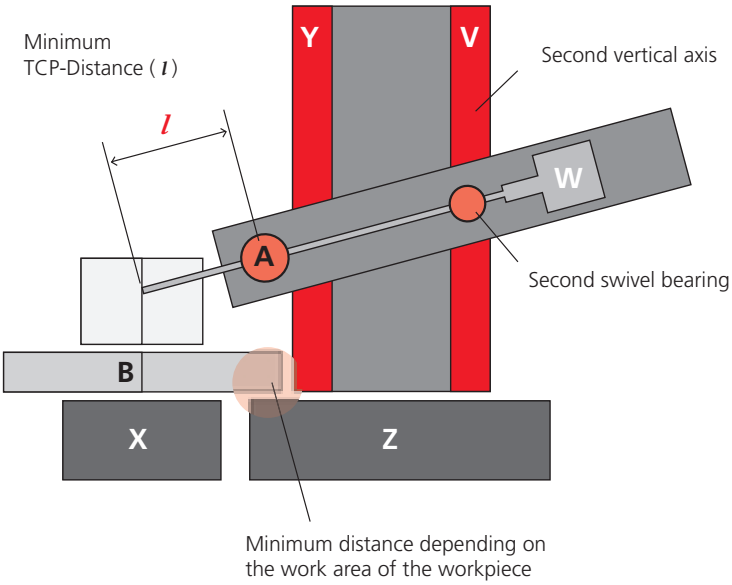


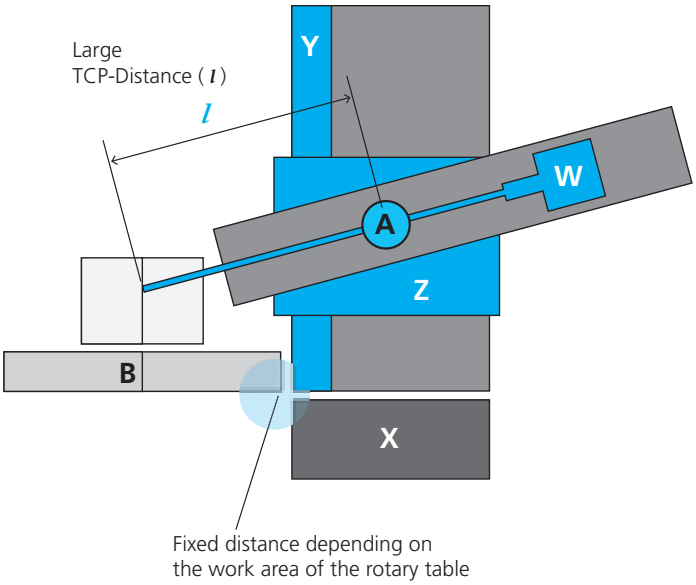
Deep drilling unit with tried and tested steady rest trailing chain, for an easy, quick and safe tool change

DRIVE

$$\Delta_{TCP} = \frac{F \cdot l^3}{3 \cdot E \cdot I}$$

"The deflection (Δ) of the Tool-Center-Point (TCP) by the machining force (F) depends on the length (*l*) of the distance between TCP and front bearing axis (A) in the cube (l^3). In relation to the bending rigidity (E · I)"
Or: the shorter *l* the smaller Δ and the higher the precision!

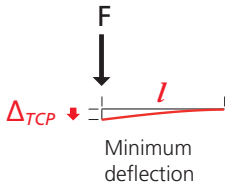


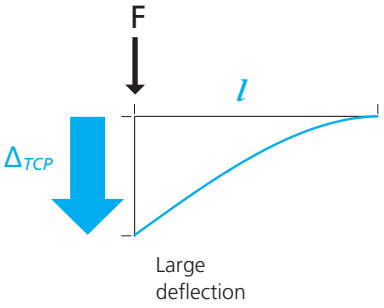


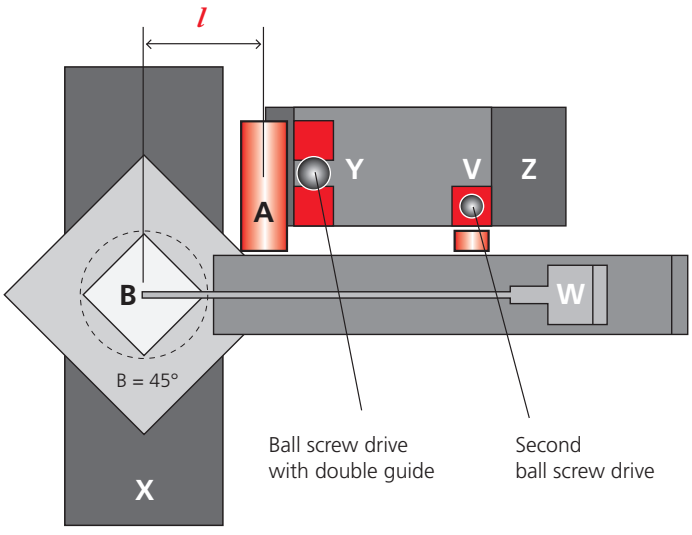
DOUBLE BALL SCREW DRIVE with POWER TOWER DESIGN

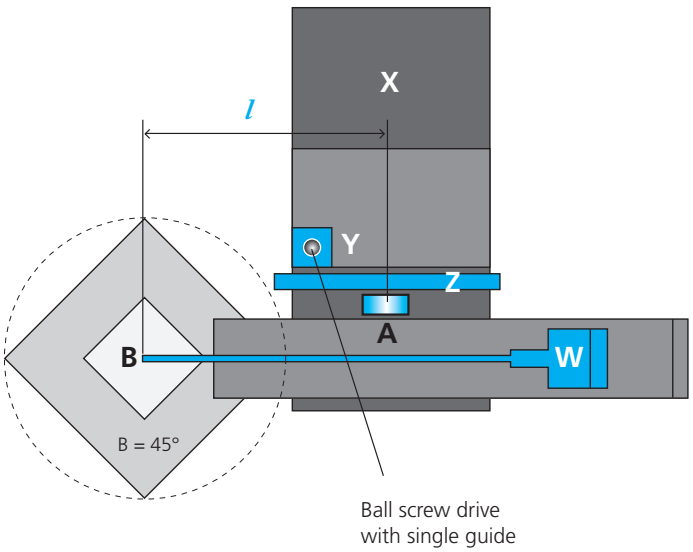
VS

Traditional drive with overlapping Z-Axis



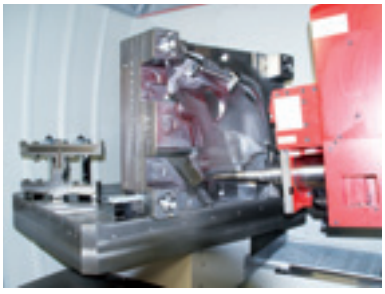






EASY ENTRY ARCHITEC

TFZ 4 with workpiece, photo Schneider Form



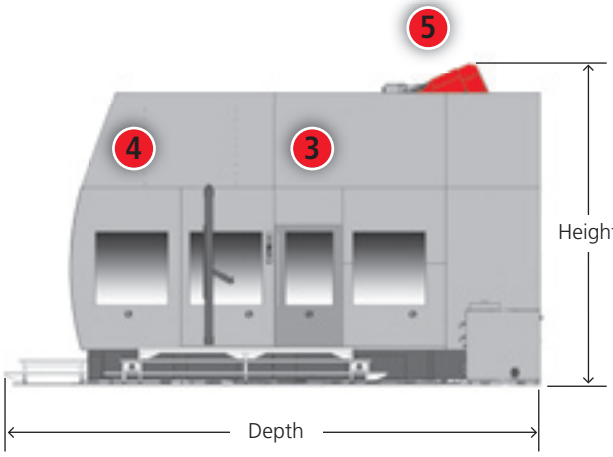
Milling processing on TFZ

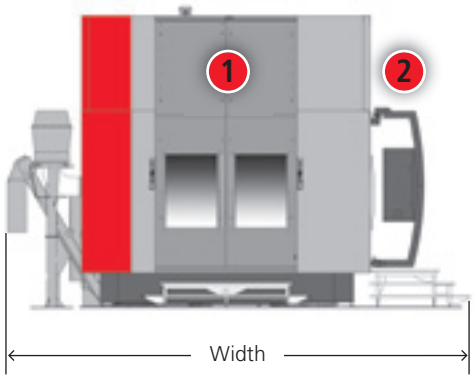
Swiveling control panel, inspection window towards the working area

WE HAVE BEEN BUILDING MACHINES FOR 140 YEARS, SO WE KNOW WHAT IS IMPORTANT FOR OPERATION AND MAINTENANCE: THE EASY ACCESS AND WELL-DESIGNED ERGONOMICS!

BEST POSSIBLE ERGONOMICS FOR OPERATION, LOADING & MAINTENANCE

- Loading doors open front and top at the same time for smooth crane loading
- Wide sliding doors as access points to the working area
- Additional inspection windows for a maximum overview
- Tool magazine and tool rack arranged inside for a quick retooling
- User-friendly service accesses for media supply and drives

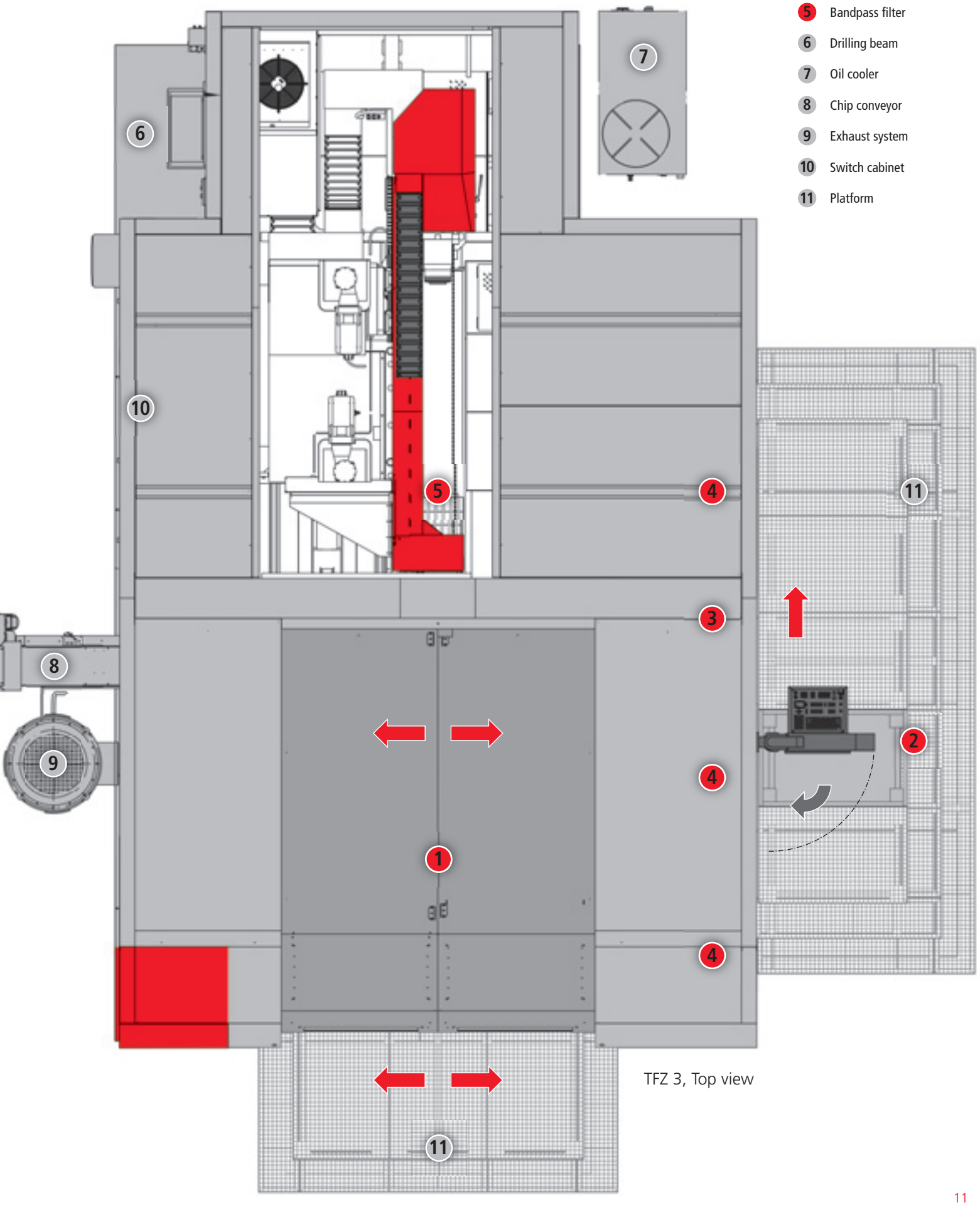




Series		TFZ 2			TFZ 2 L			TFZ 3			TFZ 3 L			TFZ 4		
		Width	Depth	Height	Width	Depth	Height	Width	Depth	Height	Width	Depth	Height	Width	Depth	Height
Floor Space	[m]	5.70	8.00	4.05 [1)]	6.30	8.10	4.30 [1)]	7.70	8.90	5.10 [1)]	9.00	10.00	5.70 [1)]	10.60	10.90	5.80 [1)]
Weight [1)]	[t]	24 – 26			29 – 31			48 – 51			55 – 58			71 – 74		

1) Depending on the equipment, all values are approximate

TURE



TFZ 3, Top view

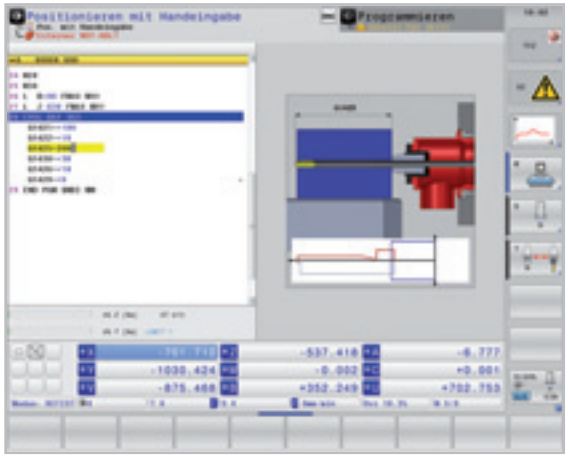
Video:
"QUICK CHECK
KINEMATICS
in action"

https://www.youtube.com/watch?v=wEVTIQBMi-o

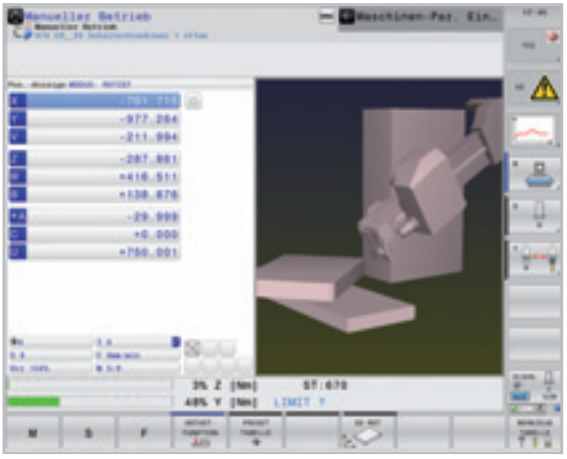
QUICK CHECK

TRUST IS GOOD, CONTROL IS BETTER! WELL-DEVELOPED PROCESS MONITORING AND SAFETY CONCEPTS FOR TFZ MACHINE DURING DEEP DRILLING AND MILLING!

Professional deep drilling cycles in the basic package for workshop programming and CAD/CAM application



Detailed and preventive collision detection with DCM



QUICK CHECK GUN DRILL

Eight basic machine cycles based on experience are included in the scope of supply of the machine and ensure a professional machining of the workpiece.

Specific groups for cross drilling cycles are available as an option. This facilitates the workshop programming and the programming of cross drillings due to the adaptation of the feed when reaching the cross bore. In this way, the tool life increases considerably.

QUICK CHECK SAFETY

Intelligent collision detection systems ensure long tool lives and prevent accidents and downtimes. Safety first is the basic rule of SAMAG.

Dynamic Collision Monitoring (DCM)
DCM is a preventive collision detection, which reacts before the machine components collide.

Gun Drill Equipment Detection (GNDED)
GNDED is based on sensors, which are able to identify mounted deep drilling equipment such as steady rests/drilling bush and to initiate a stop reaction of the machine in order to prevent collisions of the setups.

3-dimensional Acceleration Detection (3D-ACCD)
A 3D acceleration sensor immediately detects collisions and stops the machine. It also reacts with program and feed stop in case of tool breakage or wear.

SOLUTIONS

Setup for
kinematic measurement

Easily and quickly applicable cycle
for the kinematic measurement of the machine

QUICK CHECK KINEMATICS

Quick Check Kinematics (QCK) stands for the quick check of the kinematic chain during the machining process.

Why is QCK important?

During the life cycle of each machine, there are variances due to external influences such as temperature or internal influences, i.e. geometric changes in the course of maintenance works. These provoke deviations of the TCP and as a consequence also inaccuracies at the workpiece.

QCK counteracts this effect. Automatic, easy, quick, intelligent and precise measurement as well as the compensation of the kinematic chain ensure a high degree of precision and stability during the machining process.

Control panel with control, Heidenhain TNC 640
(special network equipment for the workshop area,
allows parallel working)

TFZ – FIT 2 TASK

DO YOU NEED DEMANDING AND EFFICIENT DEEP DRILLING? DO YOU NEED POWERFUL AND DYNAMIC MILLING? DO YOU NEED HIGHEST PRECISION AND BEST QUALITY? THEN YOU NEED: TFZ WITH FIT 2 TASK!

FIT 2 DRILL

- High machine rigidity allows the utilization of the performance limits of the single-lip deep drilling
- Provision of the necessary cooling lubricant, emulsion or oil, in coolant systems with process-optimally dimensioned high-pressure pumps and filters
- Quick-change systems for setup preparation during production time
- Selected, customer-oriented in-house development of deep drilling cycles

FIT 2 MILL

- Intelligent basic structure of the machine with very stable drilling beam connection
- Extremely short distance between spindle nose and front swivel bearing for absorbing high transverse forces
- Reaching the machining point with short, stable tools
- Milling spindle with additional patented support/clamping
- Selection of generously dimensioned working spindles in order to achieve maximum performance parameters while maintaining long tool lives

FIT 2 ACCURACY

- Task-based machine configuration in order to reach demanding accuracy requirements
- Direct measuring systems in all axes
- Temperature control of thermally stressed components
- Compensation programs supporting the manufacturing process

Deep drilling with
single-lip deep drilling tools

Use of conventional drilling and
tapping tools, as well as milling tools

PERFORMANCE

Deep Drilling

- Precise tool guiding by means of drilling bush and moving steady rests
- Temperature control of the cooling lubricant
- Variable cooling lubricant design
- Perfectly dimensioned coolant systems and high-pressure pumps

Milling

- Gear spindle for high torque requirements
- Water cooling of the spindle component
- Thermal stability even at maximum speed
- Additional spindle support by means of positive locking in the milling mode

FUNCTION

- Milling and deep drilling of workpieces in 4-sided complete machining up to a mass of 40t
- Drillings in different solid angles in one clamping

PRODUCTION OPTIMIZATION

- Deep drilling and milling functionality reduces workpiece clamping and thus the setup time
- Modular principle with working area optimization in height, width and table size
- Large overhang from the table edge with spindle nose or drilling bush without loss of stability
- Quick job changes due to user-friendly, optimized interfaces as well as large tool magazine capacities
- 1-spindle concept ensures good accessibility to the workpiece with short and stable tools

PROCESS RELIABILITY

- Monitoring: flow rate, pressure, feed force and power consumption at the spindle
- Large selection of supplementary safety features (QCK, DCM…)
- Redundant axis safety systems
- Safety query for steady rests and chip absorber
- Additional cooling unit in the control cabinet, recommended at a room temperature above 40°C
- Short retooling times between deep drilling and milling due to special quick-change chip absorber

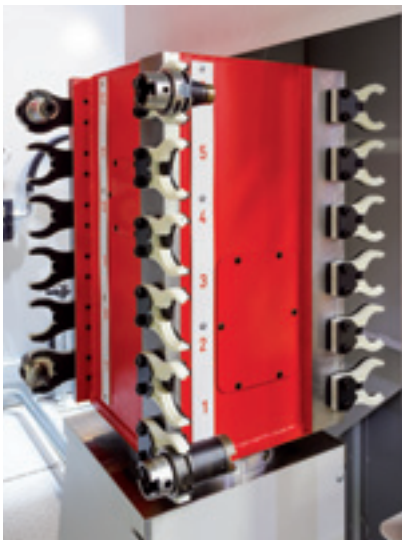
EFFICIENCY

- Use of modern drive technologies and energy-recovery modules, IE3 motors
- Software and hardware features such as sleep mode of units, cooling lubricant pumps, hydraulic unit and servo drives
- Significant reduction of the compressed air consumption
- Improved cooling and air conditioning concept
- Mains filter for reducing blind currents
- Use of the waste heat of the control cabinet
- Use of direct measuring systems free from sealing air in all main axes

PRECISION

- Second linear guide in the Y-Axis
- Swivel axis with double guide
- Water cooling of spindle, headstock and gear flange
- Direct measuring system in all main axes
- Increased system accuracy of angle measuring device NC rotary table
- System accuracy angle measuring device: ± 2.5" (Direct angle measuring system)

Tool magazine in the working area



Control panel with control Heidenhain TNC 640 with additional monitor

TFZ – FIT 2 TASK

3 SIZES, 5 MODELS AND NUMEROUS POSSIBILITIES

Based on 3 basic models of the TFZ series, we offer modular equipment variants, depending on the perfomance requirements. Entirely in terms of FIT 2 TASK.

TFZ SERIES SCOPE OF SUPPLY:

3D path controls
- Heidenhain TNC 640
- Siemens 840D [1)]
- Coordinate transformation
- Deep drilling technology programs
- Milling cycles
- Cross drilling cycles [1)]

Process monitoring
- Tool breakage monitoring
- Coolant pressure monitoring
- Coolant flow monitoring

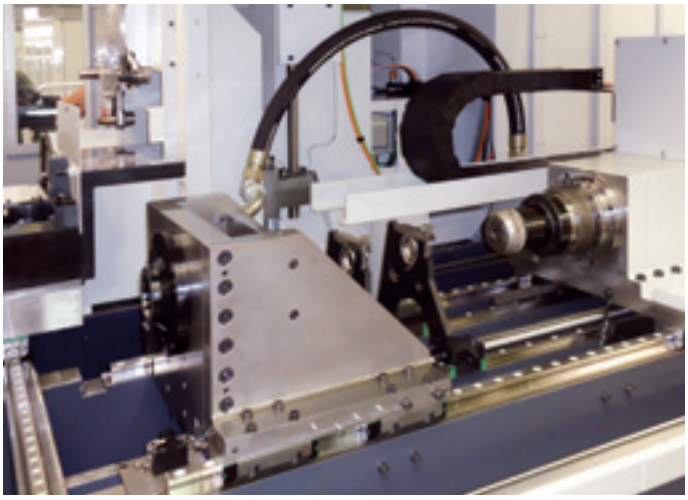
Series	
Spindle holder according to DIN	
Drilling method ELB [3)]	
Drilling diameter min. – max.	[mm]
Max. drilling depth in one pass	[mm]
Spindle	
Rated spindle power (S1=100% / S6=40% duty cycle)	[kW]
Spindle speed, infinitely adjustable	[rpm]
Rated spindle torque (S1=100% / S6=40% duty cycle)	[Nm]
Milling performance (S1=100%)	[cm³/min]
Threading (larger threads by circular milling)	
Travels	
X-Axis (table crosswise)	[mm]
Y-Axis (drilling/milling unit vertical)	[mm]
Z-Axis (drilling/milling unit horizontal)	[mm]
W-Axis (drilling/milling spindle)	[mm]
A-Axis (drilling/milling unit, swiveling around)	[°]
Rapid traverses X, Y, W and Z-Axis	[m/min]
CNC rotary table (B-Axis, 360-degree rotation)	
Table size (other dimensions on request)	[mm]
Table load (central)	[t]
Coolant supply	
Coolant pressure	[bar]
Coolant flow rate	[l/min]
Options (further options on request)	
Two-speed gearbox at i = 4 (S1=100%, S6=40% duty cycle)	[Nm]
Tool places for conventional tools	
Water-cooled main spindle	

1) optional 2) in case of HSK 3) Performance specifications for material 1.2312

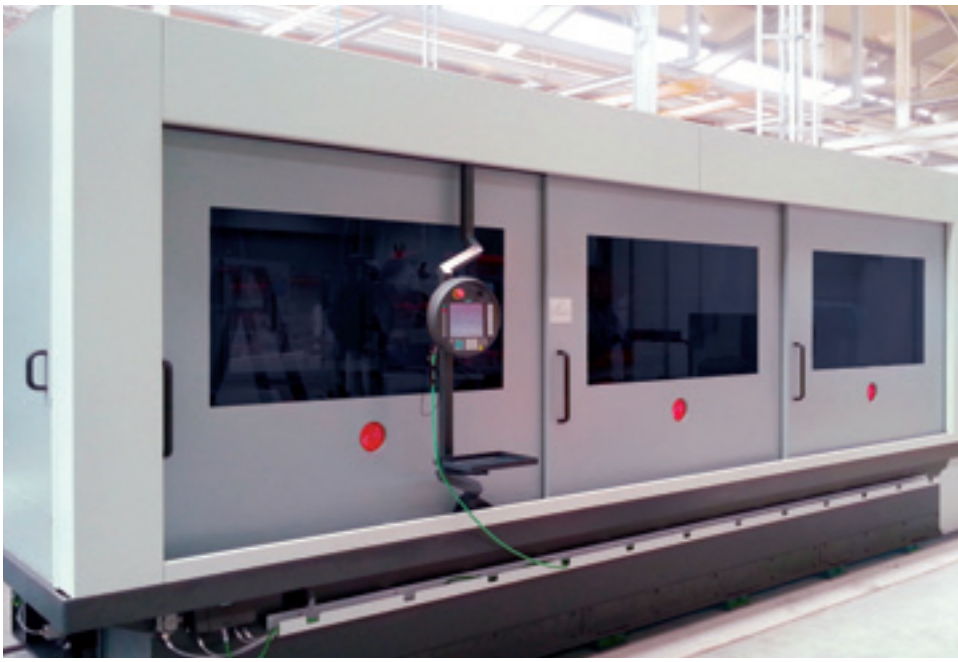
TFZ 2	TFZ 2 L	TFZ 3	TFZ 3 L	TFZ 4
SK 40 / HSK 63 [1]		SK 50 / HSK 100 [1]		
4 – 30 / 3 – 36 [1]	4 – 30 / 3 – 36 [1]	5 – 40 / 65 [1]	5 – 40 / 65 [1]	5 – 40 / 65 [1]
1,000 / 1.250	1,000 / 1.250	1,500 / 1,800	1,500 / 1,800 (2,000 / 2,300) [1]	2,000 / 2,300
9 / 13 (15 / 23) [1]	9 / 13 (15 / 23) [1]	17 / 25	17 / 25	17 / 25
6,000 / 8,000 [1] / 10,000 [1]	6,000 / 8,000 [1] / 10,000 [1]	6,000	6,000	6,000
85 / 124 (128 / 197) [1]	85 / 124 (128 / 197) [1]	216 / 320	216 / 320	216 / 320
250 / 475 [1]	250 / 475 [1]	475	475	475
M24	M24	M30	M30	M30
1,200	1,600	2,000	2,500	3,200
1,050 / 1,250 [1]	1,050 / 1,250 [1]	1,250 / 1,650 [1]	1,250 / 1,650 [1]	1,250 / 1,650 [1]
1,100	1,100	1,250	1,550	2,000
1,600	1,600	2,250	2,250 / 2,775 [1]	2,775
± 30	± 30	± 30	± 30	± 30
20	20	20	20	20
1,100 x 1,100	1,500 x 1,100	1,800 x 1,800	2,400 x 1,800 / 2,200 x 2,000 [1]	2,500 x 2,000 / 3,000 x 2,000 [1]
7 / 10 [1]	7 / 10 [1]	15 / 20 [1]	20	20 / 40 [1]
max. 100 / 90 [1]	max. 100 / 90 [1]	max. 90	max. 90	max. 90
max. 40 / 70 [2] / 90 [1]	max. 40 / 70 [2] / 90) [1]	max. 75 [2] / 90	max. 75 [2] / 90	max. 75 [2] / 90
–	–	648 / 952	648 / 952	648 / 952
24 (32 / 40) [1]	24 (32 / 40) [1]	24 (32 / 36) [1]	24 (32 / 36 / 64 / 72) [1]	24 (32 / 36 / 64 / 72) [1]
–	–	yes	yes	yes

TFM – FIT

Stable deep drilling
unit with drilling oil supply



Interior construction system
with modular tool changer

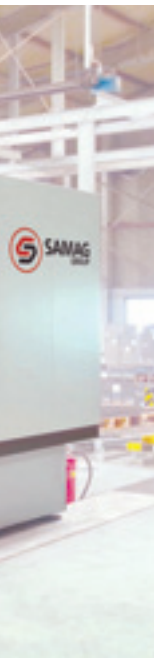


Large working area doors
for perfect accessibility

TFM with Siemens 840D – Easy integration
in the modern production

2 SPECIAL APPLICATION

WITH OUR UNIVERSAL DEEP DRILLING AND MILLING MACHINES OF THE TYPE TFM, A HIGHLY FLEXIBLE SPECIAL SERIES IS AVAILABLE FOR YOU. WE WILL FIND YOUR SOLUTION ON THE BASIS OF THE TFZ TECHNOLOGY – FIT 2 SPECIAL APPLICATION.



In addition to our TFZ standards, we also produce special machines for deep drilling and milling for extremely challenging workpiece geometries or elaborate machining processes. Based on the TFZ series, it is possible to equip the TFM machines with different machining stations. These are adjusted individually depending on the task. Flexibility also applies to the material to be processed; different degrees of hardness are feasible at any time.

Your possibilities:
Individual or in combination in a clamping

- Deep drilling (BTA or ELB method)
- Milling
- Threading
- Burnishing

Our know-how:

- High productivity thanks to combined machining
- Selection of the deep drilling methods and number of milling stations
- High stability ensures extreme precision
- Cooling lubricant supply and chip removal according to the selected deep drilling method
- Tool magazine with at least 6 spaces
- CNC control Siemens 840 D SL
- Good operability via access from both sides

Series		TFM
Drilling method		
Drilling diameter min. – max.	[mm]	6 – 65
Max. drilling depth in one pass	[mm]	1,600 / 2,000 [1]
Spindle		
Spindle holder BTA / ELB		SK6-BTA/ELB
Rated spindle power (S1=100% / S6=40% duty cycle)	[kW]	17 / 25
Spindle speed, infinitely adjustable	[rpm]	4,000
Spindle holder DIN		HSK 63 DIN 69893
Rated spindle power (S1=100% / S6=40% duty cycle)	[kW]	9 / 13
Spindle speed, infinitely adjustable	[rpm]	6,000
Travels		
X-Axis	[mm]	1,200
Y-Axis	[mm]	320
Z-Axis	[mm]	2,500
Z2-Axis	[mm]	550
CNC table		
Table size	[mm]	1,600 x 400
Coolant supply		
Coolant pressure	[bar]	max. 90
Coolant flow rate	[l/min]	depending on pump

1) optional

For longer travels, table dimensions, drilling depths and drilling diameter diameters please enquire.
Subject to technical changes, as of May 2017.

SAMAG MACHINE TOOLS

DISTINGUISHING CHARACTERISTICS OF SAMAG ENGINEERING: PART OF A STRONG GROUP, GLOBAL PRESENCE, SUSTAINED COMMITMENT AND 140 YEARS OF EXPERIENCE!

KNOW-HOW & EXPERIENCE, DEDICATION & IDEAS, RELIABILITY & FLEXIBILITY – SAMAG SINCE 1873.

Machine tool manufacturing of SAMAG in Saalfeld, Thuringia, looks back at more than 140 years of tradition. At the end of the 19th century, the company started to manufacture the first drilling machines in this area. Since that time, SAMAG engineers have repeatedly contributed to the improvement of the quality and economy of production processes with innovative designs and outstanding technological achievements.

Thus, SAMAG is one of the pioneers in the field of multi-spindle process systems. Today, SAMAG Saalfelder Werkzeugmaschinen GmbH is a leading manufacturer of:

- Multi-spindle horizontal machining centers: MFZ series for individual workpiece machining for medium to large-scale production;
- Deep drilling and milling centers: TFZ series for 4-sided complete machining of cubic workpieces;
- Multi-spindle production deep drilling machines: WBM series for machining rotationally symmetric workpieces;
- Special machines, e.g. for the interior machining of differential housings.

SAMAG – FIT 2 TASK!

SERVICE
IS OUR PRIMARY CONCERN

Our customer service does not end with the handover of the machines. We offer you production launch support, service contracts as well as spare parts supply. As standard, our machines are equipped with teleservice. This dramatically reduces the time required for troubleshooting. Of course, we are on site – throughout the world.

We offer: Comprehensive, individually tailored user training for maintenance, operation and programming – on site as well.

OUR SERVICES:

- Machine installation and commissioning
- Short response times for troubleshooting and repairs
- Maintenance, overhaul and retrofit
- Machine relocations
- Technological retooling to other components
- Maintenance contracts, inspections
- Express service / emergency repairs
- Short-term delivery of spare parts
- International service partners
- Remote diagnosis via Ethernet interface
- 24/7 service acceptance
- Customized service for your machinery

SAMAG – SERVICE

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All the companies
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