

TriFlex 5X



Multistation 5-Axis Machining Center

The FFG Rotary Transfer Platform

Flexible Multi-Way Machining

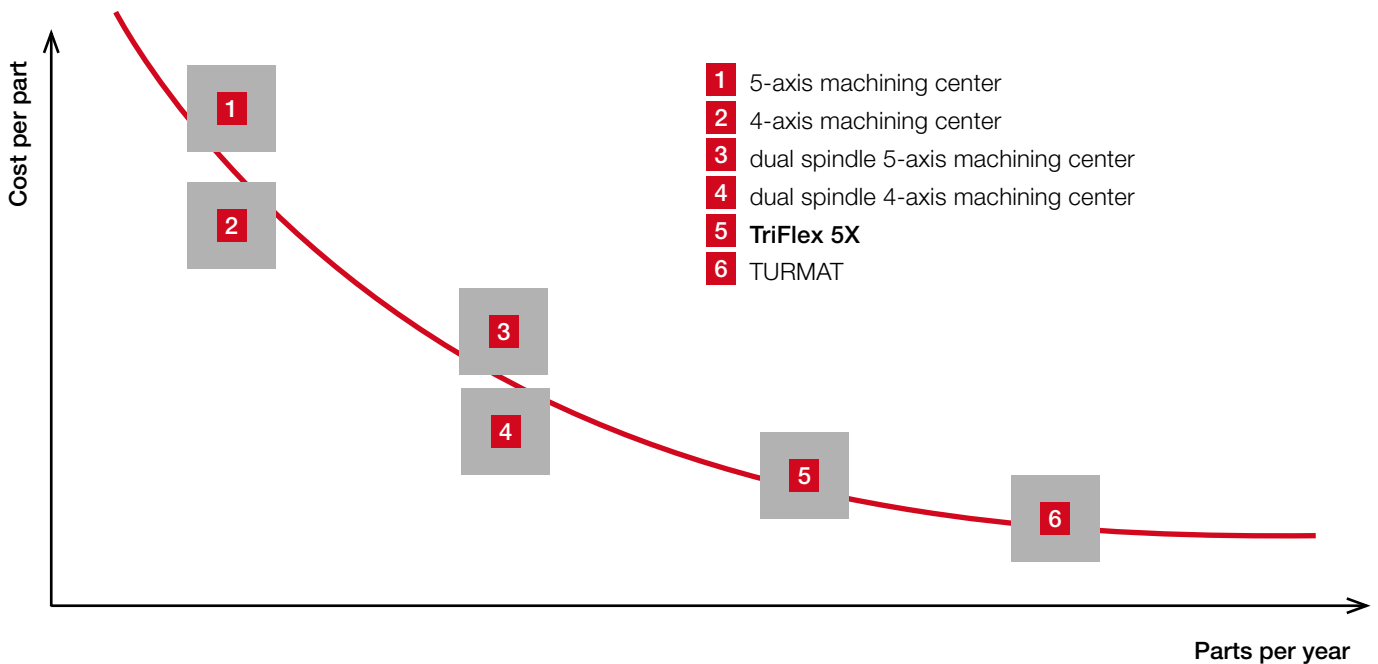
Precise, modular and efficient – The FFG Group is the world's leading manufacturer of rotary transfer machines and offers the best solutions for workpieces with high production rate.

United under the roof of the FFG group: with the rotary transfer machines of the tradition brands Pfiffner and Witzig & Frank you are always one cycle ahead.

The rotary transfer machines program covers all exigencies on the serial production of complex metal parts. Rotary transfer machines are designed for the handling of bar, coil materials or automatic part feeding. They assure high precision machining of each workpiece, being carried out simultaneously on each station. Every rotary transfer machine is specified, build for, and customized to the pieces it will handle.

The TriFlex 5X with its horizontal workstation setup allows precise machining jobs with the highest output just-in-time. The enormous flexibility of the TriFlex 5X gives our clients a major advantage in dealing with the growing challenges of today's global markets:

- ▶ The best cost-effective solutions
- ▶ Maximum precision and process reliability in mass production
- ▶ High investment security thanks to extensive modularity
- ▶ High reusability thanks to reconfigurable machine systems
- ▶ High flexibility and variability (simple change over, reduced setup times)
- ▶ High machine availability
- ▶ Low maintenance costs (TCO)
- ▶ Turnkey Solutions
- ▶ Process optimization
- ▶ Global After-Sales-Management



Rotary transfer machines: efficient volume manufacturing

Cycle time/annual production	starting from approx. 250 000 parts per year
Process	up to 40 tools
Part size	approx. 350 mm cubic size

TriFlex 5X – Highlights

The TriFlex 5X is a modern and innovative multispindle machining center.

The newly designed machine is based on the original TRIFLEX concept developed in the early 2000s and enhances its strengths by adding features of current single and dual spindle machining centers.

The predominant advantages of the new TriFlex 5X are:

- ▶ Flexibility
- ▶ Productivity
- ▶ Quality
- ▶ Cost per part

Those strengths are realized by

- ▶ complete machining
- ▶ mass production
- ▶ in a single machine
- ▶ on five sides
- ▶ in five stations
- ▶ in a single setup
- ▶ with five axes.



TriFlex 5X – Idea and Design

Flexibility

- ▶ Standardized modular rotary transfer machine
- ▶ Integrated standardized automation
- ▶ Fixture change without loss of time
- ▶ Simultaneous OP 10 and OP 20 machining in the same machine
- ▶ Fully flexible 5-axis machining
- ▶ Easy programming and operation

Productivity

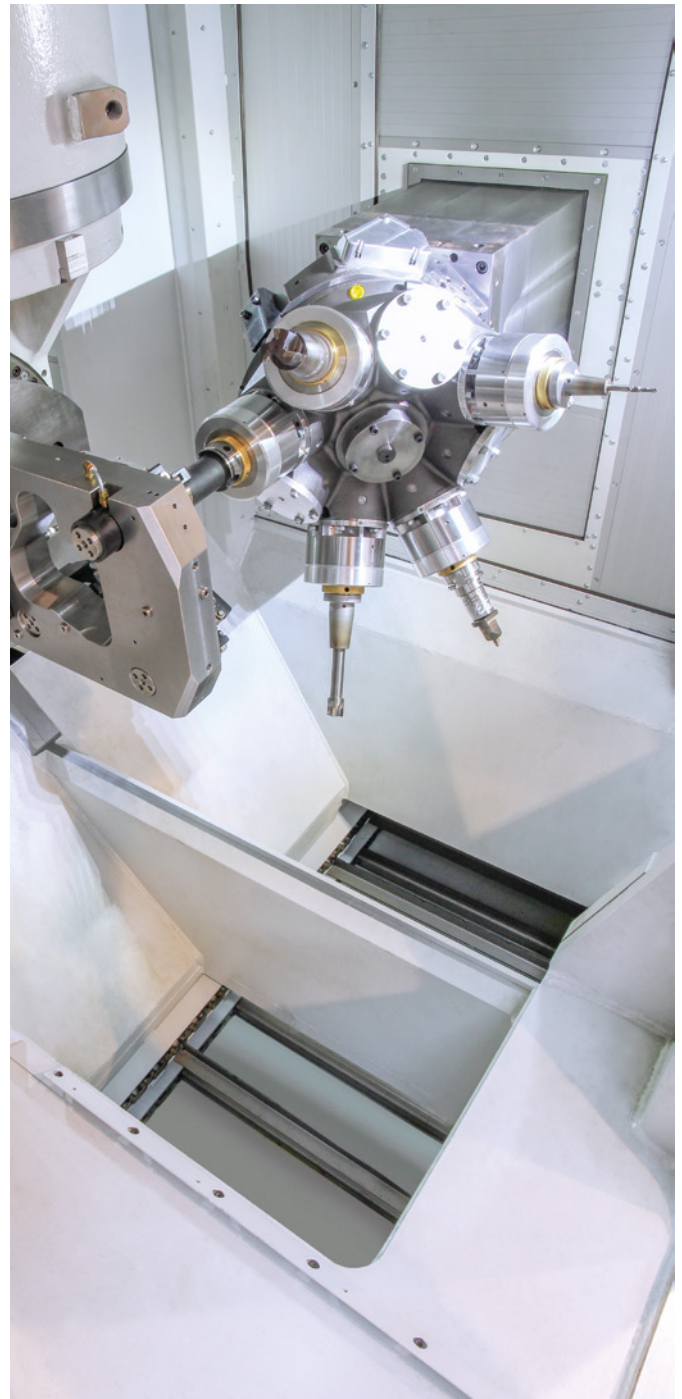
- ▶ Simultaneous 5-axis machining with five spindles
- ▶ Part loading and unloading parallel to the machining process
- ▶ High availability (tool change via 8-station turret, no motor spindle, free chipfall, no sensitive components like guides, drives in the work area)
- ▶ Chip-to-chip time < 1.9 sec
- ▶ Minimal travel distances in work area

Quality

- ▶ Full compensation of single spindle machining
- ▶ Optional thermal compensation
- ▶ Fail-safe traceability of quality features
- ▶ Inherent rigidity of box in box system with sealed work area
- ▶ Direct absolute travel measuring system

Cost per Part

- ▶ Compact machine design
- ▶ Highest output on minimal space (-30% vs three double spindle machines)
- ▶ Minimal technology cost
- ▶ One set of cutting tools (-80%)

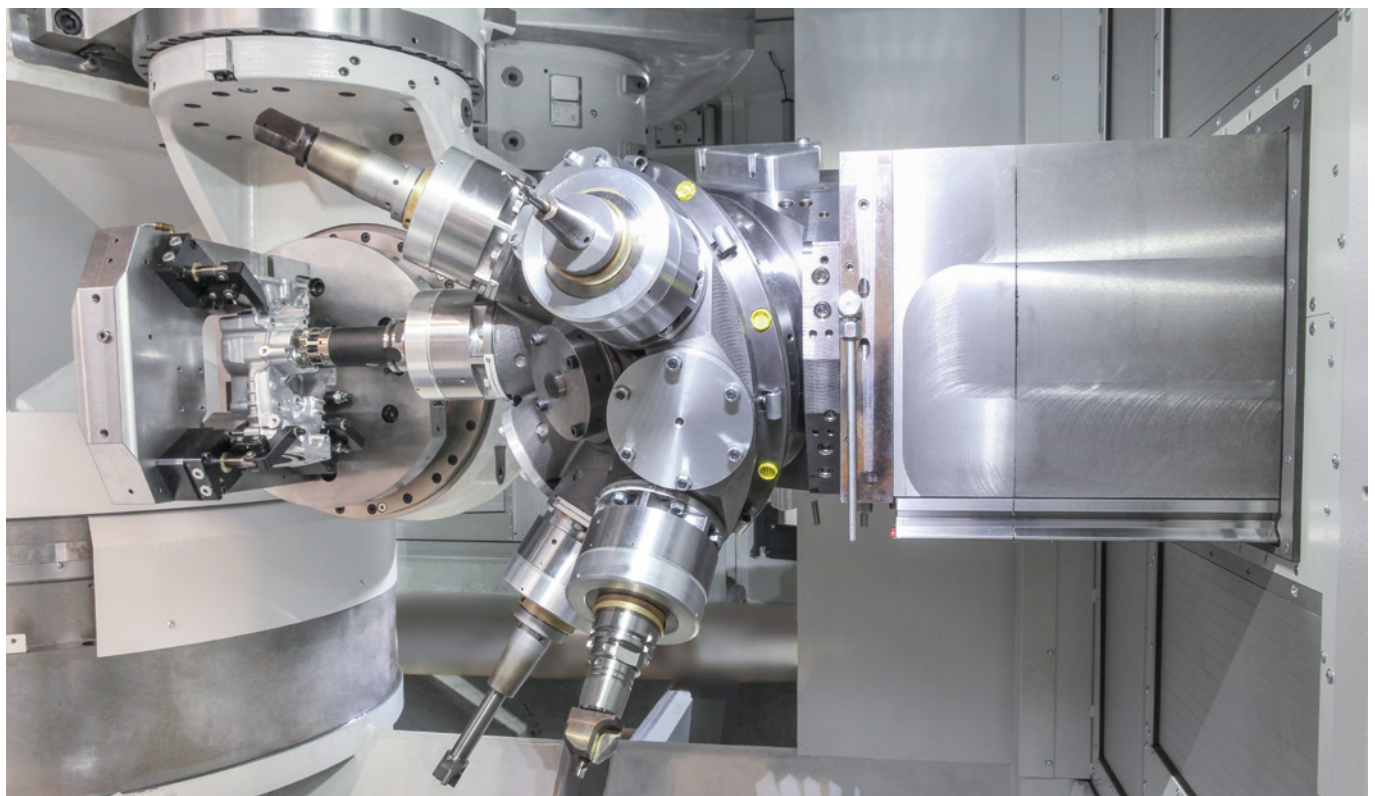


The Benchmark for Volume Production

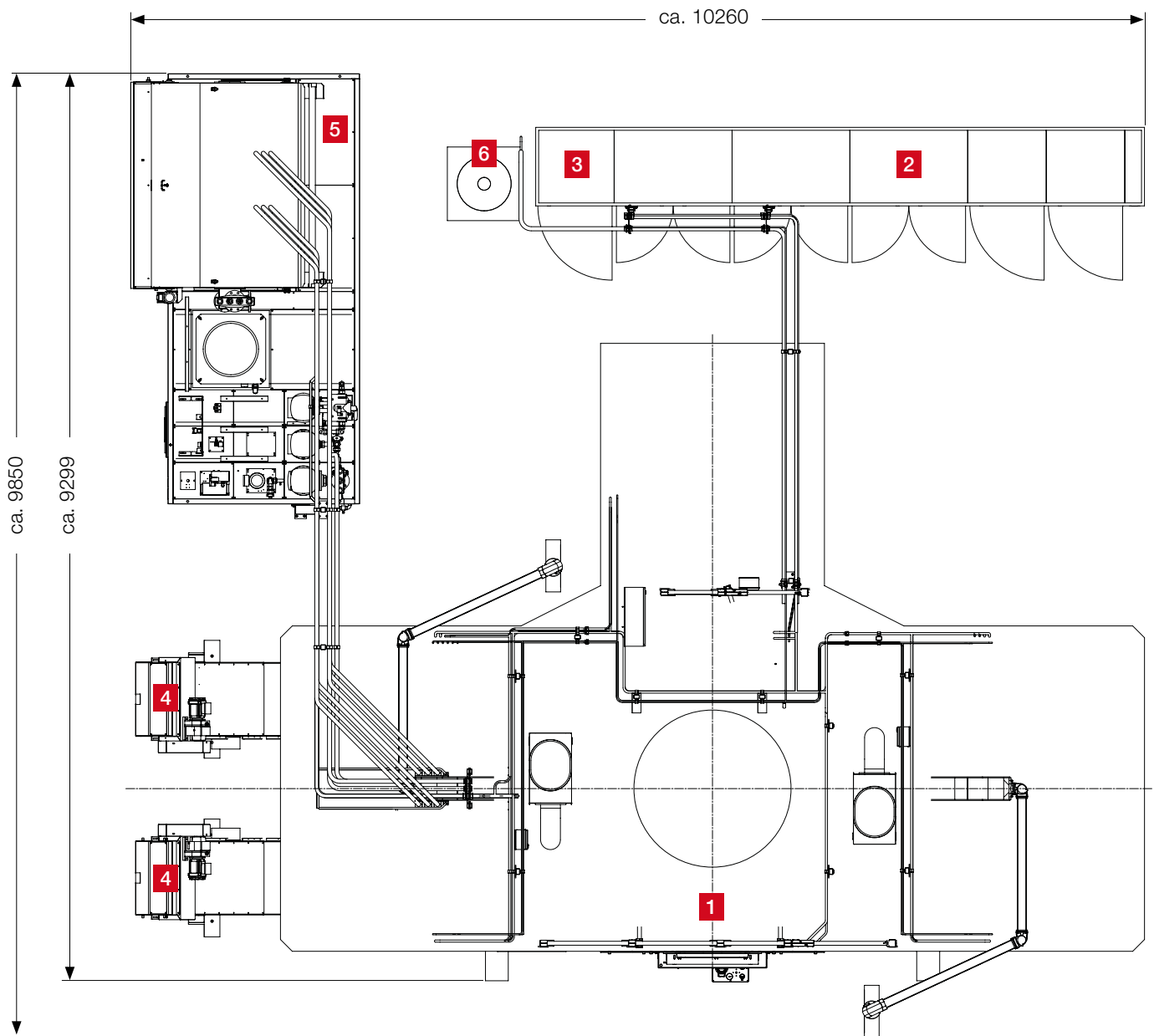
Unmatched Quality by the Second

Comparison of three linked dual spindle machining centers versus a rotary transfer machine

Type	Three double spindle machining centers with automation	One TriFlex 5X with automation
No. of machines	3	1
No. of controls	3	1
No. of chip conveyors	3	2
No. of coolant units	3	1
Space requirement	approx. 100 m ²	approx. 80 m ²
Energy consumption	approx. 85 Kwh	approx. 55 Kwh
No. of fixtures	3 x 2 x 2 = 12	6
No. of tool sets per operation	3 x 2 = 6	1



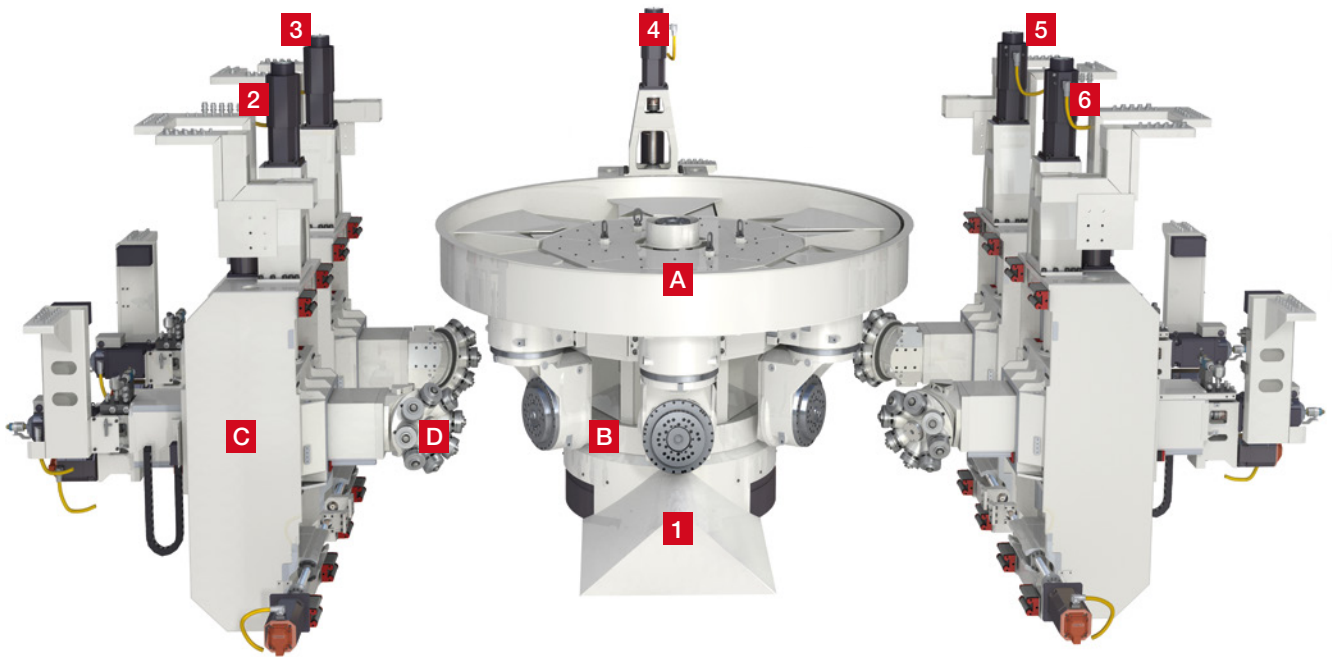
Machine Layout



TriFlex 5X

- 1** Machine
- 2** Electrical cabinet
- 3** Fluid cabinet
- 4** Chip conveyor
- 5** Coolant unit
- 6** Cooling aggregate

Machine Design



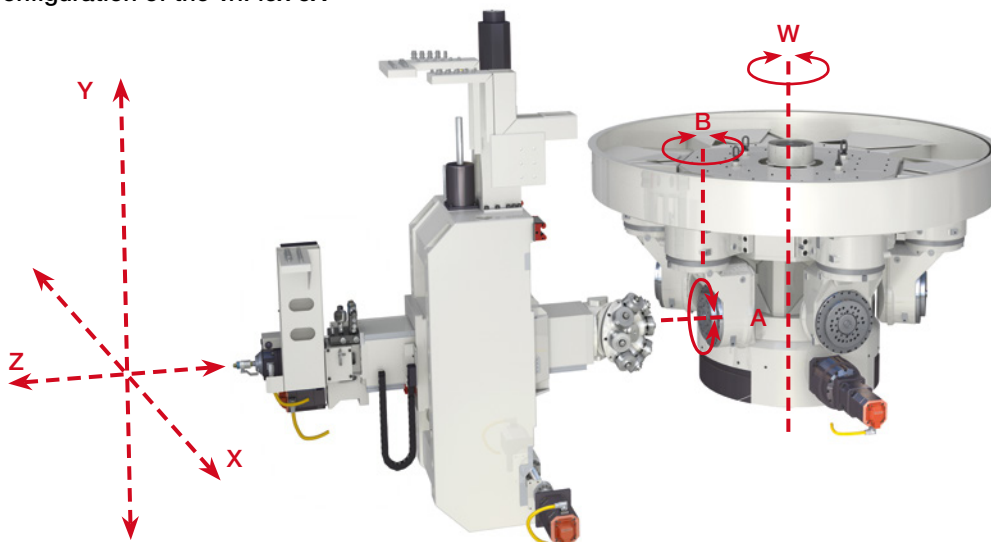
Machine stations

- 1** Loading/unloading
- 2 - 6** Machining units (3-axis modules)

Central components

- A** Central rotating unit for workpiece transfer
- B** 6x A/B-axis with torque drive for fully flexible 5-axis machining
- C** 3-axis module -> identical in station 2-6
- D** 8-fold tool turret

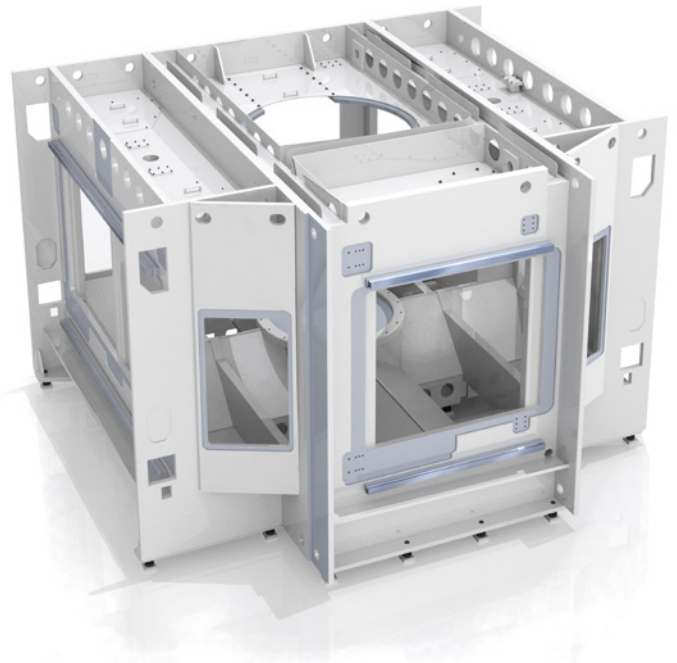
Axis configuration of the TriFlex 5X



Mechanical Highlights of the Machine

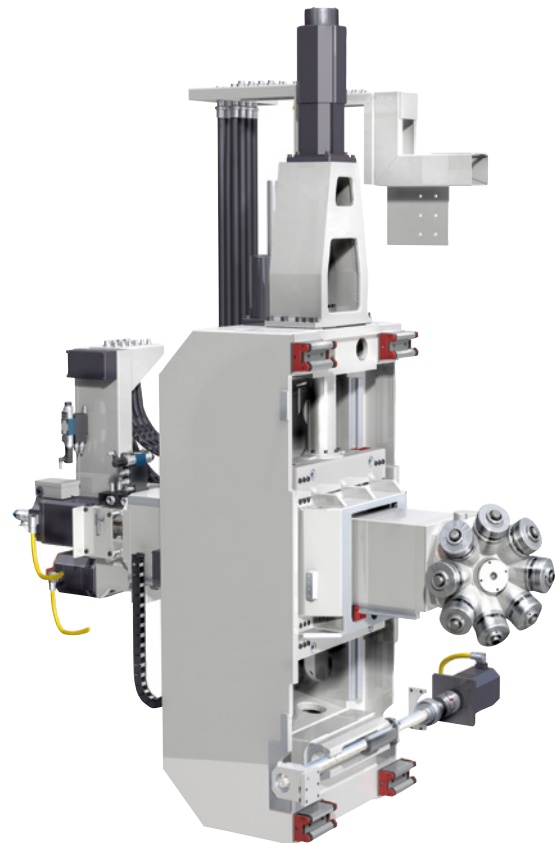
Machine Frame

- ▶ Closed frame design for high inherent dynamic and static rigidity
- ▶ Easy transportation in three sections
- ▶ Closed work area
- ▶ Free chip fall directly into the chip conveyor
- ▶ Horizontal machining
- ▶ Easy accessibility



3-Axis Module

- ▶ High inherent rigidity and thermal stability
- ▶ Dynamic direct drives and precision guideways
- ▶ Good serviceability with easy access to all components
- ▶ Travel measuring systems integrated in the guideways: wear-free and protected
- ▶ Five identical units, mechanical and electrical design
- ▶ Ideal axis configuration with box in box system
- ▶ Shortest positioning time and travel distances
- ▶ All drives outside work area
- ▶ Additional X-drive as option (gantry drive)
- ▶ Balanced Y-axis



Central Rotating Unit

- ▶ High indexing and repeat accuracy with Hirth coupling
- ▶ Low dynamic load with fixed indexing unit
- ▶ Adjustable worm gear drive for high torque and minimal backlash
- ▶ Designed to optimize flux of forces to maximize rigidity
- ▶ Pre-loaded axial/radial bearings for high tilting rigidity and ideal radial and axial runout
- ▶ Highly precise FIBRO face gear for high tilting rigidity
- ▶ Robust, wear-resistant design for longevity and low maintenance



A/B Axes

- ▶ Maximum flexibility for universal applications
- ▶ Torque drive high dynamics and short positioning times
- ▶ Good accessibility
- ▶ Compact design
- ▶ Large variety of supply configurations for various fixtures
- ▶ 6-fold media supply to A-axis



Mechanical Highlights of the Machine

Tool Turrets

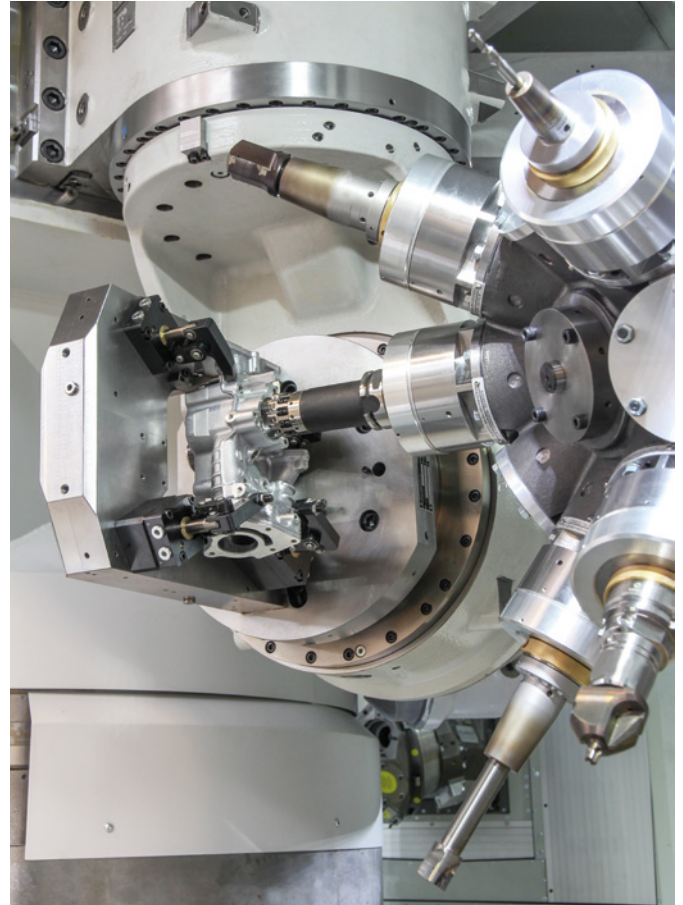
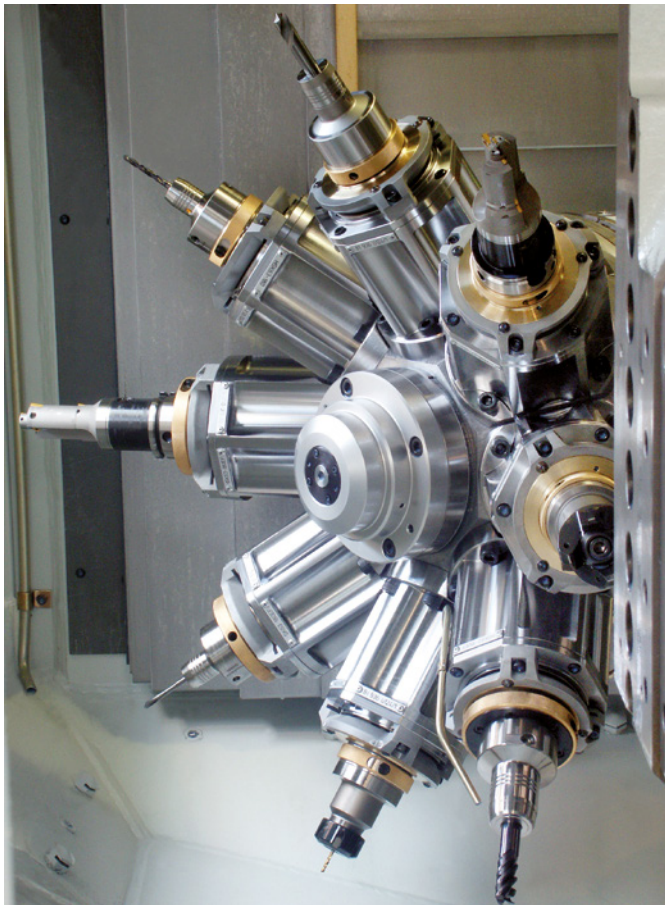
- ▶ Multispindle crown turret with up to eight tool positions
- ▶ Only one spindle in operations
- ▶ Declutch and acceleration during tool change
- ▶ Non-lifting, three-piece Hirth coupling
- ▶ Axial and radial fine tuning of every spindle position possible as option
- ▶ Compact design, minimal overhang and rigid spindle design
- ▶ Fast tool change with chip-to-chip time < 1.9 sec
- ▶ Maximum spindle speed up to 13 300/min as option
- ▶ Wear-free sealing via ring gap and sealing air
- ▶ Available with external and internal coolant supply, as well as MQL
- ▶ Torque up to 175 Nm
- ▶ Tools: HSK 63, optional HSK 80 with internal coolant supply 20 bar

Dry Machining

- ▶ Elimination of coolant reduces investment cost > 15%
- ▶ Pumps, filters, drives are omitted (approx. 30% reduced energy consumption)
- ▶ No toxic waste
- ▶ Lower maintenance cost
- ▶ Improved work environment
- ▶ Contamination and cleanliness (100 machines leak approx. 3.6 m³ coolant per day)
- ▶ Chips can be recycled as they are hardly polluted (0.3%)



MQL tools (minimum quantity lubrication)



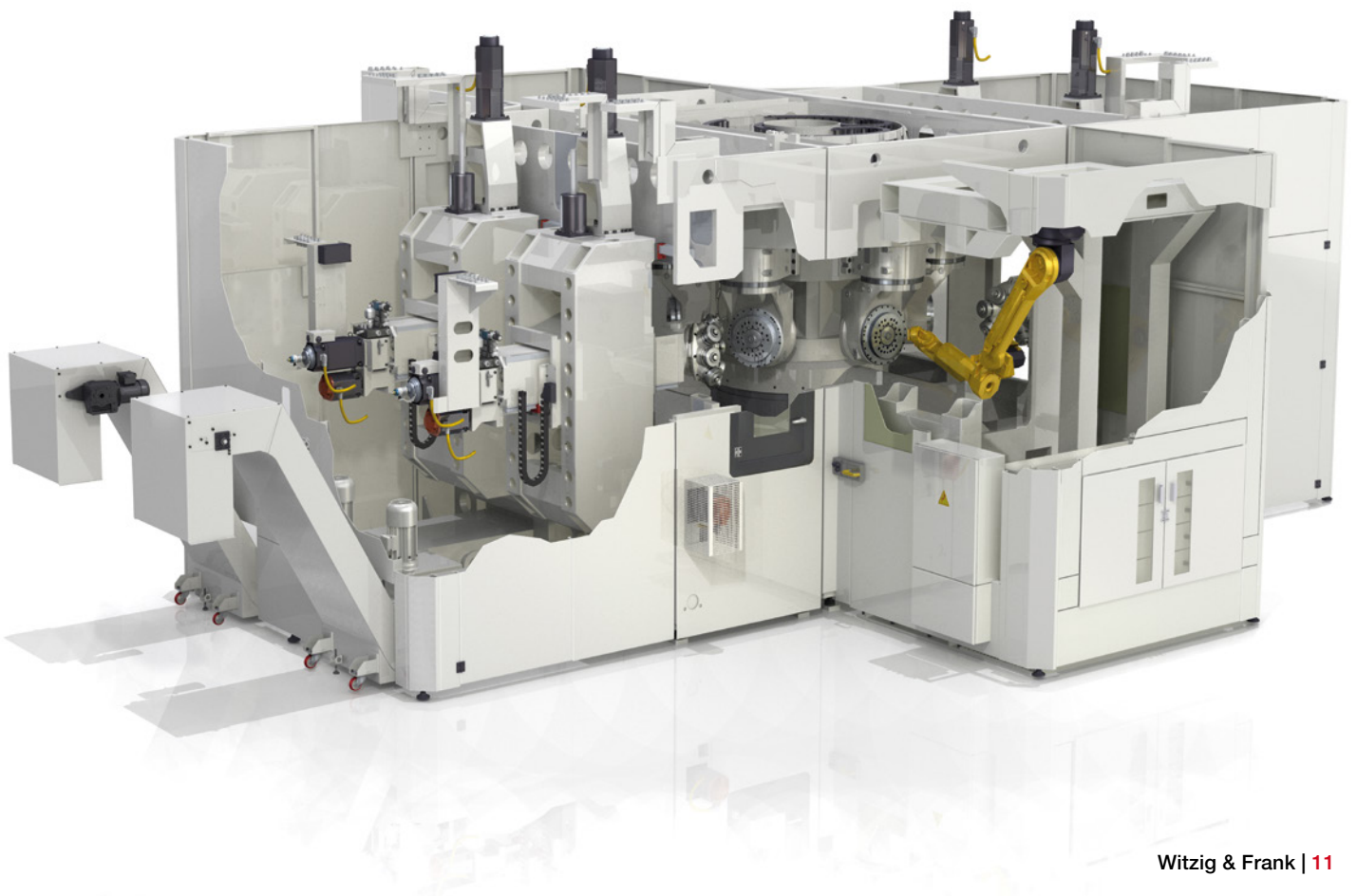
Peripheral Units

Chip Conveyor and Coolant Unit

- ▶ Central or decentral coolant supply
- ▶ Wet or dry machining
- ▶ Direct, free chipfall into two integrated chip conveyors

Loading

- ▶ Loading/unloading during machining
- ▶ Standard automation interface
 - 1. manual load
 - 2. flexible robot load with drawer type system
- ▶ Space-saving, as part carriers are stored in stacked drawers
- ▶ Part carriers can be changed any time via drawers
- ▶ Easy and quick retooling
- ▶ Maintenance-friendly



TriFlex 5X – CNC Control

Fanuc 31i (Siemens 840D sl as option)

- ▶ Power factor correction
- ▶ Process monitoring
- ▶ Main spindle condition monitoring
- ▶ Warm-up and thermal compensation programs
- ▶ Controlled shutdown of axes in case of power blackout
- ▶ Remote diagnosis
- ▶ Thermal compensation for parts and machine



Optional FFG Energy Management

- ▶ HMI screens with consumption monitoring in kWh or €
 - Current energy consumption
 - Accumulated energy consumption
 - Energy per part
 - Time-signals of consumption (oscilloscope)
- ▶ All analyses can also be viewed online via PC or mobile device

Digital Factory and Industry 4.0

- ▶ Visualization of machining process for high transparency already in the planning and proposal phase
- ▶ Optimization of process balancing and cycle time
- ▶ Early detection of interferences
- ▶ Optimization of NC programs from developers work place
- ▶ Fast implementation of program and product changes
- ▶ Process and system simulation



Technical Data

Tooling system HSK 63 C				
		X-axis	Y-axis	Z-axis
Stroke	mm	450 (Station 4: 650)	500	450
Rapid traverse	m/min	50	50	60
Acceleration	m/s ²	5	5	6
Guiding principle		Roller guiding size 55 (Schneeberger)	Roller guiding size 45 (Schneeberger)	Roller guiding size 45 (Schneeberger)
Drive principle		KGT D50 / S20 (direct) (Shuton)	KGT D50 / S20 (direct) (Shuton)	KGT D50 / S20 (direct) (Shuton)
Measuring system		Schneeberger (absolute)	Schneeberger (absolute)	Schneeberger (absolute)
Brake		Motor brake and ZIMMER Brake (redundant)		
Turret	Tools	no.		8
	Max. speed	rpm		13300
	Nominal power	kW		20
	Nominal torque	Nm		58
	Max. Torque	Nm		175
	Chip to chip time, accord. VDI 2852	s		1,9
	Internal coolant supply	bar		20 (serie)
Part, fixture	Maximum mass (workpiece + fixture)	kg		250
	Maximum workpiece length	mm		350
	Maximum workpiece width	mm		350
	Maximum workpiece height	mm		350
	Number of media supply lines into the fixture	no.		6
	of which hydraulics (max. 70 bar)	no.		5
	of which pneumatics (5-6 bar)	no.		1
Central turntable (FIBRO)	System			Hirthring (3-piece / non lifting)
	Max. load	kg		9000
	Average swivel time	s		3
	Indexing Accuracy	"		+/- 1,5
NC-Table / B-Axis	System		° -rotating from centre position (centre position = radial to drum axis)	+/- 150
	Max. load	kg		600
	Repetition Accuracy	"		8
	Clamping		Unpressurised release (hydraulic)	
NC-Table / A-Axis	System		Torque drive;	endless rotation
	Max. load	kg (Fixture + workpiece)		250
	Repetition Accuracy	"		8
	Clamping		Clamped without pressure (spring force)	
	No. of media in the clamping fixture		Hydraulic (70 bar)	5
			Pneumatic (6 bar)	1
	Table top diameter	mm		320
Complete machine	Mass	kg		70
	Dimensions (W,D,H)	approx. Mm		11.150 x 8.500 x 4.000
Coolant system	Rinsing (total machine):	l/min at 2,5 bar		600
	External coolant (per spindle):	l/min at 5-6 bar		40
	Internal coolant (per spindle):	l/min at 20 bar		100
	Tank volume	up to l		7.700
	As standard with		Cartridge double change-over filter	
			Band skimmer; Weekend circulation	
			Cooler: kW	22,4
			no. chip conveyors (scraper)	2

TriFlex 5X Applications

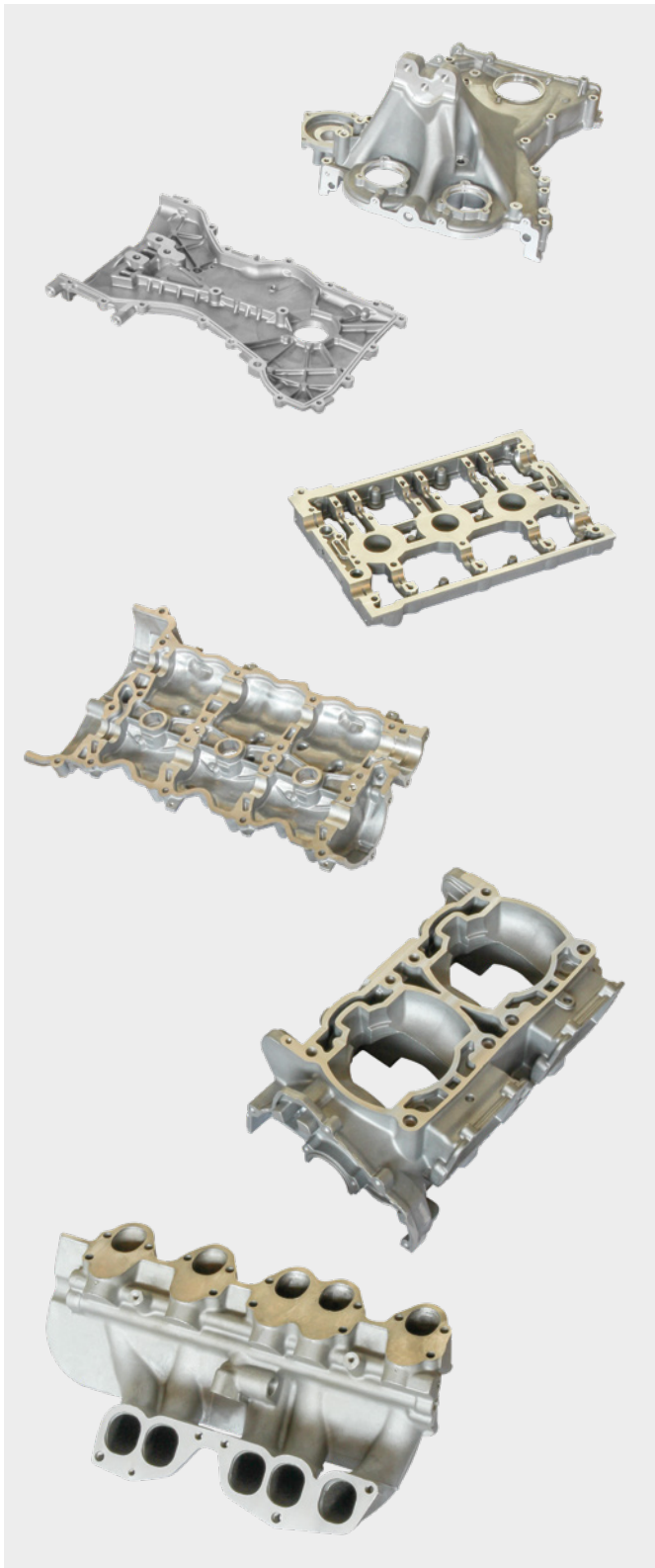
Automotive Powertrain



Automotive Transmission



Automotive Engine Parts

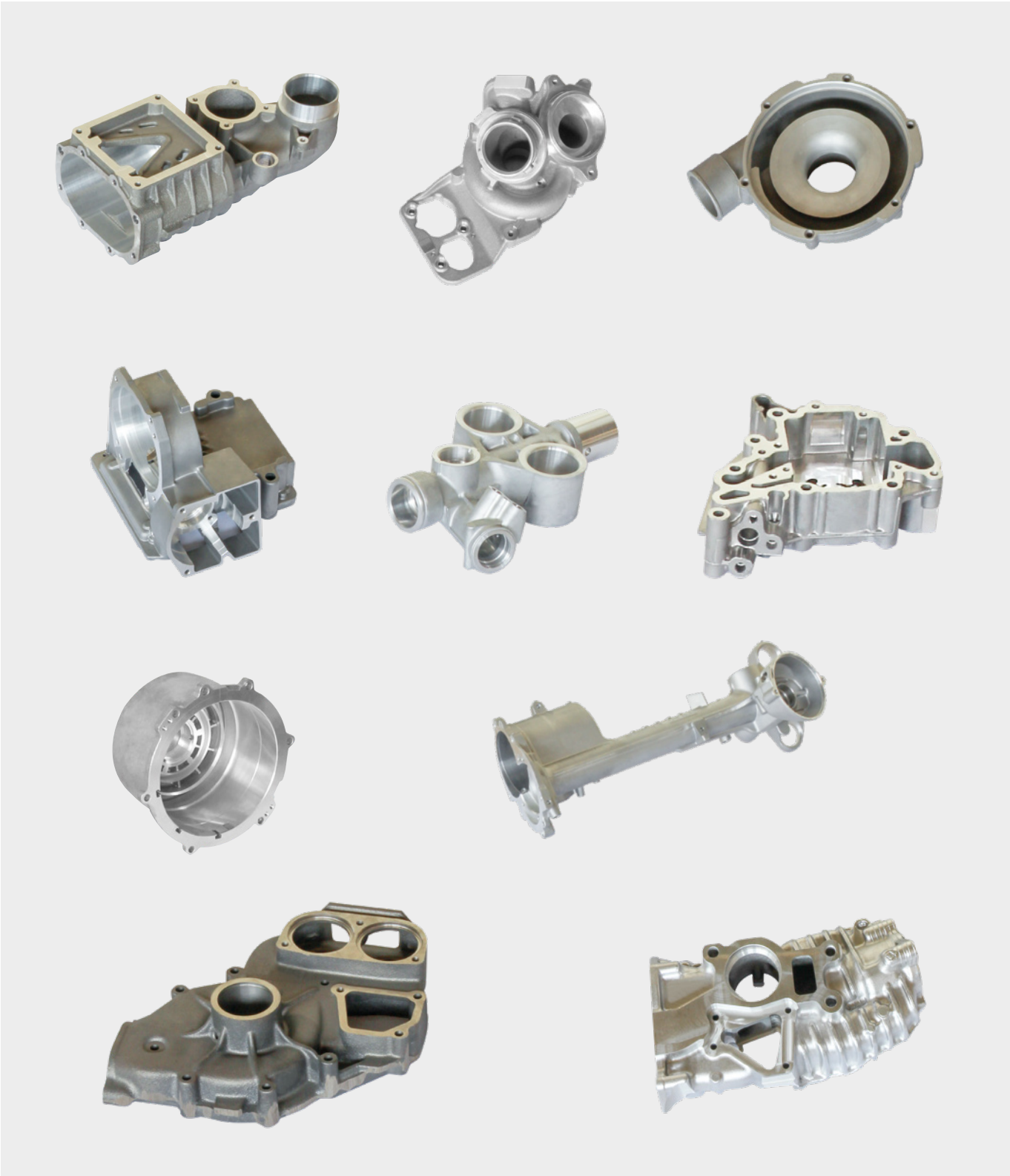


Automotive Structural Parts

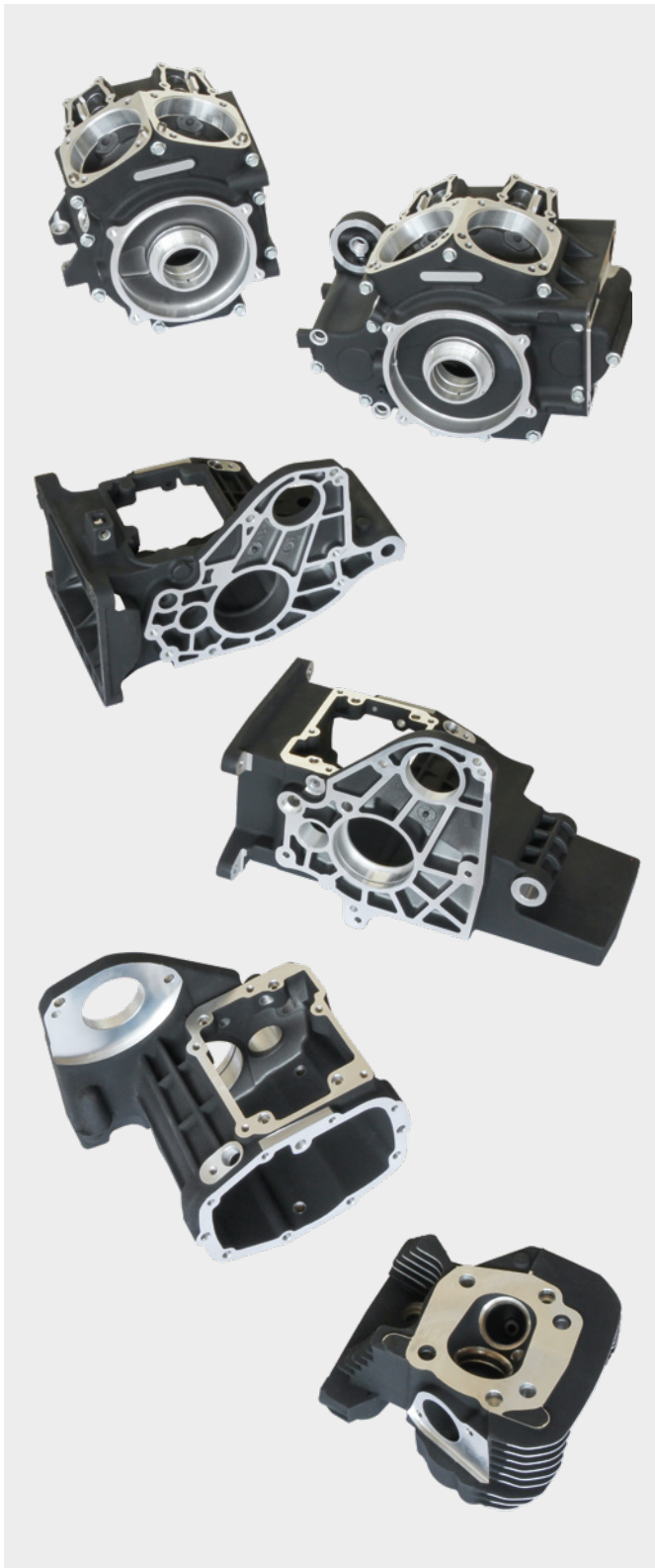


TriFlex 5X Applications

Automotive Aggregates



Motorcycle Engine and Transmission



Industrial Equipment



Service and Support

WITZIG & FRANK Services

We offer professional services for your highly productive machines and plants. Whether it's a matter of keeping the availability of your plants as high as possible or adapting them in line with necessary changes in order to continue producing products at a high level. As your partner, we want to use our know-how to help us to be successful together.

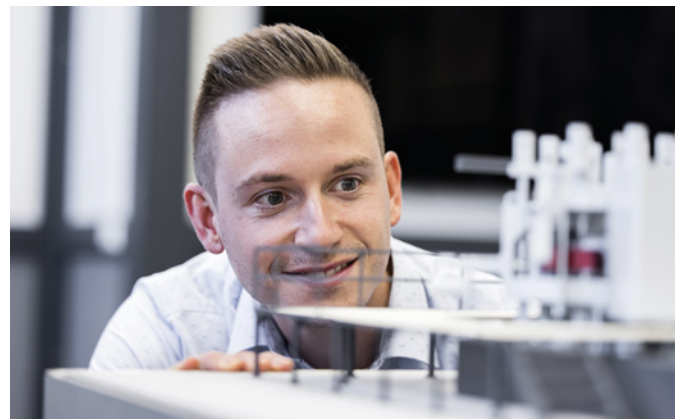
- ▶ **Hotline / Remote service**
- ▶ **Inspection**
- ▶ **Repairs**
- ▶ **Process optimization (OEE)**
- ▶ **Spare parts**
Top quality and maximum lifetime with original Witzig & Frank spare parts
- ▶ **Retooling**

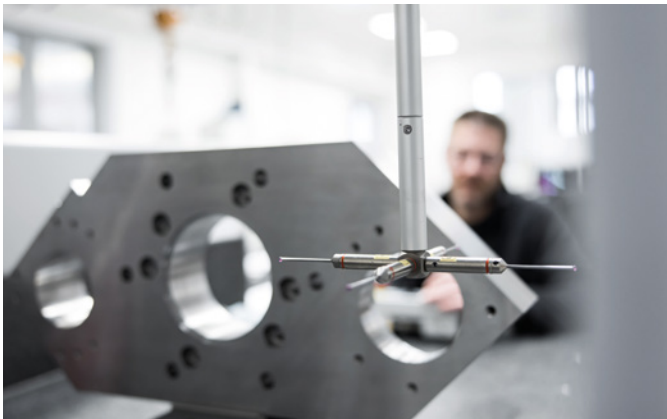


Service Products

Investment where it really pays off

- ▶ **Exchange assemblies**
- ▶ **Retrofit kit/remote access**
- ▶ **Replacement assemblies for quick on-site exchange**
- ▶ **Service agreements**
- ▶ **Training**
- ▶ **Revest®**
The rejuvenation treatment for your Witzig & Frank transfer machines





Germany

Witzig & Frank / K.R. Piffner GmbH
Am Holderstock 2
DE-77652 Offenburg
Tel.: +49 781 289 0
Fax: +49 781 289 1303
www.witzig-frank.com

Service/Parts Hotline/Website

Tel.: +49 781 289 1000
service@witzig-frank.com



USA

MAG Automotive LLC
6015 Center drive
US-MI 48312 Sterling Hights
Tel.: +1 586 446 7000
Fax: +1 586 335 4490

Service/Parts Hotline/Website

Tel.: +1 888 858 9920
MAG-Automotive.Serviceparts@mag-ias.com



About FFG Europe & Americas

The FFG entities in Europe and the Americas unite major players from the German, Italian, Swiss and American machine tool industry with a broad range of milling, turning, grinding, and gear manufacturing technology, and the knowhow of the renowned machine tool brands VDF Boehringer, Hessapp, Jobs, MAG, Meccanodora, Modul, Morara, Pfiffner, Rambaudi, Sachman, Sigma, SMS, Tacchella and Witzig & Frank. Since 1798, these brands have substantially contributed to the progress in industrial manufacturing and are well known as reliable and innovative equipment and systems solutions suppliers for the automotive and truck, aerospace, machine building, general machining, railway industry, energy and heavy engineering industries. While being an independent group, these entities benefit from the strengths and opportunities of the global Fair Friend Group. They stand for premium technology within FFG.



K.R. Pfiffner AG

Sonnmattstrasse 28
CH-3427 Utzenstorf
Tel.: +41 (0)32 666 35 35
Fax: +41 (0)32 666 35 55
www.pfiffner.com

Witzig & Frank / K.R. Pfiffner GmbH

Am Holderstock 2
DE-77652 Offenburg
Tel.: +49 781 289 0
Fax: +49 781 289 1303
www.witzig-frank.com

FFG Europe & Americas

info@ffg-ea.com

www.ffg-ea.com