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**Pfiffner**

RT 100-12 CNC THE FLEXIBLE ROTARY TRANSFER CENTER

About FFG Europe & Americas

FFG Europe & 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, IMAS, 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.



FFG Europe & Americas

K.R. Pfiffner AG (Head office)
Sonnmatstrasse 28
CH-3427 Utzenstorf
Tel. +41 32 6 66 35 35
Fax +41 32 6 66 35 55

FFG Europe & Americas

K.R. Pfiffner GmbH
Axtbuehl 2
DE-78658 Zimmern o.R.
Tel. +49 741 92 88 0
Fax +49 741 92 88 155

FFG Europe & Americas

FFG European & Americans
Holdings GmbH
Salacher Strasse 93
DE-73054 Eisingen/Fils
Tel. +49 71 61 805-0
Fax +49 71 61 805-223

PF2602(02)DEN/0/01.23



FFG Europe & Americas

info@ffg-ea.com

www.ffa-ea.com

Flexible Machining to Perfection

The FFG Rotary Transfer Platform

Flexible Multi-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 at the high volume end.

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

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

The ability to set up working stations horizontally as well as vertically allows big machining jobs with the highest output just-in-time. The enormous flexibility of the rotary transfer machines gives our clients a major advantage in dealing with the growing challenges of today's global markets:

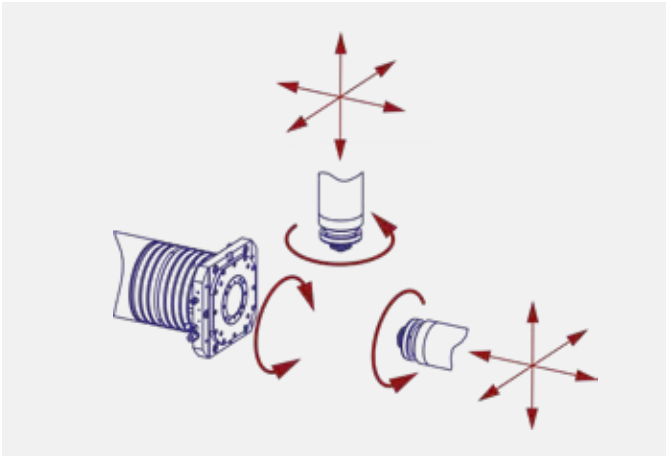
- ▶ The most cost-effective solutions
- ▶ Maximum precision and process reliability in mass production
- ▶ High investment security thanks to extensive modularity
- ▶ High reusability thanks to reconfigurable machine systems
- ▶ High flexibility and variability (simpler retooling, reduced setup times)
- ▶ High machine availability
- ▶ Low maintenance costs (TCO)
- ▶ Turnkey solutions
- ▶ Process optimisation
- ▶ Global after sales management

The Standard for Series Production

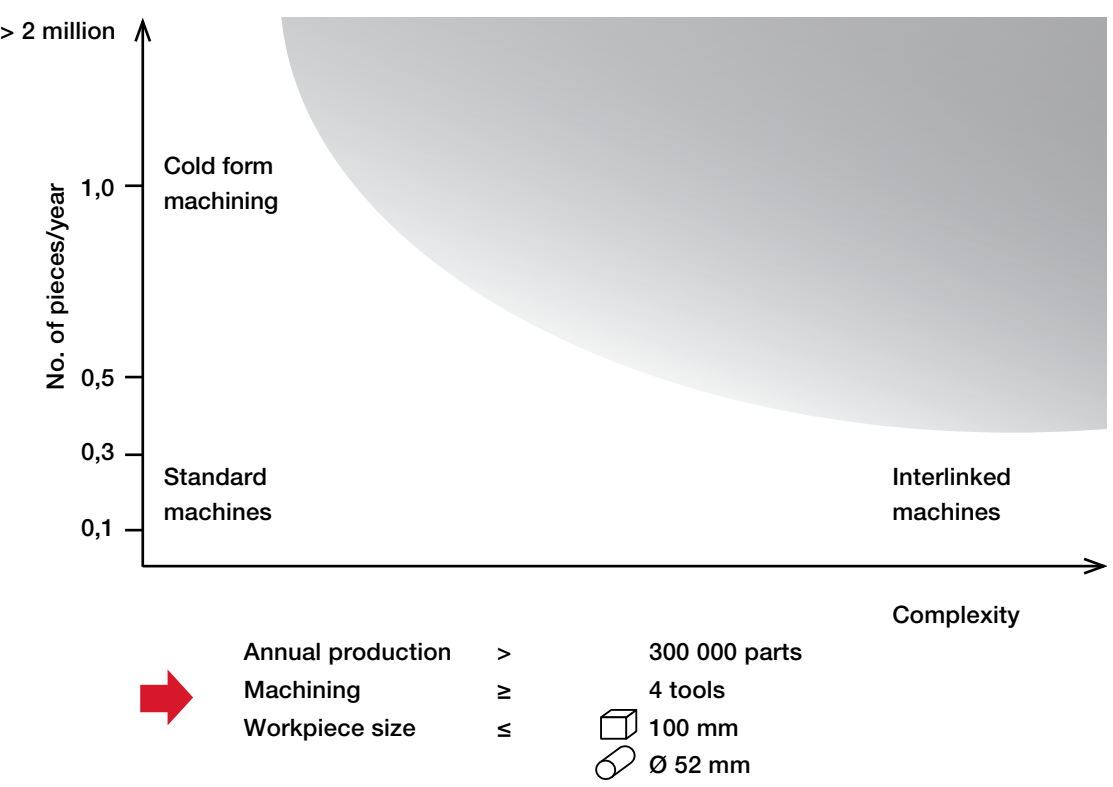
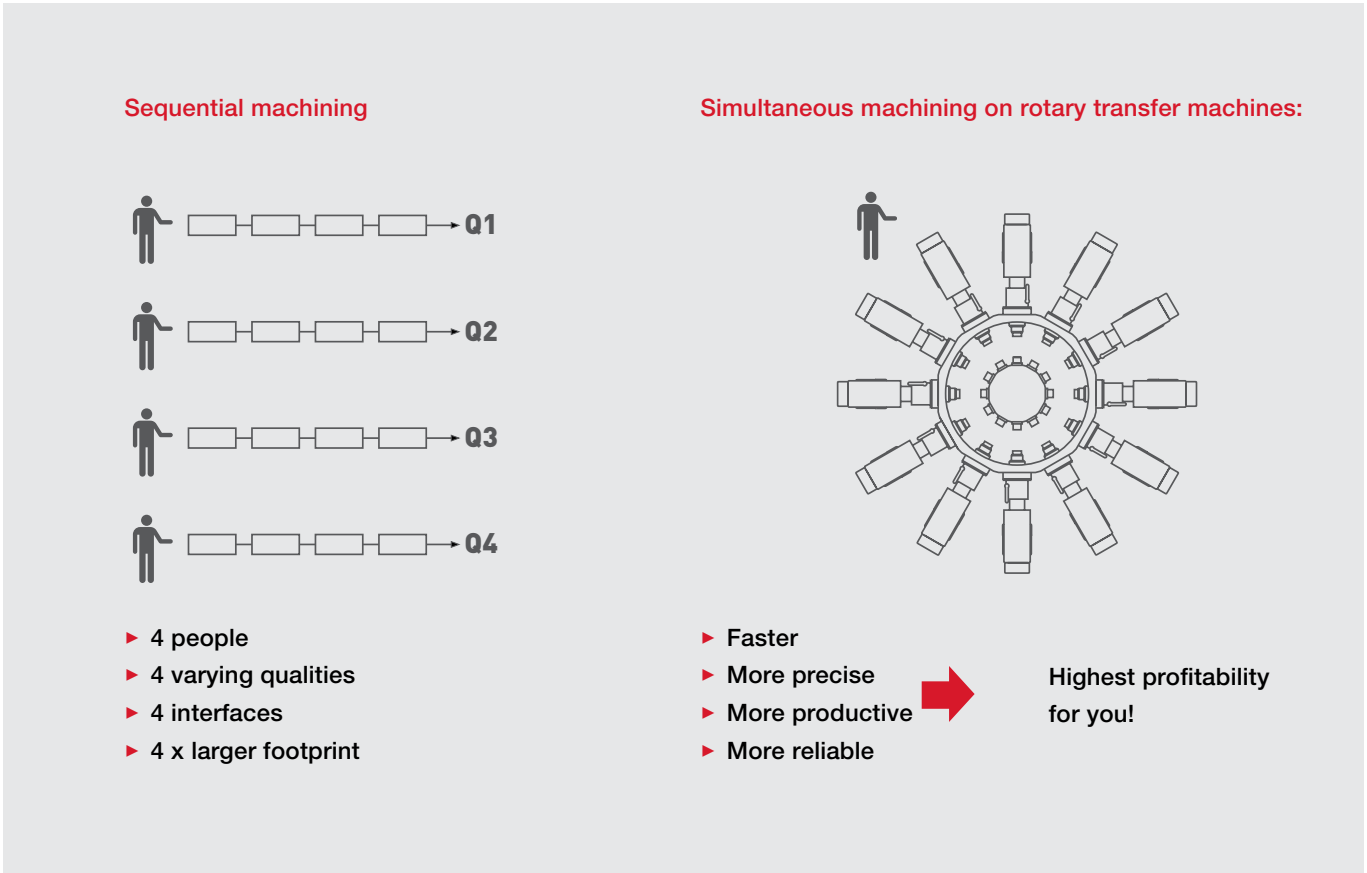
The Highest Machining Quality within Seconds

Rotary transfer center: the rotating workpiece spindle
At the core of the RT 100 CNC are 12 independently driven workpiece spindles and up to 18 installable, simultaneously operating machining modules in both horizontal and vertical positions.
With this high-end technology, the most challenging machining tasks in the 6-side cutting of highly complex mass-produced parts are carried out to the highest level of quality. The structure of the up to 18 implementable machining modules is always carried out on the same basic module (3-axis module). In combination with a multitude of tool modules (modular system), there is an almost endless list of configuration possibilities for optimal and highly cost-effective workpiece production. The machine system can be reconfigured at any time, and therefore provides extremely high investment security for the company. The following machining processes, including chuck compensation, transverse machining and special operations (such as in-process measurement), are performed to an optimal level: Turning, milling, drilling, and other technologies such as

interlinking, broaching, wobble broaching, honing, grinding and mounting. Whenever challenging workpieces need to be manufactured in large quantities, FFG provides the best solution with Pfiffner rotary transfer machines.



Kinematics RT 100-12



Areas of application for the flexible Pfiffner rotary transfer machines by quantity and complexity

RT 100-12 CNC

Champions League Production

Machining of complex turned and milled parts

Uncompromising cutting of high-strength materials within the areas of rotating, milling and drilling with maximum precision and process reliability in mass production – these are the outstanding features of this unique and ingenious high-end technology.

The 12 independently driven workpiece spindles and up to 18 machining modules in both horizontal and vertical positions allow the most challenging machining tasks to be performed from 6 sides.

The machining can be carried out from the bar and from the blank. When blanks are processed, the workpieces are not merely loaded, but also measured in their clamping positions and adjusted accordingly in the subsequent machining stations; this allows any potential dimensional fluctuations to be detected and then compensated.

The RT 100-12's high modularity provides an almost endless list of configuration possibilities for optimal and highly cost-effective workpiece production.

RT 100-12 highlights

- ▶ Machining of stationary and rotating workpieces
- ▶ Easily reconfigurable machine system
- ▶ Simultaneous machining from 5 sides without re-clamping
- ▶ Cycle time-parallel loading and unloading of workpieces
- ▶ Bosch MTX control, which can control up to 99 axes simultaneously
- ▶ Rotary indexing table with endless cycling thanks to state-of-the-art slip ring technology
- ▶ Multi-stage tools, stationary and rotating
- ▶ Crown turret head for up to 6 rotating spindles or stationary tool holders
- ▶ Compensation of the most precise dimensions thanks to reliable in-process measurement
- ▶ Individually combinable horizontal and vertical machining



Example: complete RT100-12

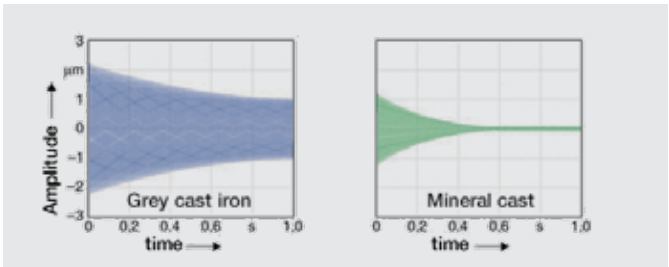
The Solid Basis for the Highest Precision

Basic Structure of the RT 100-12

Maximum rigidity – maximum dampening

Due to the mineral cast machine bed, the RT 100-12 boasts extremely high dampening abilities in addition to its impressive static and dynamic rigidity, and is therefore an outstanding choice for highly dynamic and precise machining.

The composite material consisting of minerals and stone which is combined with epoxy resin allows the constructive integration of pipes for hydraulics and coolants.



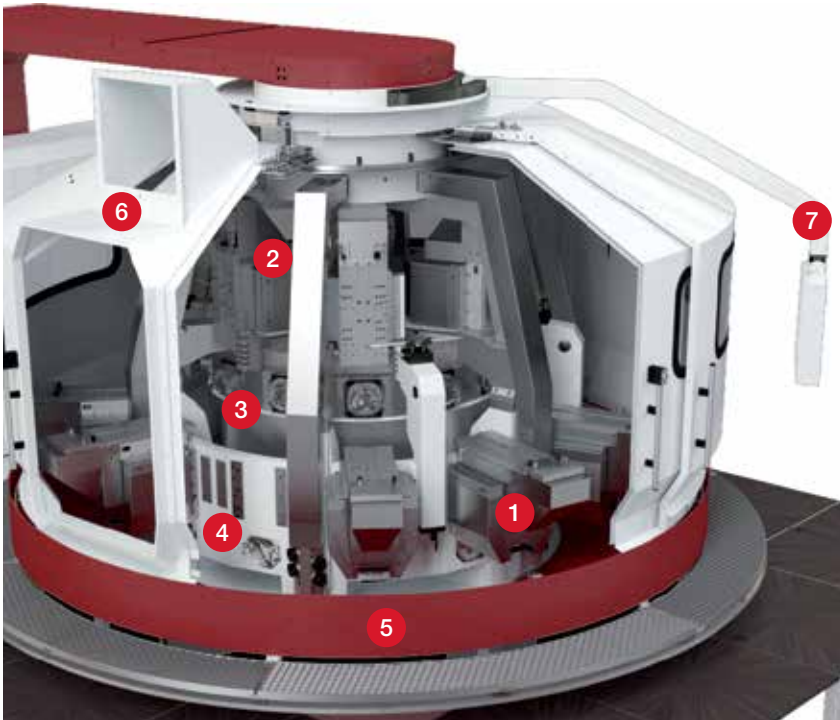
Decaying behaviour of vibrations (source: epucret.de)

The advantages of the mineral casting machine bed

- ▶ Excellent dampening qualities
- ▶ Impressive dynamic and static rigidity
- ▶ Good chemical resistance
- ▶ High thermal stability
- ▶ Design possibilities with integral construction



A brief description of the RT machine structure



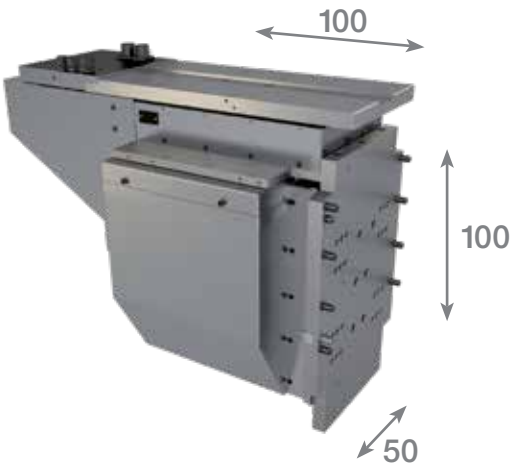
- 1 Horizontal basic module
- 2 Vertical basic module
- 3 Rotary table with tool spindles
- 4 Mineral cast machine bed
- 5 Collecting basin
- 6 Loading/unloading connection (station 1)
- 7 Control panel (can be swivelled by 320°)

Investment Security Through Modularity

One Basic Module for all Purposes

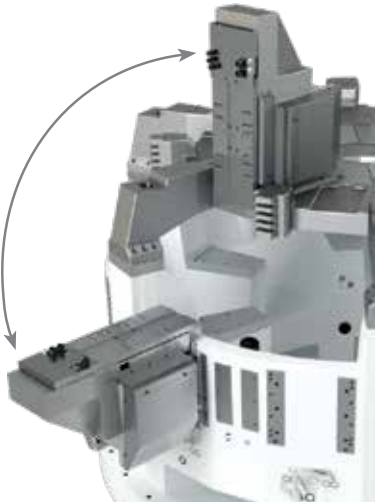
3-axis machining module

The setup of up to 18 implementable machining modules (12 horizontal and 6 vertical) is always carried out on the same basic module. This unique degree of modularity with the universal machining unit for all stations provides an almost



3-axis basic module

endless list of configuration possibilities for optimal and highly cost-effective workpiece production; this crowns the RT 100-12 as the king of rotary transfer machines. The machine system can be reconfigured at any time, and therefore provides extremely high investment security for the company.



3-axis basic module, horizontally and vertically implementable

Consistent modularity from the control to the tool tip

Standardised interfaces guarantee a high degree of modularity. As a result, milling, drilling or turning tasks can be freely performed.

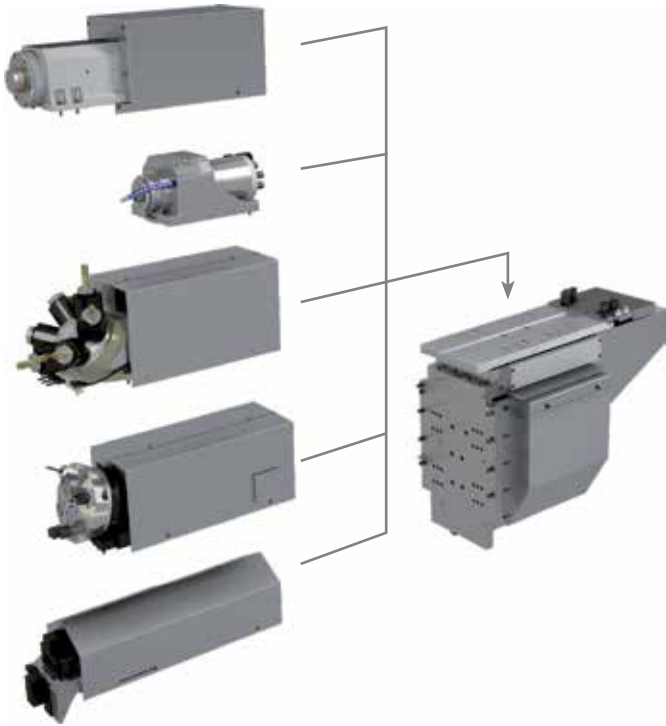
The resulting combinations allow up to 96 tools to be used, whereby a maximum of 18 tools can be simultaneously engaged. The process integration of chipless operations, such as in-process measurement, is economically significant.

Pfiffner tool modules

- ▶ Drilling/milling spindle
- ▶ Crown turret head or drum turret module
- ▶ 4-fold tool holder
- ▶ Sawing module (for working from the bar)
- ▶ etc.

Tool modules available on the market

- ▶ High-frequency spindles
- ▶ Deep hole drilling spindle
- ▶ Angular drilling heads
- ▶ etc.



Examples of modular assembly possibilities (machining module)

Count on Excellence – The Perfect All-rounder, Now Boasting Even More Powerful Turning Processes

Rotary indexing table

The rotary indexing table is the beating heart of every rotary transfer machine. It ensures the highly precise positioning of workpieces between the individual stations.

Thanks to most advanced slip ring technology, the rotary indexing table can be continuously turned.



A look at the centrepiece, the rotary indexing table with 12 workpiece spindles

The workpiece spindle provides accurate rotation

The positionable C-axis (workpiece spindle in the rotary indexing table) facilitates machining of the workpiece from 5 sides.

In addition to its function as an indexing device, the workpiece spindle also acts as a rotating spindle for the highest precision during internal and external turning processes.



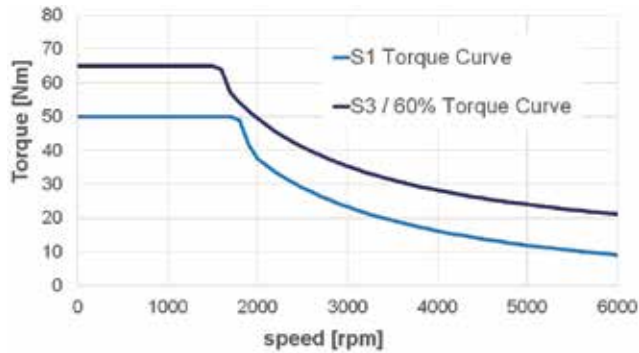
Workpiece spindle

Technical data: rotary indexing table

- ▶ Connection for 12 workpiece spindles
- ▶ Switching time 1 s (30°)
- ▶ Repeat accuracy < ± 0.4''
- ▶ Water-cooled torque motor
- ▶ Hydraulic clamping (12000 Nm)

Technical data: workpiece spindle

- ▶ Water-cooled AC servo hollow shaft motor
- ▶ Speed range 0-6000 U/min.
- ▶ Spindle clamping force 200 Nm
- ▶ Modular mounting for various clamping devices



3-jaws chuck



Hainbuch Spanntop



Collet

Ready for your Application

The RT Loading Variants

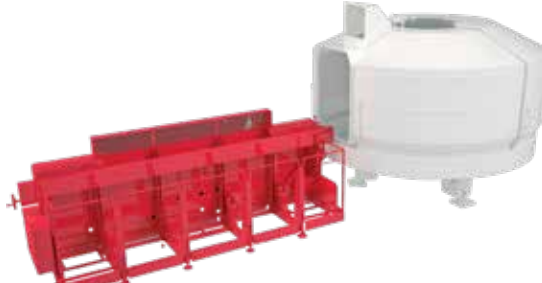
Limitless possibilities for loading and unloading processes

As customer needs are always the priority at Pfiffner, each Pfiffner rotary transfer machine is configured and optimised in accordance with individual customer specifications. Together with the customer, we determine the perfect material feeding variant either from bar or blank for the most economical serial production of a complete workpiece family. As a result, we completely integrate our production line into the value chain.

The machining can be carried out from the bar and from the blank. When moulded and cast blanks are processed, the workpieces are not merely loaded, but also measured in their clamping positions. The tracking of the following machining stations is carried out in accordance with position, which allows any potential dimensional fluctuations of the blank to be compensated by the machine.



from bar



Bar feeder and saw

Dimension: for 3 m to 6 m bar
Different cross sections possible
Autonomy: approx. 10 - 20 h (supporting surface 800 mm wide)

Bundle loader and saw

Dimension: for 3 m to 4 m bar
Loading up to 2 tonnes in a bundle possible
Autonomy: approx. 3 shifts (24 h)



from blank



Pick & Place

For blanks as bulk material feed
Automatic orientation within the conveyor
Autonomy: approx. 1 shift (8 h)

Loading robot (6-axis robot)

Double gripper for a quick loading and unloading, possible on one station
Ideal for linking multiple machines
Autonomy: fully automated process

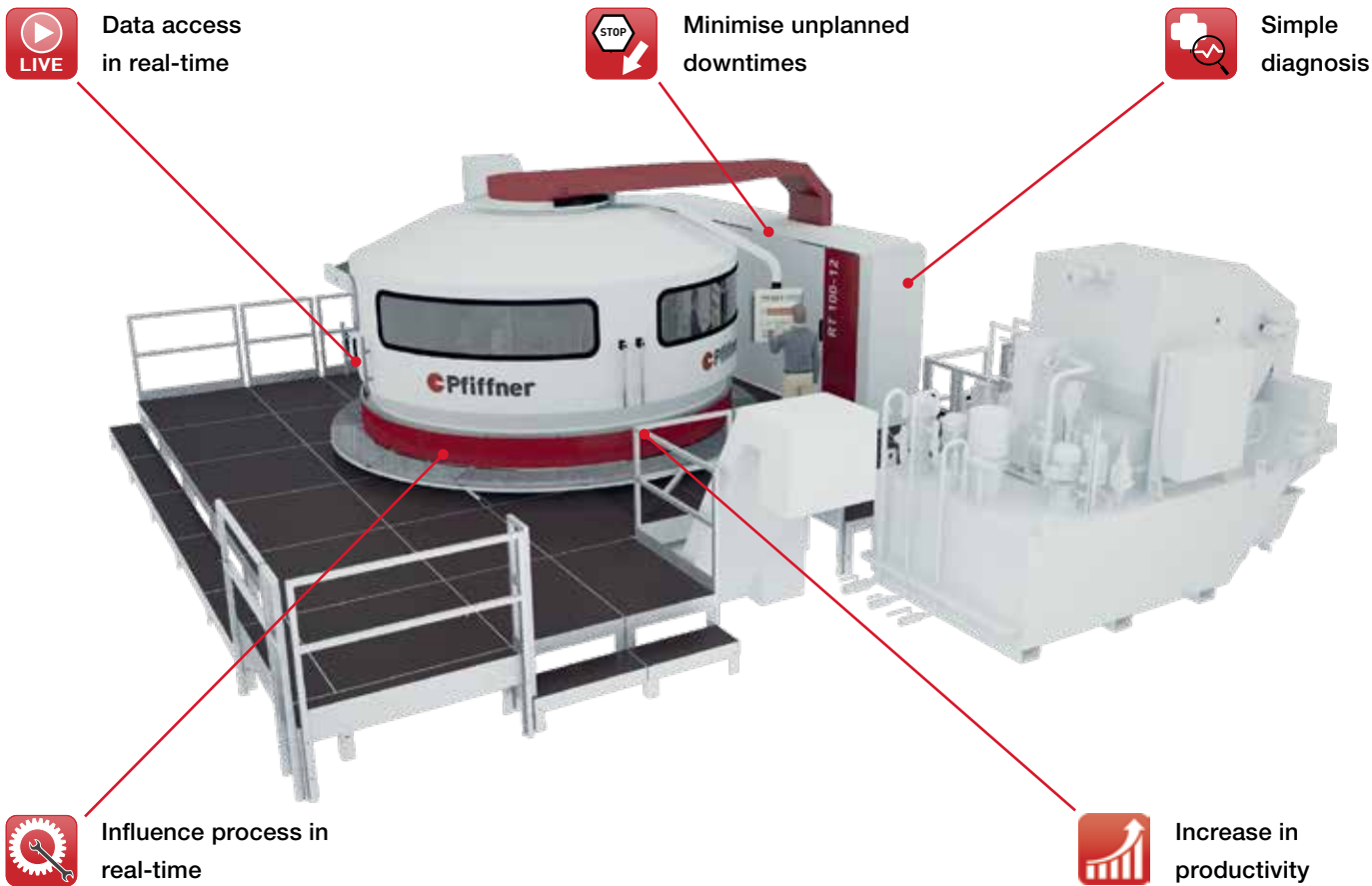


Industry 4.0

The Challenge within Production

The fourth Industrial Revolution

In recent years, production has been oriented towards the principles of lean production, increased flexibility and therefore the achievement of significant success with regard to productivity and supply capability. With Industry 4.0, modern production is on the cusp of a radical upheaval. As the leading rotary transfer machine manufacturer, Pfiffner is ready to take this step into the future together with its customers and implement key new developments.



The Pfiffner concept for Industry 4.0 is the use of the IoT Gateway from Bosch Rexroth for machines with IndraMotion MTX. Data is made available via the umati (universal machine tool interface) interface. umati is an initiative of VDW (German Machine Tool Builders' Association). It is a uniform interface that allows the secure, smooth and effortless integration of machine tools and plants into customer and user-specific IT ecosystems.

Information in the right place, at the right time

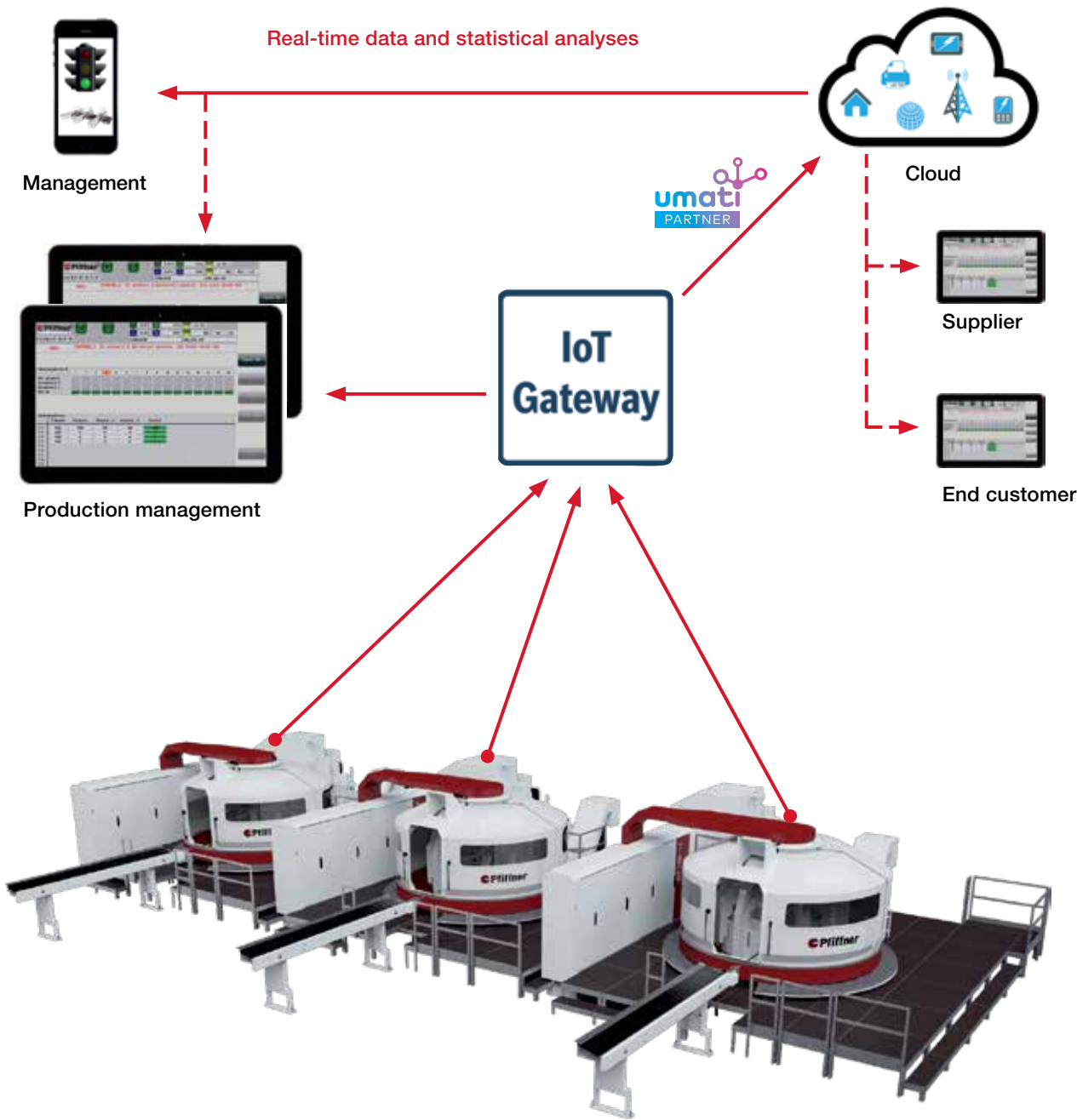
For Pfiffner, this primarily means making use of modern comprehensive information and communication technology in order to increase productivity. Requirements such as real-time capability of production data and simple production system diagnoses can be smartly and intelligently implemented. With Pfiffner production systems, the "fourth Industrial Revolution" is practically within reach!

The control, drive and sensor data is recorded via OPC-UA and pre-processed. Selected data can optionally be displayed via a web interface. In the end, the data for other IT systems (MES, PPS, data analytics...) is made available via an umati server using OPC-UA¹.

¹ Uniform language for the "real-time coupling" of machines

Industrie 4.0

Our Approaches for your Benefit and Added Value



Compiling and recording data

- Recording and analysis of machine data
- Web-based visualisation
- Use of standardised interfaces

Machine state monitoring

- Working mode, cycle times and counter
- Machine availability

Machine diagnostics

- Predictive maintenance

Safer remote access

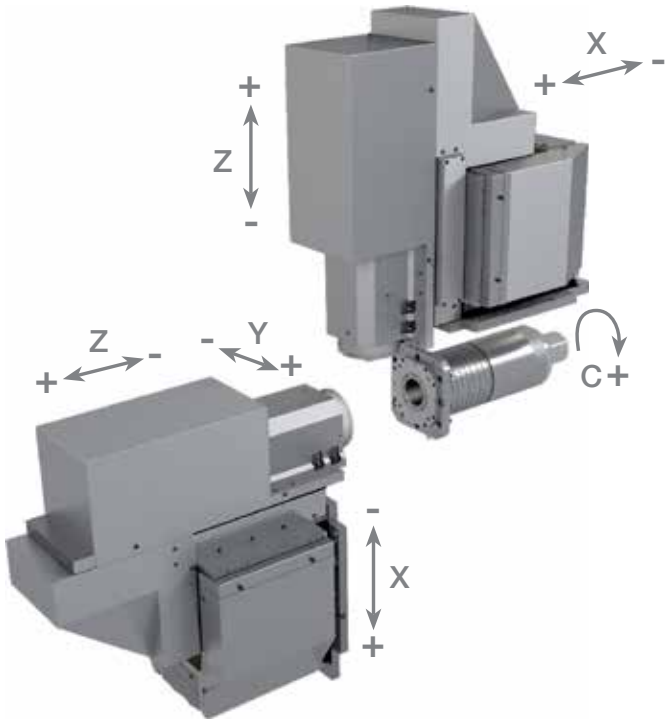
- Use of proven IoT cloud security
- Safer access via current Internet connection

The New Control System

Bosch Rexroth IndraMotion MTX advanced

Innovative, flexible, future-proof

Until now, there had been no CNC control available on the market that could control so many axes. The challenge lies in being able to combine decentralized intelligent electric and electro-hydraulic axes in any configuration. So far, we had to use multiple CNC control systems in parallel using the so-called master-slave process. Within engineering, this was extremely time-consuming and expensive. For our machines, and consequently for our customers, this was no ideal technical solution with regard to operability and cycle times. With the IndraMotion MTX advanced, an individual CNC control can control up to 99 axes and 25 NC channels. The CNC control also boasts outstanding processing power and a high storage capacity. The drive-internal safety functions of the IndraDrive drives make it possible to create a modular safety concept. The efficient control hardware for all axes and the integrated PLC reduce cycle times, therefore increasing productivity. At the same time, they simplify operation and reduce the time to change to new products. In addition, our customers can also change the machine configuration themselves. They have the option to independently add or remove the functions of a unit. The new machine software impresses with its high degree of modularity.



Machine axis kinematics



Pfiffner operating panel



Rexroth IndraControl L85
Source: Bosch Rexroth AG



Rexroth Synchron-Servomotor IndraDyn S
Source: Bosch Rexroth AG

Control with 99 axes / 25 channels

- Higher allocation speed
- Simpler and faster operability and programming
- Savings of time and money
- >10% performance increase

Flexibility

- Scalable and modular control system
- Technically expandable to 99 axes
- Reconfigurable machine system
- Mechanically and electrically a homogeneous modular system
- High reusability and therefore high investment security

Everything from a single source: the CNC control as well as the drive technology

- Long-term product care
- Long-term reusability
- Long-term support services
- Partnership for even higher customer satisfaction



We are at Home in Many Industries

Uncompromising cutting of highly complex workpieces (also high-strength materials) within the areas of rotating, milling and drilling with incredible precision and process reliability in mass production. These are the outstanding features of this unique and ingenious Rotary Transfer Center.

The 12 independently driven workpiece spindles and up to 18 installable X/Y/Z basic modules in both horizontal and vertical positions allow the most challenging machining tasks in the 6-sided cutting of highly complex mass-produced parts to be carried out to the highest level of quality.

The machining can be carried out from the bar and from the blank. When moulded and cast blanks are processed, the workpieces are not merely loaded, but also measured in their clamping positions and adjusted accordingly in the subsequent machining modules; this allows any potential dimensional fluctuations to be detected by the machine and then compensated. These unique qualities of the Pfiffner RT100-12 are a key factor in its success, and as a result it has been successfully implemented within numerous different quality-oriented industries.



Application examples:



Cycle time: 13.8 sec.
Material: Ovako 677k



Cycle time: 20 sec.
Material: 20NiCrMoS2-2



Cycle time: 34 sec.
Material: 100 Cr6



Cycle time: 50 sec.
Material: 16 MnCr5



Cycle time: 24.4 sec.
Material: 42CrMo4



Cycle time: 24 sec.
Material: 16MnCr5



Cycle time: 40 sec.
Material: 1.4301



Cycle time: 76 sec.
Material: 1.4301

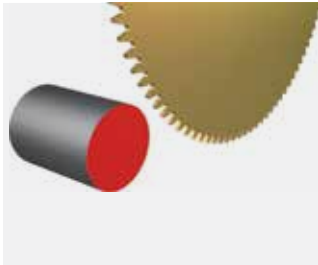


Cycle time: 21 sec.
Material: 16MnCr5



Cycle time: 29 sec.
Material: EN GJL-250

Endless Possibilities



Station 1V, tool 1, Saw
Sawing off a bar part



Station 2V, tool 1, turret
Milling the surfaces



Station 2V, tool 2, turret
Cross drilling



Station 2H, tool 1, turret
Rough drilling



Station 6H, tool 2, turret
Breaking/deburring edges



Station 7H, tool 1, Capto holder
Internal turning



Station 7H, tool 2, Capto holder
External turning



Station 8H
Inverting



Station 2H, tool 2, turret
Rough drilling



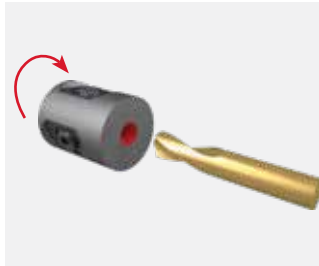
Station 3H, tool 1, turret
Inclined surface milling



Station 3H, tool 2, turret
Inclined bore



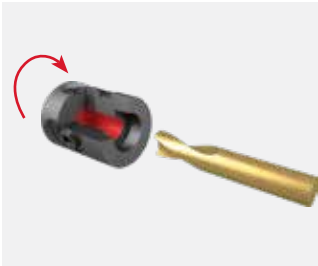
Station 4V, tool 1, turret
Slot turning



Station 9H, tool 1, turret
Rough drilling



Station 9H, tool 2, turret
Core drilling



Station 9H, tool 3, turret
Drilling



Station 9H, tool 4, turret
Turning an inner contour



Station 4V, tool 2, turret
Hexagon milling



Station 4H, tool 1, turret
Drilling



Station 4H, tool 2, turret
Drilling



Station 5H, tool 1, Capto holder
Drilling



Station 10H, tool 1, Capto holder
External turning



Station 10H, tool 2, Capto holder
Threading cutting



Station 10H, tool 3, Capto holder
Internal turning



Station 11H, tool 1, turret
Slot milling



Station 5H, tool 2, Capto holder
Face and external turning



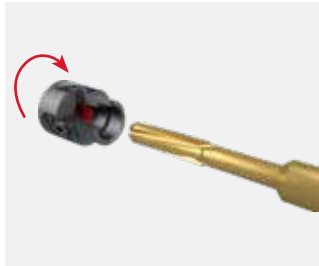
Station 6V, tool 1, turret
Tapping



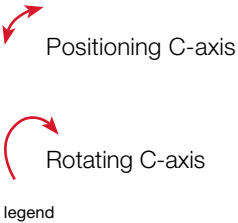
Station 6V, tool 2, turret
Cross drilling



Station 6H, tool 1, turret
Milling the recess



Station 11H, tool 2, turret
Reaming



The proven technology of Pfiffner rotary transfer machines allows highly profitable and complete machining of highly complex serial parts. The application possibilities are limitless. Intelligent procedures ensure maximum precision and allow shorter setup times through duplicate settings. Universal application areas employing modular machining modules support the development of challenging and future-oriented solutions.

Service, Support and Consultation from a Single Source

The great trust that customers have placed in the Pfiffner group throughout its over 45-year history is an obligation. The development of individual solutions is based on the close and cooperative partnership with customers all around the world. In addition to the individual equipping of rotary transfer machines as well as the straightforward support provided during the conversion of a machine, the fast delivery of spare parts and short reaction times in the event of machine faults round off Pfiffner's scope of offers with needs-oriented gloss. Thanks to the use of state-of-the-art telecommunications technology, the significance of the teleservice is now even greater. Cheap and efficient remote diagnoses support the seamless functioning of the Pfiffner rotary transfer machines.

An overview of our support services:

Service calls

- Provision of a service call within 24 h of initial telephone contact
- Telesupport via VPN for Pfiffner rotary transfer machines

Repairs

- Qualified repairs with functional tests of units, spindles and valves at Pfiffner locations

Spare parts

- Central storage facility with high availability of parts
- Competent point of contact for consultation and sales

Customer training

- Operator training
- Maintenance training (mechanical and electrical)
- Programming training
- Individual customer training according to requirement profile

Inspection agreements

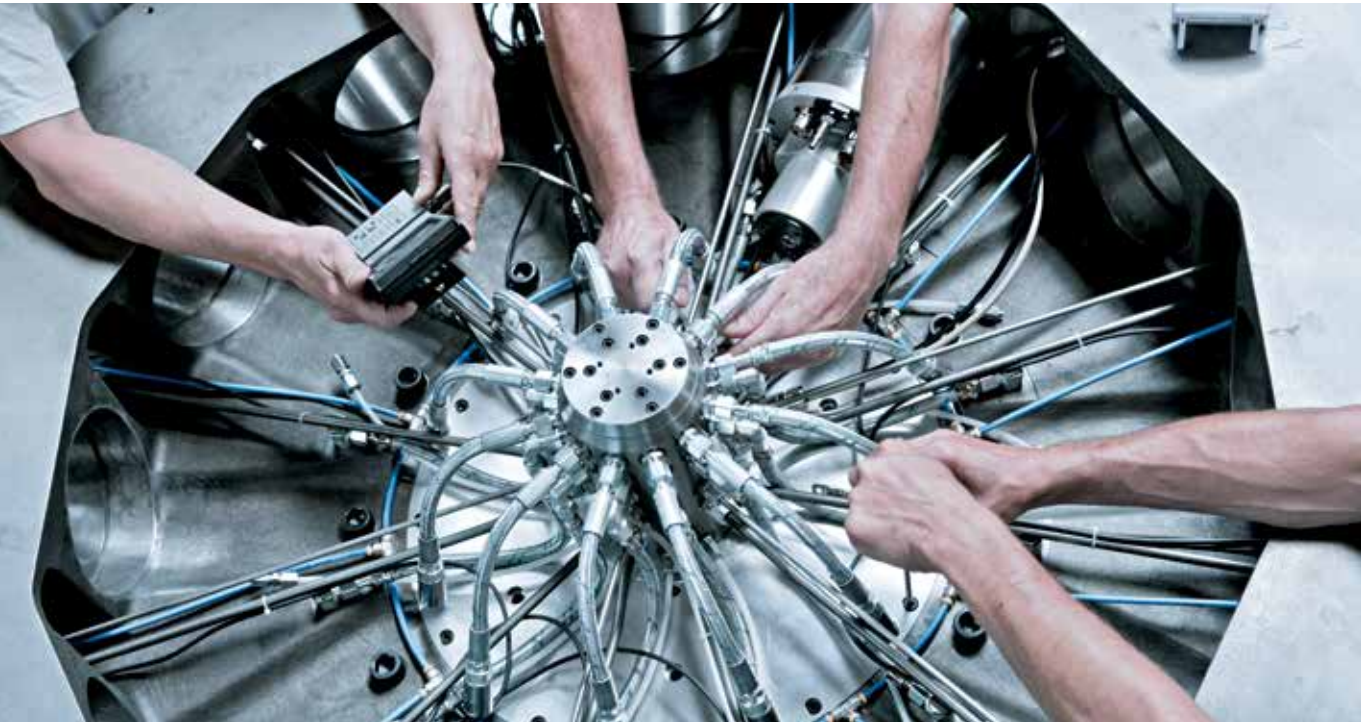
- Maintenance and service costs decrease, production quality and planning security

Turnkey solutions with initial process engineering

Feasibility and chip removal attempts

Process optimisation, installed base
(over 2600 machines in use worldwide)

Modernisation, installed base (ReVest® & tuning kits)
(visit www.pfiffner.com for additional information, videos, etc.)



Overview
Technical Data: RT Product Line



Efficient spindle drives

40% of the total power consumption is taken up by industry. 65% of this is consumed by motors. Through improved energy efficiency of the speed-regulated drives, this consumption can be reduced by up to 50%. A further benefit is the flexibility to meet new requirements.



Ready for the future

The Pfiffner I4.0 solution provides our customers with an overview of the state of the machine and an improved planning capability for maintenance and repairs. Condition monitoring is not only used to reduce downtime times, but also to guarantee process quality.



100% CNC

Rotary transfer machines have never been this flexible before. Being able to react quickly to changing requirements provides you with the decisive competitive edge.
A safe investment in the future!



Everything under control

Pfiffner sets the course: Setup mode and diagnostics displays are available at all times for a fast and targeted error analysis. Therefore, your machine will once again be working in perfect sync and with maximum precision at a record time.



Minimal setup times

Shorter product life cycles and increasing part diversity require a rapid retooling process. Thanks to the consistent modular principle and innovative configuration software, your machine will be fully operational again in a very short time.

			RT 100-6 CNC	RT 100-12 CNC
Rotary indexing table	Clamping stations	Number	6	12
	Clamping devices		Collet	Collet
	Indexing time	Seconds	Chuck 1.2	Chuck 1.0
Workpiece size (max.)	Bar material, round	mm	52	52
	Cubic blanks	mm	100 x 100 x 100	100 x 100 x 100
	Max. workpiece length	mm	150	150
Machining units (Number)	Horizontal	Number	6	12
	Vertical		6	6
	Total		12	18
Dimensions and weights Complete	L x W x H	m	6.0 x 8.0 x 4.0	6.0 x 8.0 x 4.0
	Approximate values	t	20	22