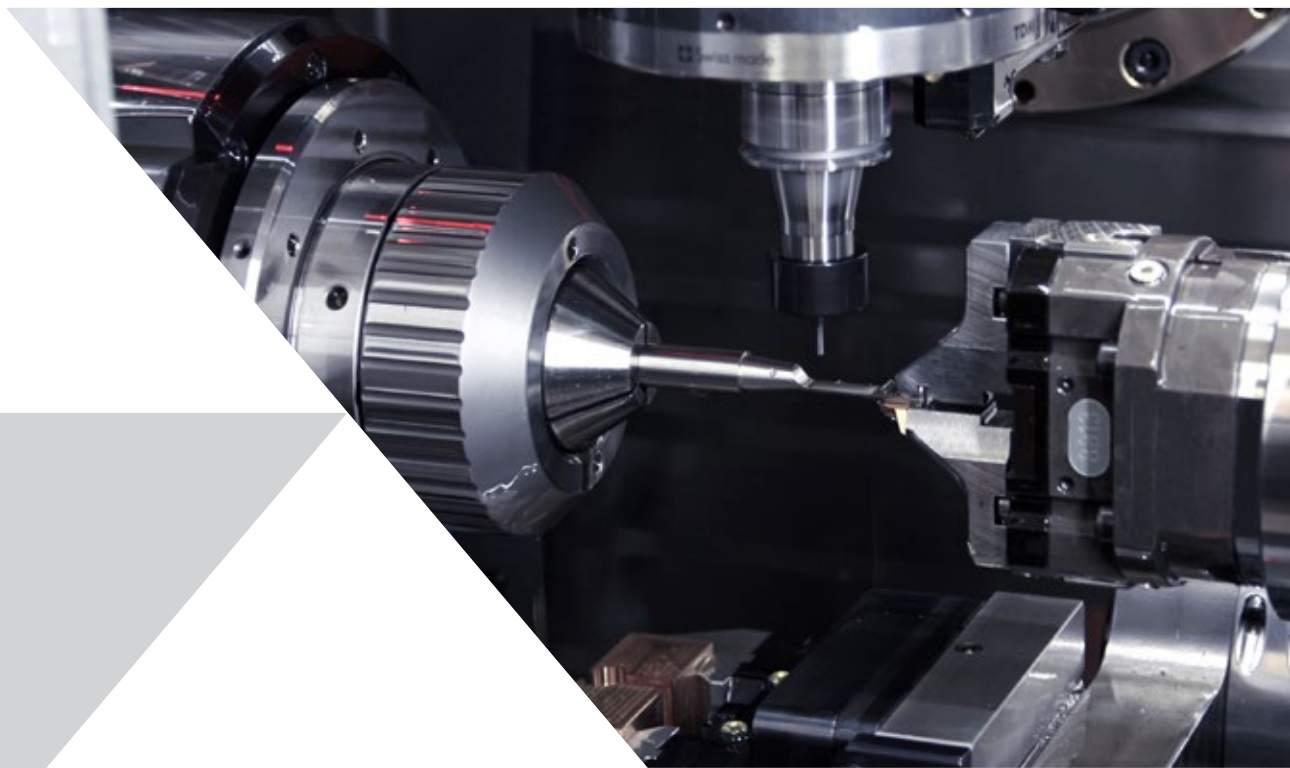


starrag

 bumotec

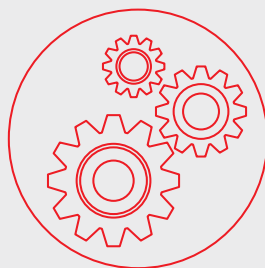
s191H  
High precision CNC mill/turn



# s191, THE COMPLETE SOLUTION

The Bumotec s191 HORIZONTAL is the result of blending "Swiss" mechanics and state-of-the-art axis drive technologies.

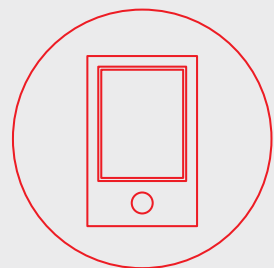
The cast iron machine base and travelling column eliminate vibrations in a perfect way. The advanced cinematics allow the implementation of numerous machining operations at a very small footprint. The combination of milling and turning grants the machining of most different, complex parts in hard-to-machine and precious materials.



**Micro-Mechanics**



**Watch-Making**



**Electronics**



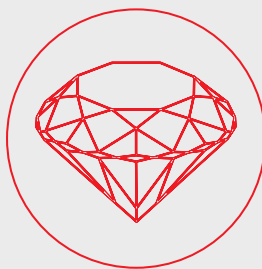
- Complete machining solution
- Working from bar or raw parts
- Bar capacity Ø32/50/65 mm
- Outstanding modularity
- Acceleration 1,2 g
- Rapids 50 m/min
- Linear motors & drives
- Ramp-up 0 to 30 000 rpm in 1,5 s
- 90° tilt in 0,35 s
- Up to 7 axes and three spindles
- Turn/mill and multiple other operations
- Tool magazine 30 / 60 or 90 pockets
- 5 axes simultaneous machining



**Medical**



**Aerospace**



**Jewelry**

# DIRECT DRIVE TECHNOLOGY AND OUTSTANDING THERMAL STABILITY

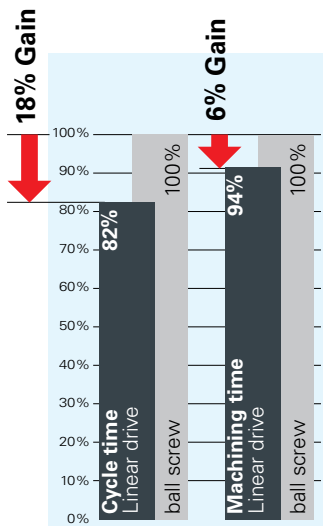
- Higher precision and repeatability
- Better surface finish
- Faster cycle times
- Reduced Maintenance

## Ball Screw vs. Linear Motor Considerations

### Linear Motor Drive Option for the Z and Y axis

Linear motor slides provide a step up in production speed, quality and stability while eliminating maintenance.

Criterion	Linear Motor Drive	Ball Screw Drive
Acceleration	Up to 1,2 g	0,9 g, physical limitation of the ball screw
Speed	Only limited by linear guides	Physical limitation of the ball screw
Wear	None	High, particullary while fast movements
Reliability	Very High	High
Components	No mechanical coupling	Ball screw, nut, coupling, drive etc.
Cooling	Necessary	Necessary while fast movements
Backlash	Zero over lifetime	minimal but increase with wear

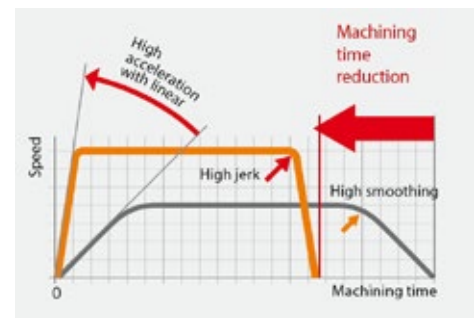


### Reduction of cycletime

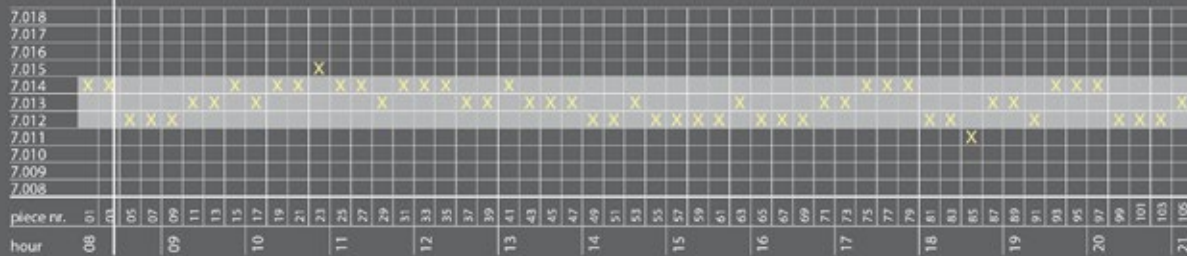
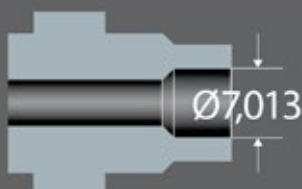
Comparison of cycle time between a machine with ball-screw and linear drive technology.

### The Additional Advantage of Speed

- Reduction of bi-times
- Better dynamics and finishes at higher speeds.



08.00 Start production



### Exceptional Surface Quality

State-of-the-Art control and drive technology combined with proven mechanics support the achievement of best surface qualities at short mfg time. Below: Complex bracelet component with preparation for stone setting in 316 L.

### Contouring precision

The combination of linear drives and 1/100 µm glass scales facilitates outstanding levels of precision and interpolation quality.

Below: Renishaw BallBarTest printout (radius 50 mm).



#### ISO 230-4 Circular deviations

##### X, Y 360 test 2

Instrument	BallbarQC10
Machine	Bumotec s191H
Operator	gachoub
Date	04.09.15 16h50

##### Circular deviations (SAH)

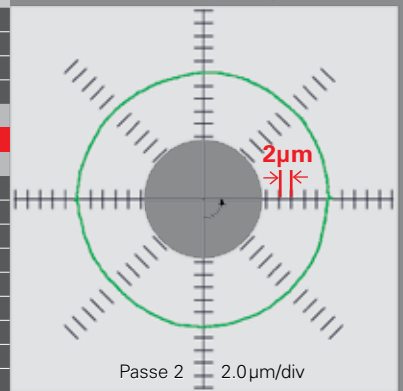
Value	1.4µm
-------	-------

##### Testing parameters

Radius	50 0000 mm
Calibration Frequency	41.667Hz
Feedrate	500 mm/min
Cutting procedure	SAH
Measuring plane	XY
Measuring position	
Starting angle	270°
Exit angle	270°
Angular overlap	180°

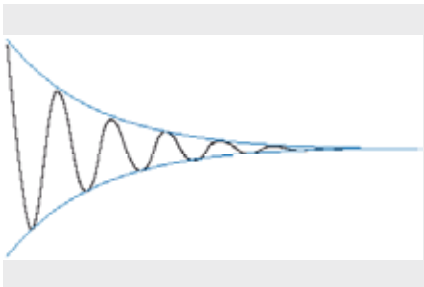
RENISHAW

Roundness: 1.4µm



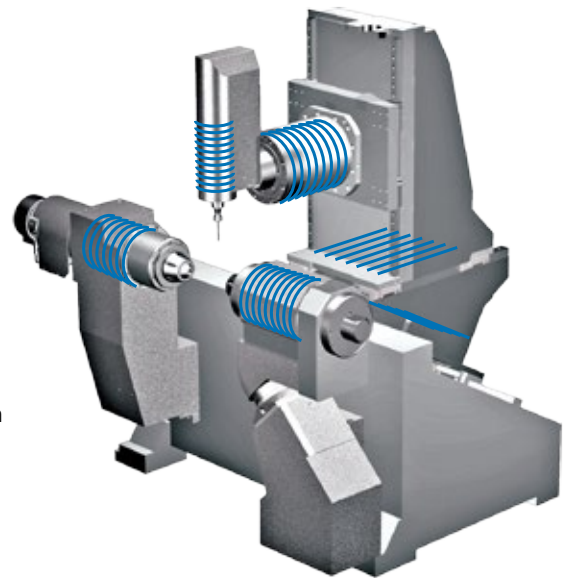
### Cooling system

A stabilized cooling circuit enables a very regular production and almost eliminates warm-up cycles when starting or after interruptions.



### The reduction of mechanical components

helps eliminate vibrations and wear, ensuring a steep increase in precision and positioning, even at high speeds. The result is exceptional surface quality and excellent tool life.



24.00 Stop

8 h Stand still

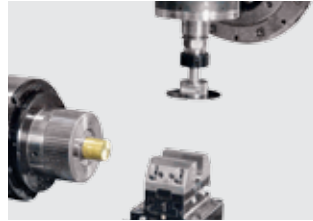
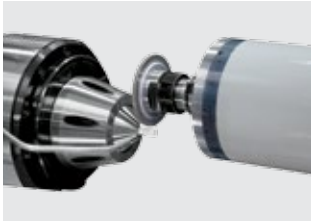
08.00 Start production



Example of unmanned manufacturing in automatic mode. One observes the little dimensional dispersion and the perfect compliance with tolerances at the restart after an 8 hours interruption.

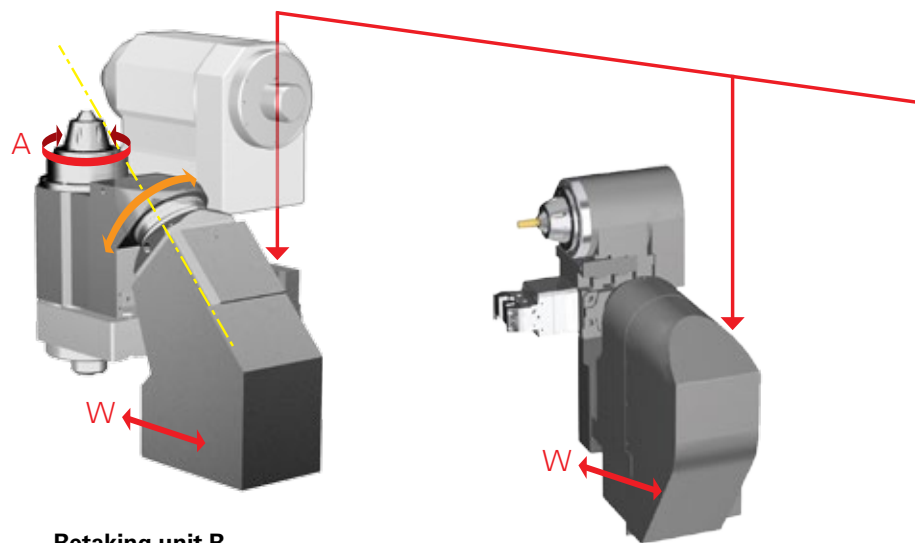
# A MODULAR CONCEPT

- Tailored solution for customers manufacturing
- Multiple combinations possible
- Mill/Turn and more



## Multiple machining set-ups

The multipurpose Bumotec s191H enables the manufacturing of most complex parts, 6-sided in one set-up.

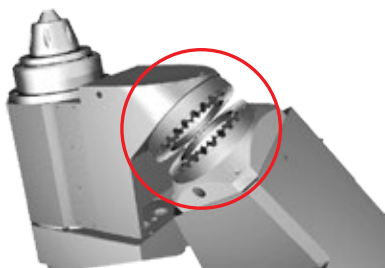


### Retaking unit R

- Full subspindle
- Horizontal/vertical positioning/machining
- Max. power: 15 kW
- Max rpm: 6000 min<sup>-1</sup>
- Max torque: 36 Nm
- Identical to mainspindle

### Retaking unit PRMC

- Power: 11,1 kW
- Torque S1/S6: 13 /34 Nm
- Max spindle speed: 6000 min<sup>-1</sup>
- Max C-axis speed: 90 000°/min



### High precision and strength locking

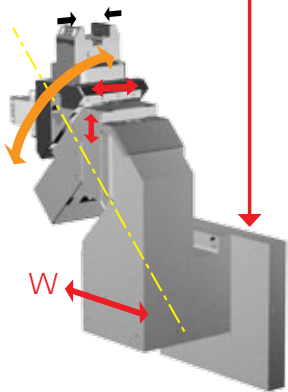
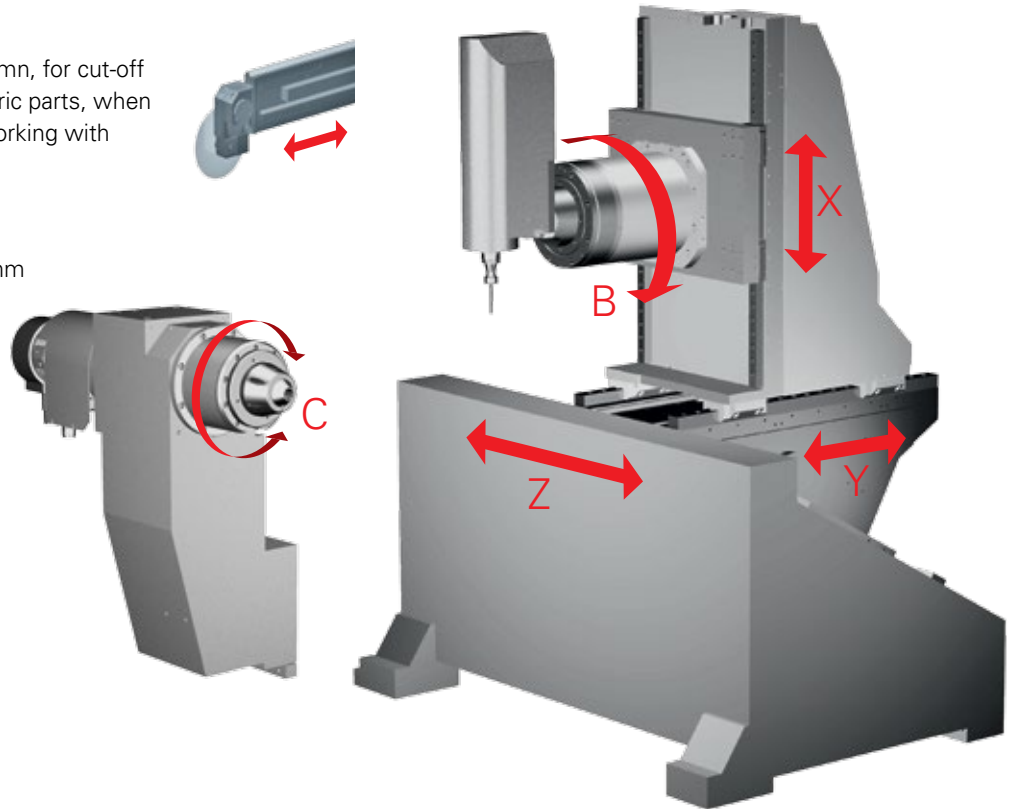
R / PRM / PRC are positioned and locked by HIRTH coupling perfect alignment with main-spindle.

### Independent cut-off unit

Integrated in travelling column, for cut-off of very fine or non-symmetric parts, when taken by the subspindle, working with circular saw.

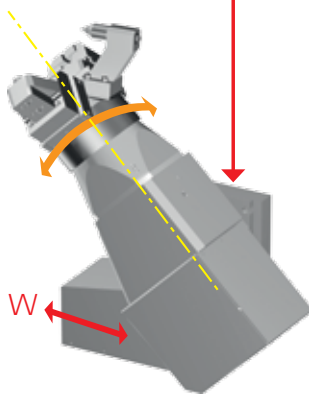
### Mainspindle C

- Direct drive
- Bar capacity:  $\text{Ø}32/50/65$  mm
- Max rpm:  $6000 \text{ min}^{-1}$
- Max torque: 124 Nm



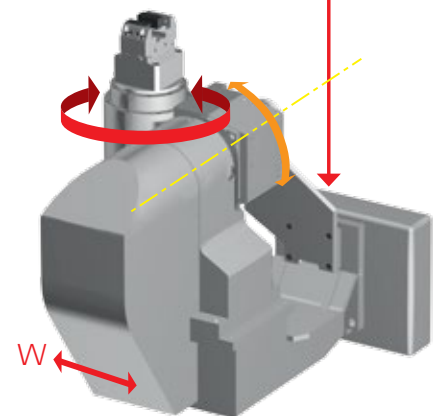
### Retaking unit P

- Horizontal/vertical positioning
- Different clamping systems
- Sitting on W-axis



### Retaking unit PRM

- 4 positions revolving unit
- 2 clamping positions (vice/collet/chuck)
- 1 tailstock



### Retaking unit PRC

- Integrated C-axis positioned perpendicular to the bar
- Max rpm:  $72\,000 \text{ °/min}$
- Max torque: 35 Nm

# MODULARITY

- Vast range of clamping devices
- Perfect solution for each part



SK50 or SK65 collets



W20 collets



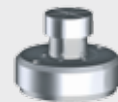
Ottet form collets



F38 or F48 collets



F38 or F48 collets



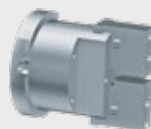
Ottet form collets



Profile/extrusions clamping system



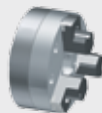
2 jaw selfcentering clamping device



2 jaw selfcentering clamping devices



3 jaw chuck



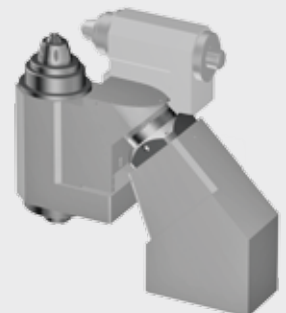
3 jaw chuck



Special clamping unit for watch paltines



Ø32 / 50 / 65 mm



## Accessories for main spindle and retaking spindle

A vast range covers all clamping requests for blanks or bars. Integrated stoppers associated to a clamping pressure allow one to fix the most delicate or massive part.

## Clamping systems for retaking units

Vices, collet systems or tailstocks are available. Customers special systems can be integrated when needed.

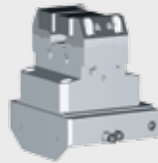
## Modularity

The majority of all clamping devices can be interchanged between the spindles and retaking units.

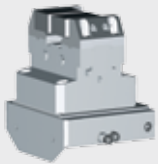




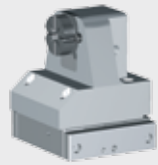
Ottet form collets



Self-centering vice



Self-centering device



Small collet clamping system for small parts



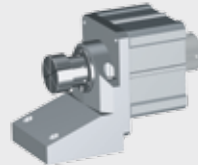
3 jaw chuck



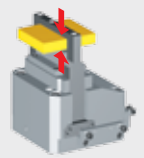
Tailstock



Tailstock



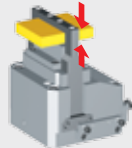
OTTET form collets



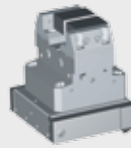
Vertical clamping unit



F38 collets



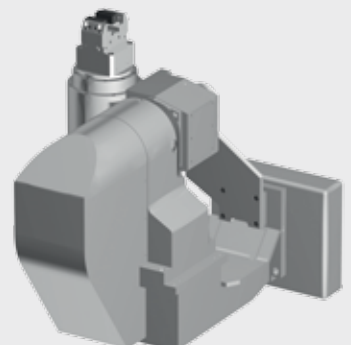
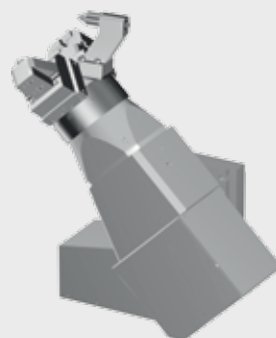
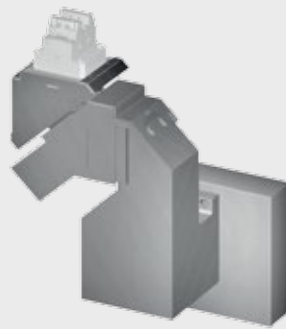
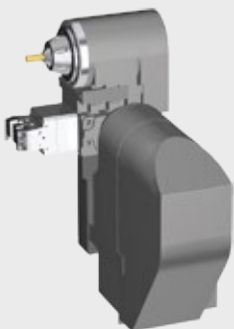
Vertical clamping unit



Self-centering vice



Self-centering vice



# THE WORKING SPINDLE

- High speed and torque
- Outstanding rigidity
- Designed for longevity

## SWIVELLING B-AXIS

The machining spindle carrier axis is controlled by a torque motor with 226 Nm (339 Nm on the «Plus» model) with the following advantages:

- Outstanding positioning and movement response characteristics.
- Excellent surface quality
- High speed design (0° to 90° in 0,35 s)
- Free of any backlash
- Zero lifetime wear



### Through spindle coolant

The spindle is designed for through spindle coolant pressure up to 100 bar.

### B-axis and spindle cooling

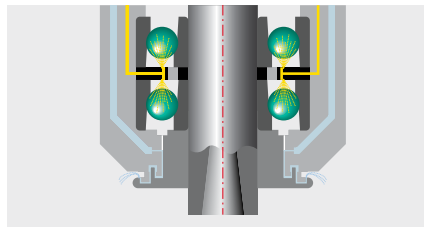
Outstanding results during 5-axis simultaneous machining and TCP (ToolCenterPoint) programming. Stable dependable accuracy at all times.

## ADVANTAGES OF THE SPINDLE

### Speed and Longevity

Ceramic hybrid ball bearings support:

- High acceleration
- High constant speed
- High rigidity

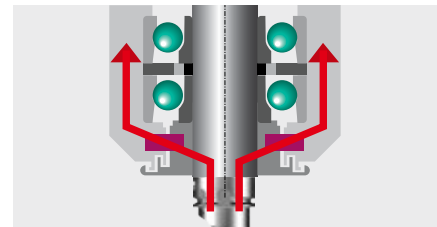


### Sealing

A pressurized labyrinth seal keeps contaminants out.

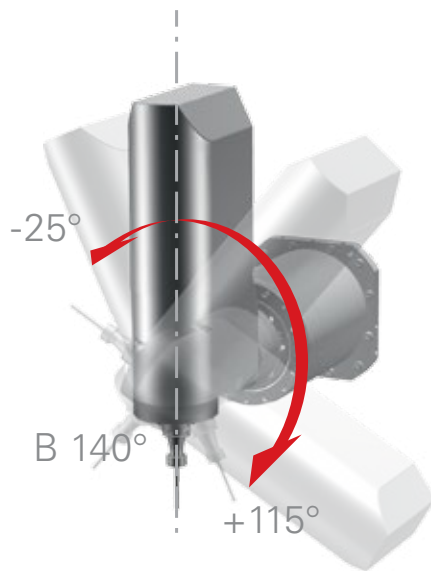
### Oil-Air lubrication

Supporting high spindle speeds and longevity.



### Shock protection

An ingenious design guarantees precise positioning of non-rotating tools (e.g. turning) at 8 x 45° while protecting transmission of shocks to the hybrid bearings for exceptional longevity.



**B-Axis  
Swivelling spindle**

The machining spindle is mounted on B-axis direct drive with 226 Nm (339 Nm on the «plus» model).  
The generous swivel range grants uncompromised machining access at all angles for a perfect 5 sided part.

**HSK40 or CAPTO C4**

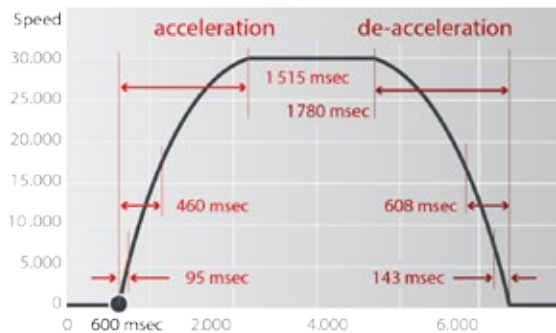
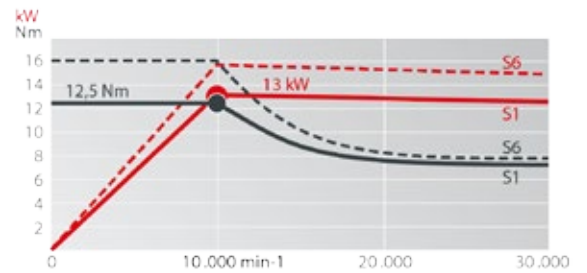
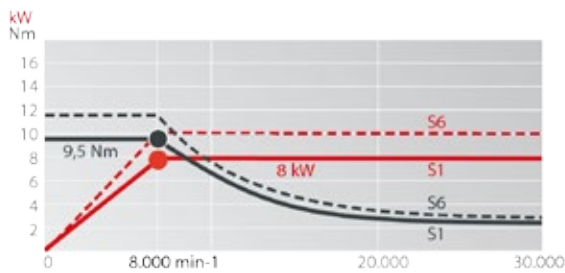
Different toolholder interfaces adapted to the customers machining need allow the exploitation of the latest cutting tool technology available.

s191H Ø32/50 mm

<b>B-Axis</b>	<b>Power S1 / S6</b>	<b>Torque S1 / S6</b>
	4,3 kW	106/226 Nm
<b>Working Spindle</b>	<b>Power S1 / S6</b>	<b>Torque S1 / S6</b>
	8 kW (9,6 kW)	9,5 Nm (11,5 Nm)

s191H Ø65 mm **Plus**

<b>B-Axis</b>	<b>Power S1 / S6</b>	<b>Torque S1 / S6</b>
	4,3 kW	166/339 Nm
<b>Working Spindle</b>	<b>Power S1 / S6</b>	<b>Torque S1 / S6</b>
	13 kW (16 kW)	12,5 Nm (15,5 Nm)



**High ramp-up / ramp-down with the Bumotec working spindle**

The spindle ramps-up in an instant to correspond with the high positioning speed of the axes.

**OPTIONAL FUNCTIONS**

- Anglage
- 40 000 min<sup>-1</sup>
- Package horizontal rectification (hard material machining)

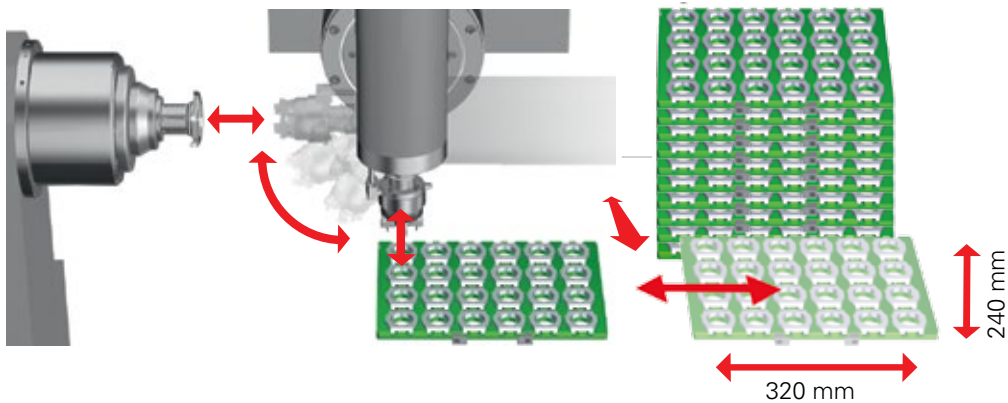
# AUTOMATION

- Upscale autonomy
- Unmanned production



## Automation

A completely integrated loading/unloading unit enables highest autonomy at lowest invest. No referencing needed when changing parts. Parts handling through spindle grippers in the working spindle (stored in the tool magazine). Simple use of the machine axes. The pallet magazine can store raw parts as well as rapid indexing pallet systems such as 3R, Mecatool, Yerly and others.



## Integration

Bumotec integrates on customers demand other loading/unloading solutions.

The Bumotec machining centers can be used as stand-alone machines or as manufacturing cells and can be built up into flexible production systems.



# ACCESSORIES

A huge range of equipment to increase the s191H performance.

## Fixed touch probe

A touchprobe allows the measuring / breakage- wear check of rotating and non-rotating tools in 3 axes. Interactive menus facilitate the use for the operator.



## Spindle probe

The spindle probe helps to check certain criteria in production, or to shift reference points for the machining of castings/forgings.

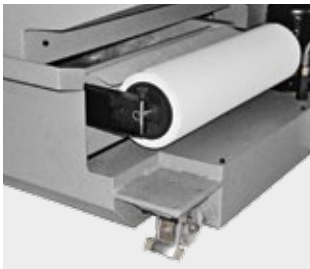


## Chip conveyors

Different models allow the perfect conception according to the customers needs.

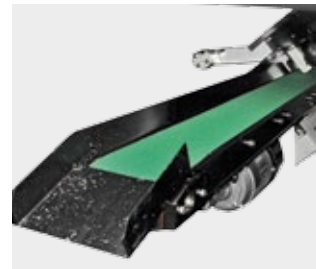
## Automatic barfeeders

Different set-ups and makes available, for short/long bars, with or w/o automatic barfeed.



## Paperbond chip conveyor

Perfect for precious metals. The paper density defines the filtering quality.



## Parts Conveyor

A conveyor belt assures the smooth transport of produced parts out of the working zone.



## High pressure coolant pump

The unit is 100% independent:

- Full-stream cooling of cutting fluid
- Full-stream filtering down to 5  $\mu$
- Automatic reverse-flow filtering, w/o disposables
- Pressure up to 100 bar
- Volumetric pump at 25 l/min

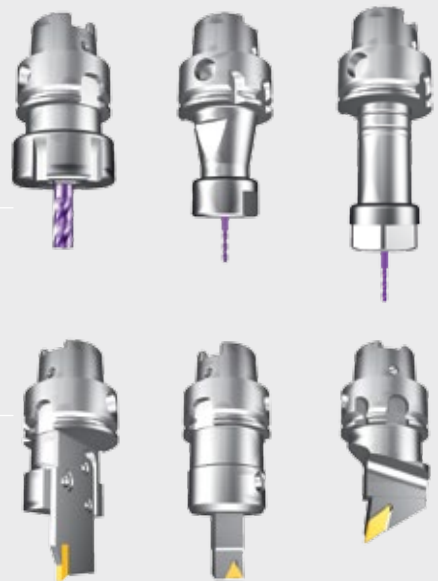
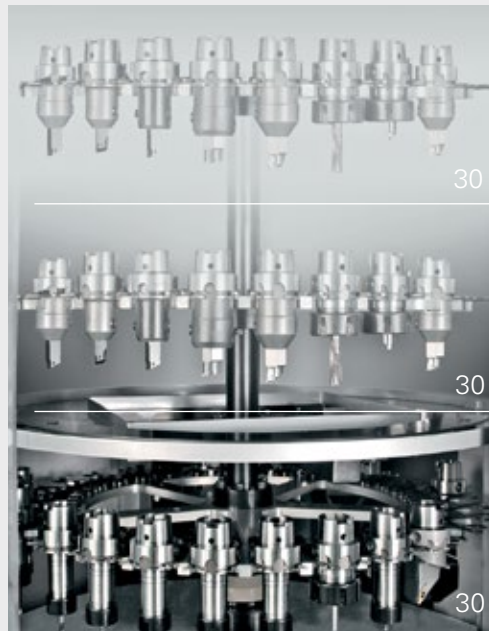
# THE TOOL MAGAZINE

- 30 / 60 / 90 tool pockets
- HSK40 or Capto C4

## Tool Magazine

30, 60 or 90 tool pockets. All tools, regardless of milling or turning, are stored on 30 pocket discs.

The tool always returns to their initial position. Tool change in 1,8 s. Very good accessibility to magazine out of working zone.

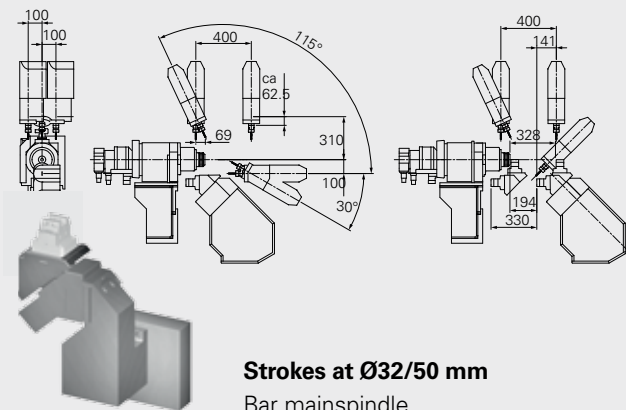


## Special tool holders

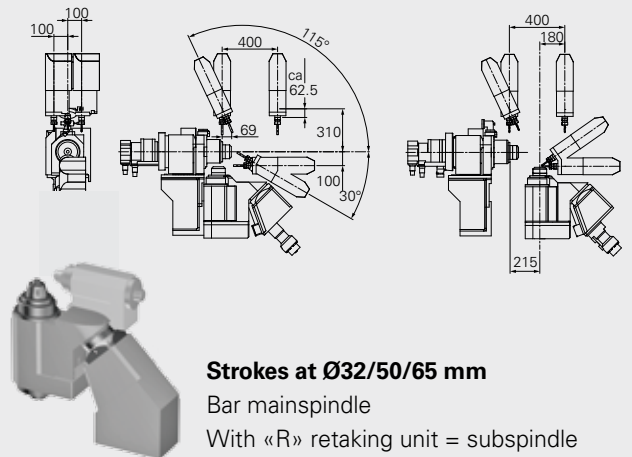
2-, 3-, or 4 cutting tips tool holders increase productivity, as they are used like a turret in the working spindle, thus saving a lot of tool-change-time.



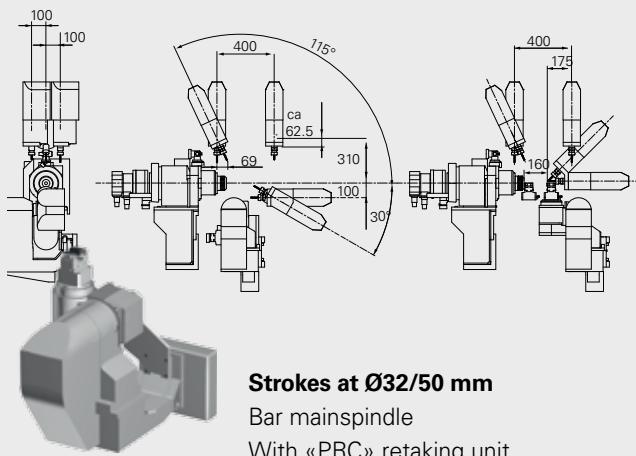
# MACHINE TRAVEL LAYOUT



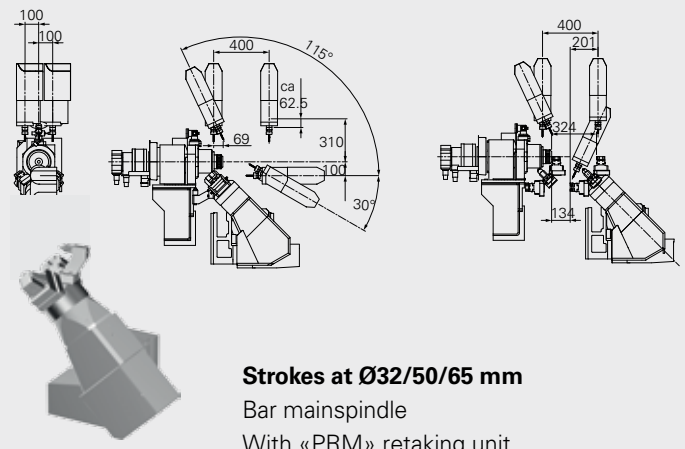
**Strokes at Ø32/50 mm**  
Bar mainspindle  
With «P» retaking unit



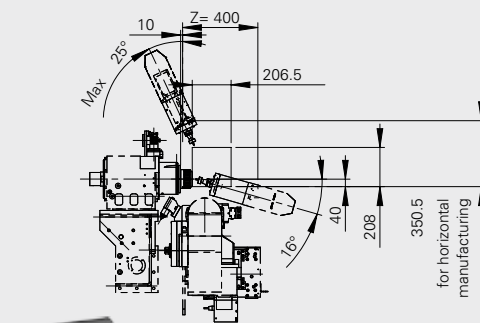
**Strokes at Ø32/50/65 mm**  
Bar mainspindle  
With «R» retaking unit = subspindle



**Strokes at Ø32/50 mm**  
Bar mainspindle  
With «PRC» retaking unit



**Strokes at Ø32/50/65 mm**  
Bar mainspindle  
With «PRM» retaking unit



**Retaking unit PRMC**  
Bar mainspindle  
With «PRMC» retaking unit

# CERAMIC MACHINING

A set of dedicated options, designed to the machining of ceramic and other hard materials, is available:

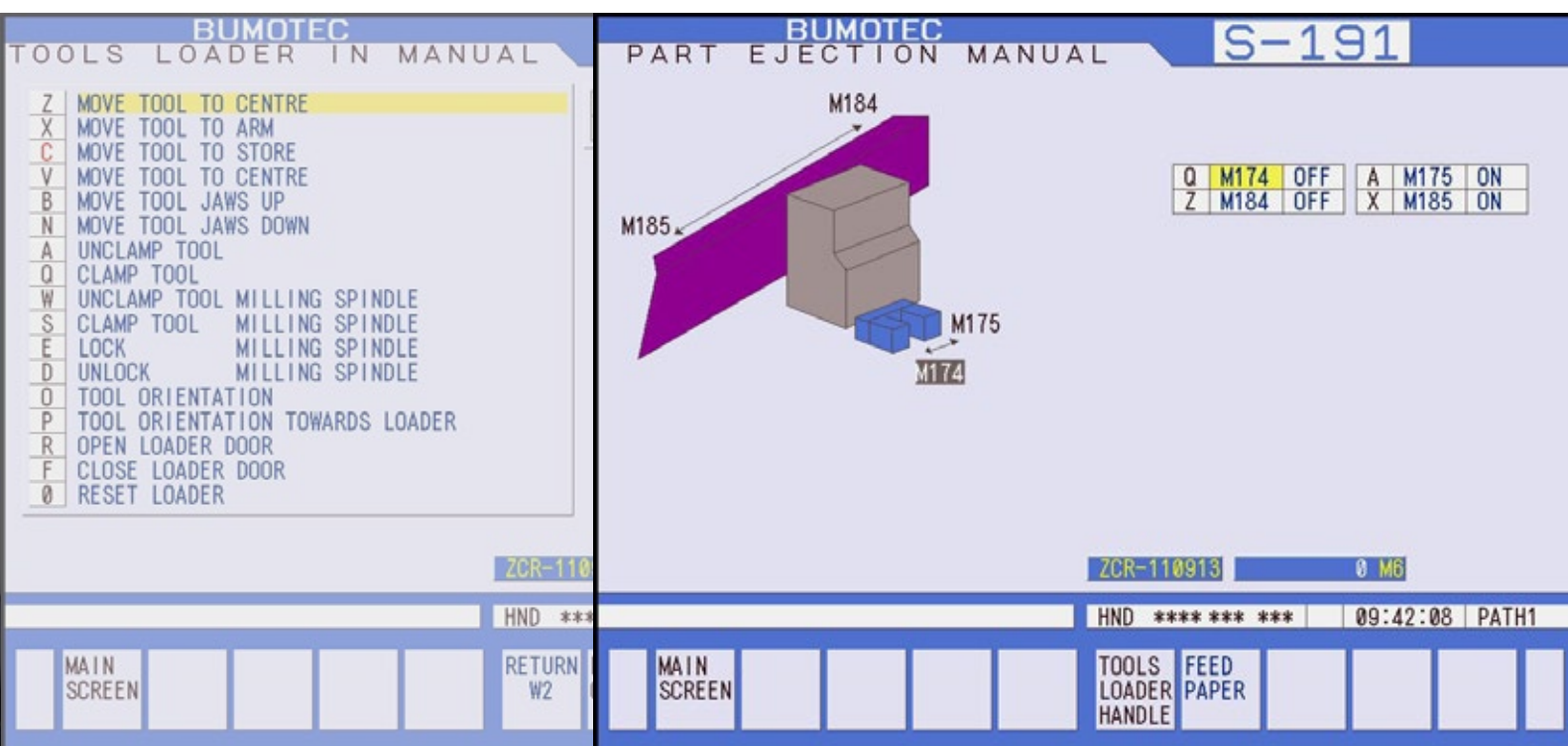


- HF spindle (150 000 min<sup>-1</sup>)
- Laser tool check
- Working zone entirely in stainless



# THE FANUC 31i CONTROL

- State-of-the-art control technology
- Smooth Bumotec man-machine-interfaces



## All machine setting

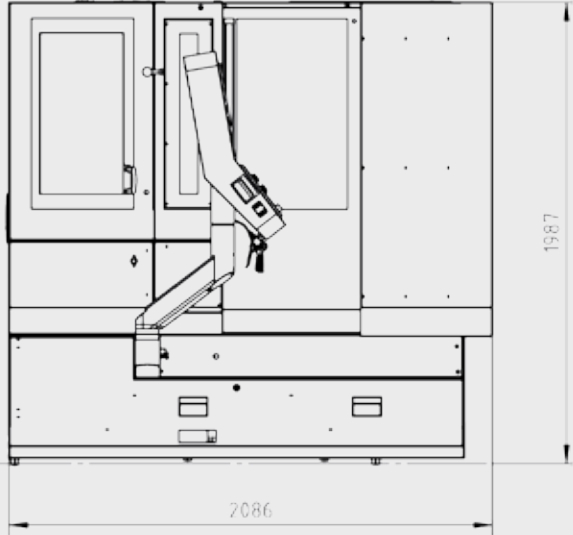
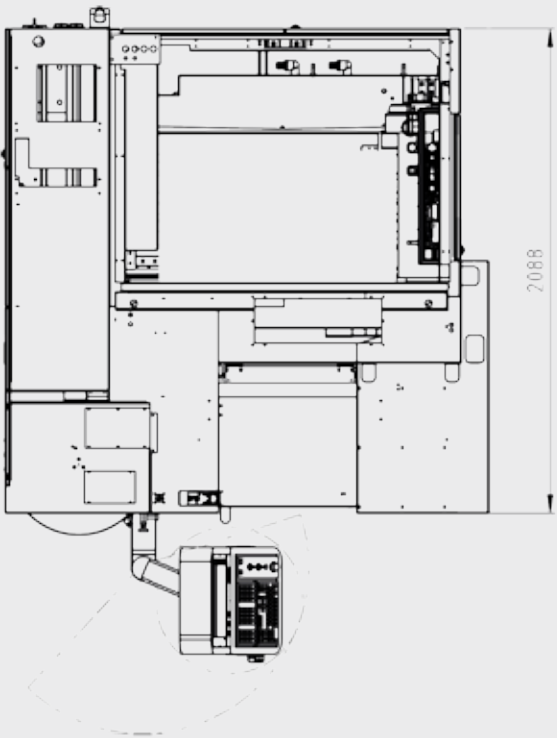
A lot of the menus are dedicated to the basic characteristics of the machine. So, the machining programs are not relating to the specific machine data. Full interchangeability between the machines is given.

## Ease-of-use

Bumotec has developed a vast array of smooth interactive subroutines, helping to simplify the programming.



# FOOTPRINT



# AXIS CONFIGURATION

s191H (with retaking spindle)

