

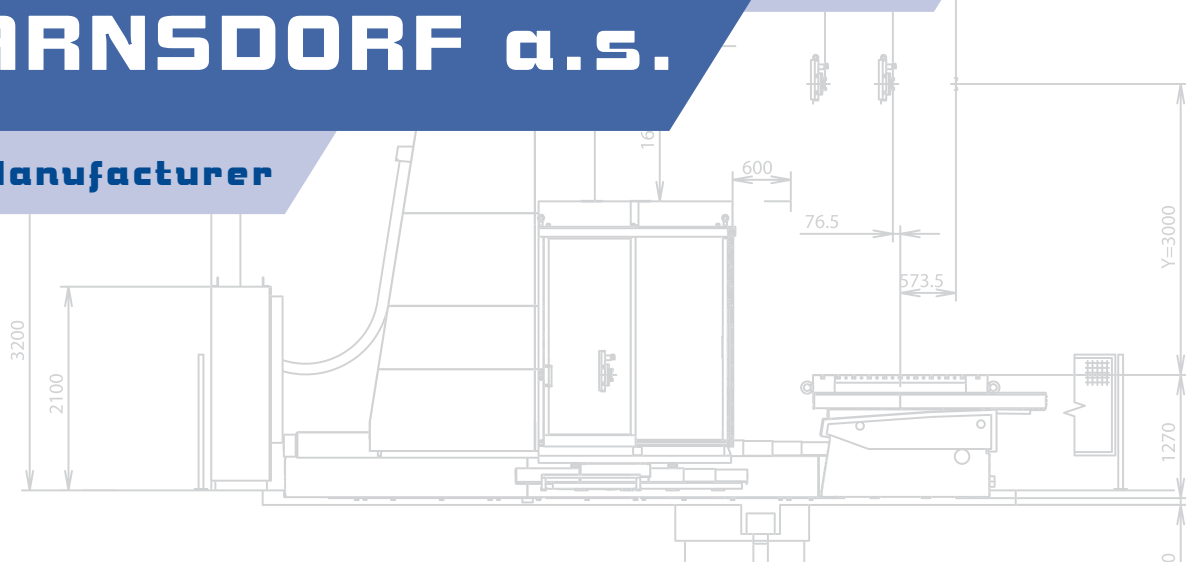
*Your partner for future machining*



# WHT 110 (C)

## TOS VARNSDORF a.s.

**Machine Tool Manufacturer**



**52.9** mil €  
annual Company turnover  
in 2016

**30**  
football fields could  
be built on the  
TOS VARNSDORF grounds

**481**  
employees

**1903**  
year of establishing  
TOS VARNSDORF

**10**  
subsidiaries  
companies around  
the world

**19,494**  
machines sold between  
1941 and 2016

**0.01**  
machine accuracy  
in the order of hundreds  
of a millimeter



## PRECISE TOOL MACHINE MANUFACTURER

TOS VARNSDORF a.s., established in Varnsdorf, Czech Republic, has a long tradition in manufacturing machine tools. The Company was founded already in 1903 under the name Strojírny Arno Plauert and since then, it has grown into a large industry company renowned throughout the world.

The Company specialises in development, manufacturing and sales of machine tools complemented by a wide range of services. The Company possesses its own design group, which ensures the machine design, and a strong production base for manufacturing the machines.

The production programme consists of the three groups of products: table-type machine tools for universal purposes and a powerful machining of the workpieces from 5 to 30 t, large table-type machines of the WRD type for the most demanding technological operations, and modern machining centres that utilise the state-of-the-art technologies with the most progressive, modern tools allowing for application of the automatic tool or palette change as well as integration in the automatic manufacturing systems.

The services we offer with these products range from the offer of training for the operation and programming of the machines and preparation of the technological studies and quotations, to consultancies, e.g., regarding the machine location in the workshop or the production of the machine basement. The Company possesses a strong service team to ensure any requirements of the warranty and post-warranty service.

The Company also provides services in the form of cooperation bids (custom machining, measuring, and chemical/heat treatment of engineering products).

**7 production halls = 32,776 m<sup>2</sup>**



**481 employees**



**2016 turnover = 52.9 mil. EUR**



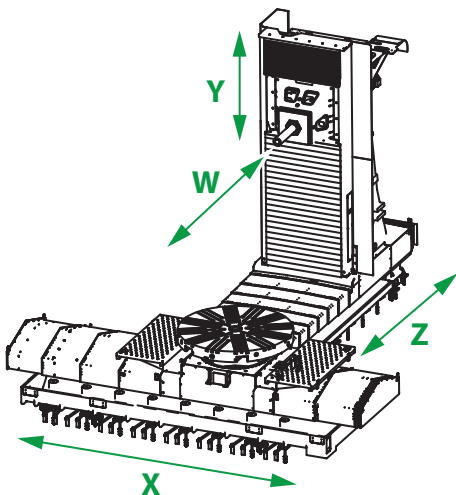
A high technical level of our products was acknowledged in 1996 when the Company was awarded Quality Management System certification in compliance with ISO 9001 including re-certification to ISO 9001:2008 performed at the beginning of 2010.



## WHT 110 (C)



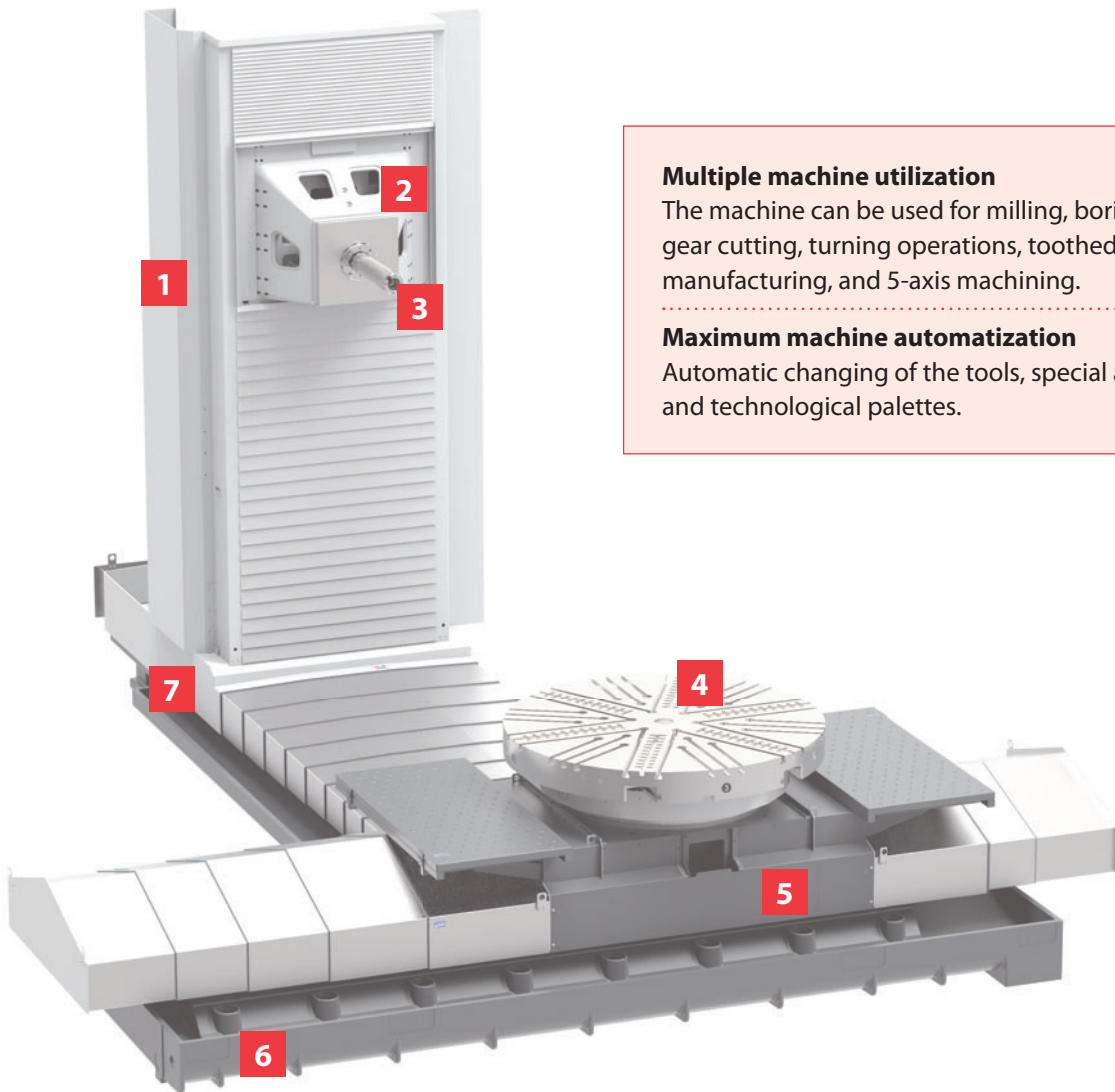
The new high-performance WHT 110 is a horizontal machine tool suitable for the most demanding operations that require precise drilling, gear cutting, turning operations or milling. WHT 110 machines may be designed as machining centres with a wide choice of accessories, e.g., automatic change of technological palettes, tools, special accessories, turning tables, and a range of other options that will satisfy the needs of the most demanding applications in areas such as the aerospace industry, power industry, mining industry, oil industry, and engineering industry. These „multi-tasking“ machines are suitable both for single-piece and batch production.



### Machine configuration

- WHT 110 S – so called „small“ machine version with a rotary table, rotation speed of working spindle up to 4,000 rpm. See the parameter table on page 8 for the axis ranges.
- WHT 110 L – so called „large“ machine version with a rotary table, rotation speed of working spindle up to 4,000 rpm. See the parameter table on page 8 for the axis ranges.
- WHT 110 C (S / L) – machining centre-like machine version (automatic palette and special accessory change, fully covered) with rotation of working spindle speed up to 6,000 rpm.
- WHT 110 machines are equipped with a primary spindle with a diameter of 110 mm

# Key Machine Features



## Multiple machine utilization

The machine can be used for milling, boring, gear cutting, turning operations, toothed gear manufacturing, and 5-axis machining.

## Maximum machine automatization

Automatic changing of the tools, special accessories, and technological palettes.

**1** Maximum machine dimensions:  
X – 3 000 mm, Y – 2 000 mm a Z – 2 500 mm

**2** Two types of central headstocks:  
4,000 rpm, 28 kW, 1,200 Nm  
6,000 rpm, 31 kW, 1,375 Nm

**3** Thermal compensation of the machine

**4** A wide choice of clamping devices. Rotary table with capacity up to 6,000 kg.

Up to 4 automatically changeable palettes.

Carousel table with a diameter of 1,600 mm and 320 rpm.

**5** Linear guideways in X, Y and Z axes ensure a high accuracy and strength of the guide with a very low friction coefficient.

**6** The basic parts of the frame (tables, palettes, longitudinal and transverse beds) are made of the highest quality grey cast iron of Czech origin.

**7** High feed speeds in X, Y, Z axes: 25,000 mm/min and 40,000 mm/min

## TOScontrol

The TOScontrol machine management software consists of the splash screen with the system main menu and the application modules (applications), similar to the mobile device operating systems.



### Screen status

A screen with the basic machine parameters (coordinates, program, alarms, user logged in, etc.).



### CNC – Control system

A standard Sinumerik Operate screen with an added side bar and the button for return to the basic menu.



### Documentation

This application enables reading and management of pdf documents (e.g. the machine operating instructions, workshop manual, etc.) including the possibility of creating user rights and tabs in the documents.



### IP Camera

Viewing the IP camera image including the control option.

### Other applications are being prepared:



### Technological calculator



### System settings



### Calendar



### In-process measurement

# In-process Measurement



**Machine control system**

**Operating principles:**

Independent position measurement of the tool/probe with the „Leica“ laser tracker – effective and precise measuring of the position on the machine.



**Touch probe from the 3D coordinate measuring device**

**Intended use:**

Fast and accurate interoperation check.  
A condition for exact final machining.



**A server for communication between the metrology and control systems.**



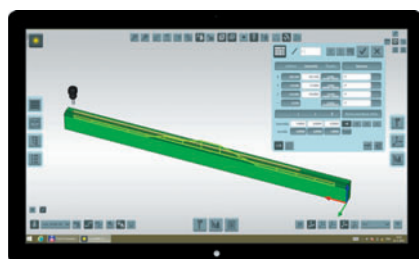
**Added value:**

Workpiece inspection directly on the machine saves the time required to transport the workpiece to the 3D coordinate equipment. An independent measuring of the probe position in the workspace = measuring is immune to machine inaccuracies.

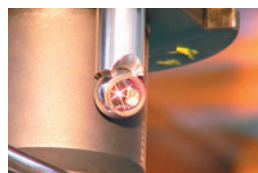
**Method of use:**

- During measurement the machine is controlled using the metrology software (behaves as normal 3D measuring equipment).
- Based on the measured values, the actual machine inaccuracies can be defined.
- The measured values can be transferred into the machine control system as the position corrections.
- It is then possible to make the final machining without the need of changing the NC program.

**Laser tracker for an accurate position measurement.**



**Metrology SW for on-line machine control during measurements.**

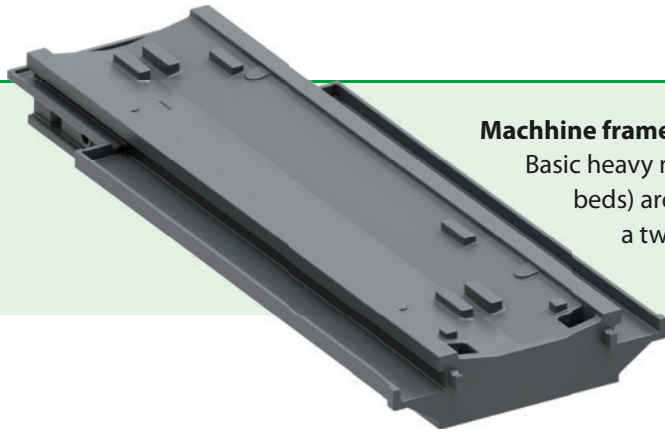


**Corner deflector to monitor the probe position**

**Actual accuracy:**

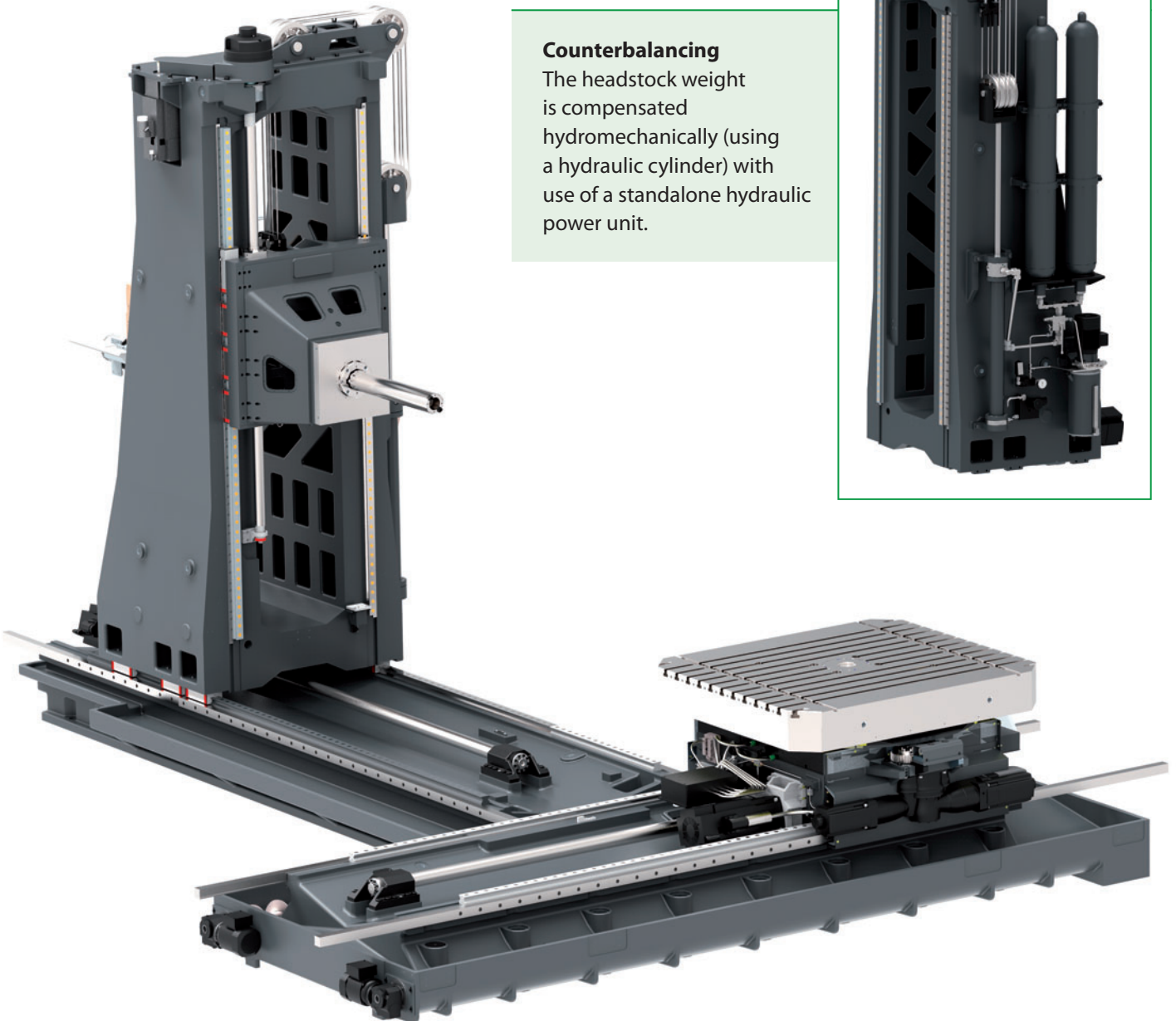
The accuracy as specified by the laser tracker manufacturer is  $\pm 15 \mu\text{m} + 6 \mu\text{m}/\text{m}$ ; typically  $\pm 7.5 \mu\text{m} + 3 \mu\text{m}/\text{m}$ .  
The verified accuracy is 20-30  $\mu\text{m}$  within the whole machine working space.

## WHT 110 (C)



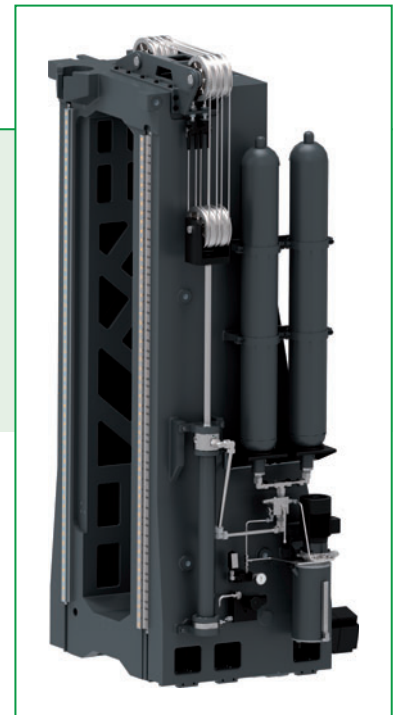
### Machine frame

Basic heavy machine parts (tables, palettes, longitudinal and transverse beds) are casted from grey iron. The machine column is designed as a twin-shell casting also made of grey iron with an optimised structure.



### Counterbalancing

The headstock weight is compensated hydromechanically (using a hydraulic cylinder) with use of a standalone hydraulic power unit.

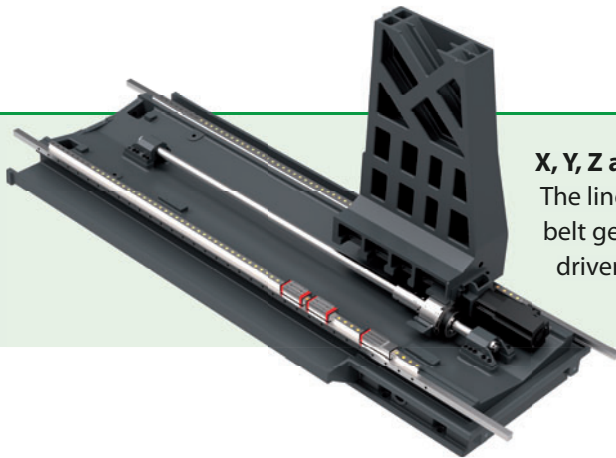
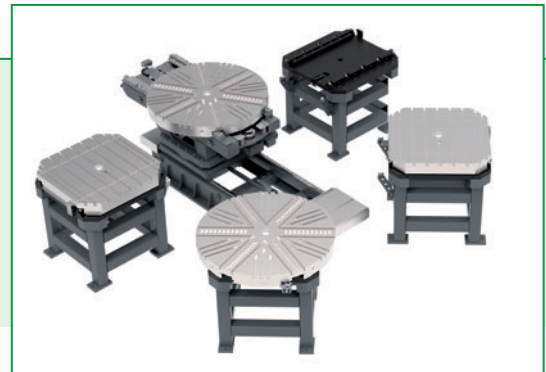




# WHT 110 (C)

## Automatic change of technological palettes

Conceptually, the palette change equipment is based on the automatic change of the technological palettes between the stationary stowage stations and the palette clamping base on the machine. The palettes are handled using a rotary palette manipulator.



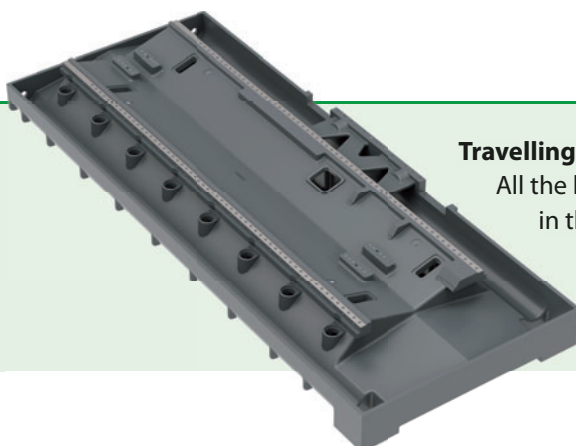
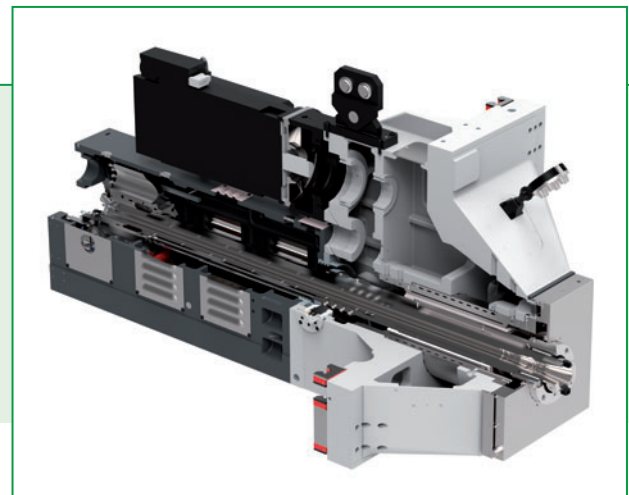
## X, Y, Z and W axis drives

The linear axes are driven by standalone actuators with embedded belt gears and ball screws with a large pitch. The X and Z axes are driven from the ball screws with rotating ball nuts. The Y and W axis are driven from the rotating ball screws.

## Central headstock

The WHT 110 machine is equipped with a central core headstock. This solution is optimum in respect to a uniform thermal and mechanical loading of the machine frame. The spindle is driven from a standardised gear case connected to the main motor. Two mechanical spindle speed ranges are shifted electromechanically.

The travelling spindle is sliding in the hollow spindle.



## Travelling group guides

All the linear travelling machine groups in the X, Y and Z axes are guided in the pre-loaded compact rolling linear guideways. The travelling spindle is sliding in the hollow spindle. The table is supported on a large radial-thrust cylindrical roller bearing with high capacity and rigidity.

# Machine Centres

## TECHNICAL PARAMETERS – BASIC MACHINE PARAMETERS

Machine type		WHT 110 S	WHT 110 L	WHT 110 SC	WHT 110 LC
<b>Headstock</b>					
Working spindle diameter	mm			112	
Spindle taper				ISO 50	
Working spindle speed range	1 rpm	10 – 4 000			10 – 6 000
Main motor nominal power S1	kW	28			31
Nominal torque on the spindle S1	Nm	1 200			1 375
Spindle stroke W	mm			650	
<b>Column</b>					
Headstock vertical travel, Y	mm	1 250	1 600	1 250	1 600
Longitudinal column adjustment Z	mm	1 500	2 500	1 500	2 500
<b>Rotary table</b>					
Transverse table travel, X	mm	1 500	2 500	1 500	2 500
Max. workpiece weight	kg		6 000		
Table clamping area dimensions	mm	1 250 x 1 250	1 250 x 1 600	1 250 x 1 250	1 250 x 1 600
<b>Feeds</b>					
Feed and rapid traverse ranges – X, Y, Z	mm/min	25 000			40 000
Feed and rapid traverse ranges – W	mm/min			20 000	
Feed and rapid traverse ranges – B	1/min			3	
<b>Basic machine equipment:</b>					
– Chip conveyor			•		•
– Machine operator covering			•		•
– X-axis covering			•		•
– Modification for the manual change of the manually adjusted milling heads			•		
– Remote diagnostics			•		•
– Complete machine enclosure (including the machine operator covering)					•
– Automatic tool change AVN 40					•
– Modification for the automatic change of the milling heads (UPPT)					•
– CHZ tool cooling (via the external nozzles)					•

Basic horizontal table type machines or centres are available in two versions – S (small) and L (large). Each version has its pre-defined parameters (see the table) and equipment. It is possible to only select from the range of options (e.g. milling heads, face plates, etc.).

## OPTIONAL MACHINE VERSIONS

Machine type		WHT 110	WHT 110 C
<b>Headstock</b>			
Working spindle diameter	mm	112	
Spindle taper		ISO 50	
Working spindle speed range	1 rpm	10 – 4 000	10 – 4 000    10 – 6 000
Main motor nominal power S1	kW	28	28    31
Nominal torque on the spindle S1	Nm	1 200	1 200    1 375
Primary spindle travel W	mm	650	
<b>Column</b>			
Headstock vertical travel, Y	mm	1 250, 1 600, 2 000*	
Longitudinal column adjustment Z	mm	1 500, 2 000, 2 500	
<b>Rotary table</b>			
Transverse table travel, X	mm	1 500, 2 000, 2 500, 3 000	
Max. workpiece weight	kg	6 000	
Table clamping area dimensions	mm	1 250 x 1 250, 1 250 x 1 600	
<b>Turning table</b>			
Transverse table travel, X	mm	1 500, 2 000, 2 500, 3 000	
Max. workpiece weight (max. palette load)	kg	6 000 (4 000)	
Table clamping area dimensions	mm	Ø 1 600	
<b>Automatic palette change</b>			
Transverse table travel, X	mm	1 500, 2 000, 2 500, 3 000	
Max. palette load	kg	4 000	
Palette clamping area	mm	1 250 x 1 250, 1 250 x 1 600	
Max. number of palettes	ks	2 to 4	
<b>Automatic tool change</b>			
Number of pockets – circular type magazine	ks	20	
Number of pockets – chain type magazine	ks	40, 60, 80	
Number of pockets – rack type magazine	ks	100+	
Max. tool diameter			
– with the magazine fully occupied	mm	125	
– with the free adjacent positions	mm	300	
Max. tool length	mm	500	
Tool change time	s	10	

\* Only for WHT 110

## Machine covering

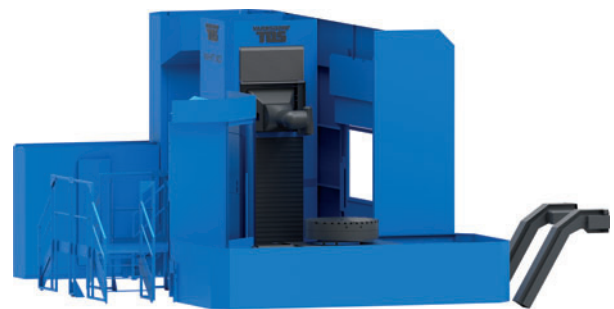
### Horizontal machine tool



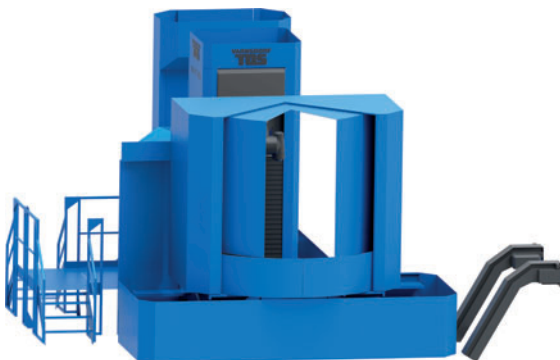
Covering basic version: the bed, column and operator's place covers

### Optional version

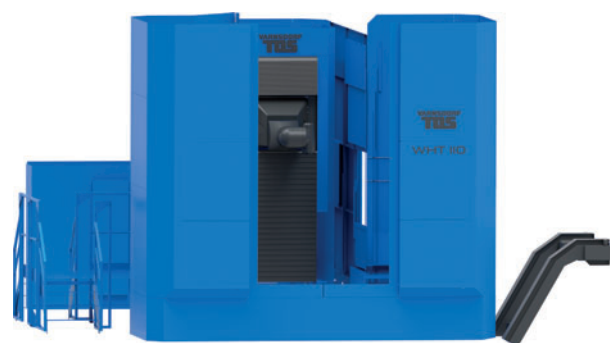
Machine covers with the automatic tool change: bed, column, operator's place and automatic tool change covers



Protective covering of the workspace: the bed, column and operator's position covers and workspace protective covering that includes a removable sheet metal cab



„C“ cover: the beds, the column, the machine operator's station, and the workspace covering along the X and Z axes

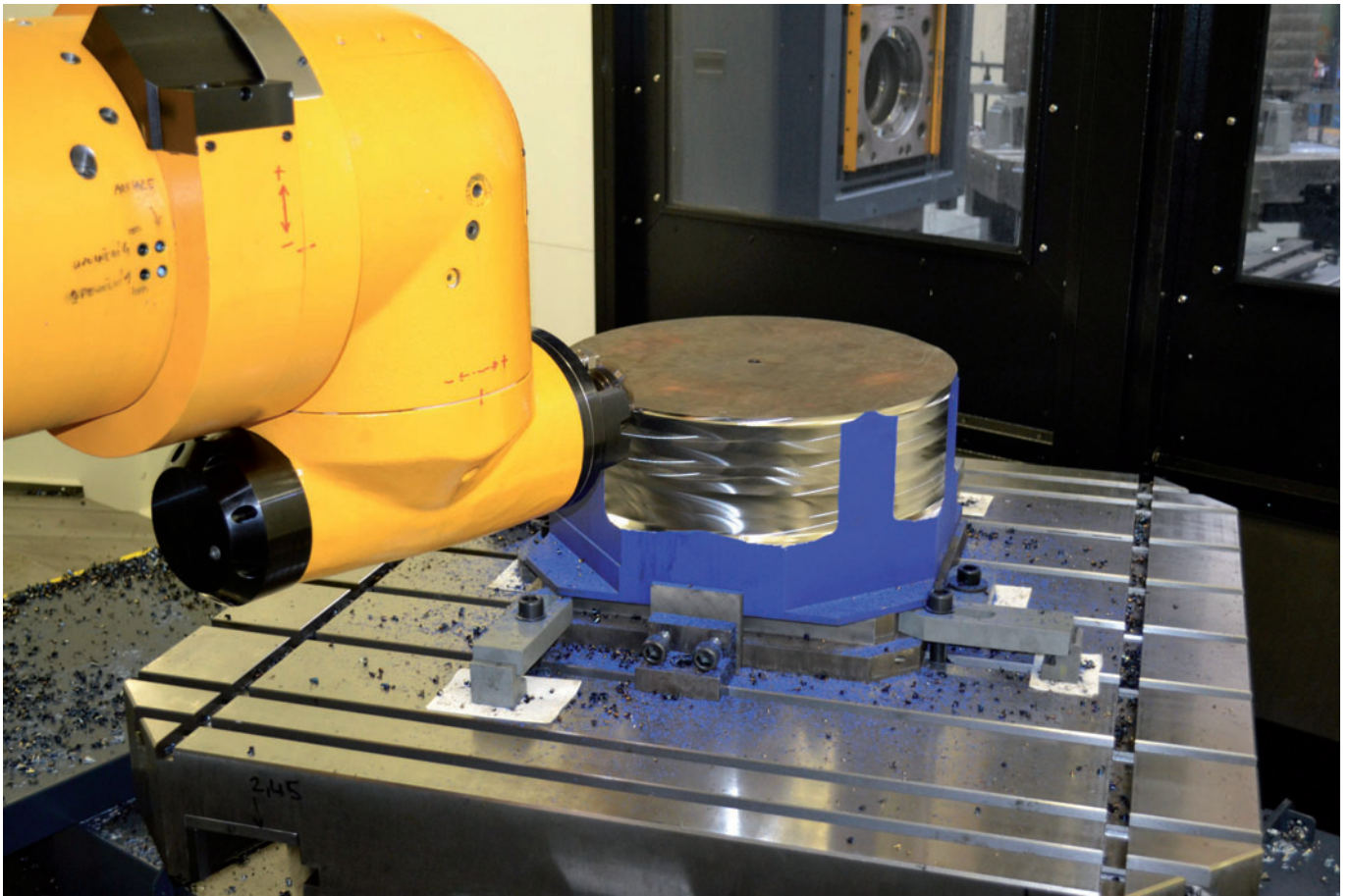


### Horizontal machining centre



A complete covering of the machining centre. In addition to the covering, a chip washing option or the workspace exhaustion can be specified.

# Technology examples



## Milling heads and face plates

### HUR 50

HUR 50, a universal milling head with manual positioning, consists of three compact attached basic parts that may be rotated one against another to achieve the required position of the primary spindle. The angle can be set with an increment of  $0.1^\circ$  with use of the circumferential vernier-fitted scales. The setting dowels are used to position the head parts in one of the eight basic positions ( $4 \times 90^\circ$  in the vertical split plane,  $2 \times 180^\circ$  in the inclined split plane).

- Number of axes: 2
- Rotation speed (rpm): 3 000
- Power (kW): 20
- Torque (Nm): 1 000
- Positioning: manual
- Weight (kg): 330



### HPR 50

HPR 50, a rectangular manual head, consists of two compact attached basic parts that may be rotated one against another to achieve the required position of the primary spindle.

- Number of axes: 1
- Rotation speed (rpm): 3 000
- Power (kW): 25
- Torque (Nm): 1 200
- Positioning: manual
- Weight (kg): 200



### HUI 50

HUI 50, a milling head, is automatically indexed in both planes with an increment of  $2.5^\circ$  and ensures a higher efficiency of rotating the head spindle against the machine system of coordinates.

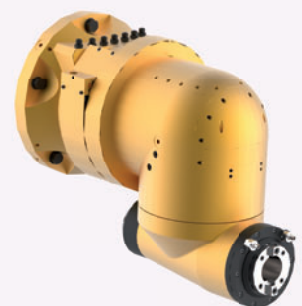
- Number of axes: 2
- Rotation speed (rpm): 3 000
- Power (kW): 32
- Torque (Nm): 1 000
- Positioning: index  $2.5^\circ$
- Weight (kg): 440



### HOIL 50

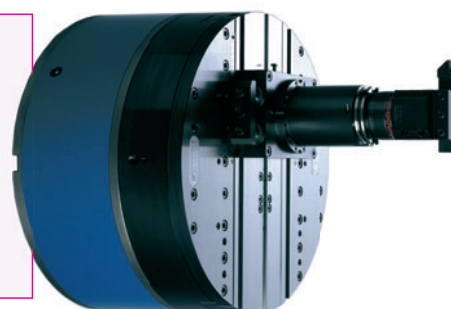
HOIL 50, an orthogonal, automatically indexed light head uses the same basic design as the HOI 50 head.

- Number of axes: 2
- Rotation speed (rpm): 3 500
- Power (kW): 25
- Torque (Nm): 1 000
- Positioning: index  $1^\circ$
- Weight (kg): 450



### D'Andrea Face plate

- Max. boring diameter: 1 000/1 250/ 1 400 mm
- Plate size: 500 /600 /800 mm
- Feed range: 160 /200 /250 mm
- Boring accuracy: 0,01 mm
- Positioning: automatic

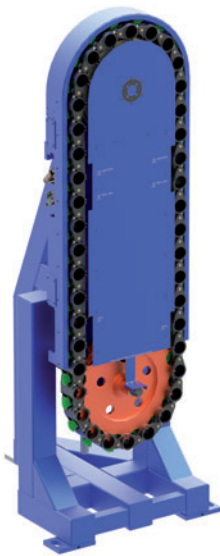


## Automatic Tool Change (ATC)

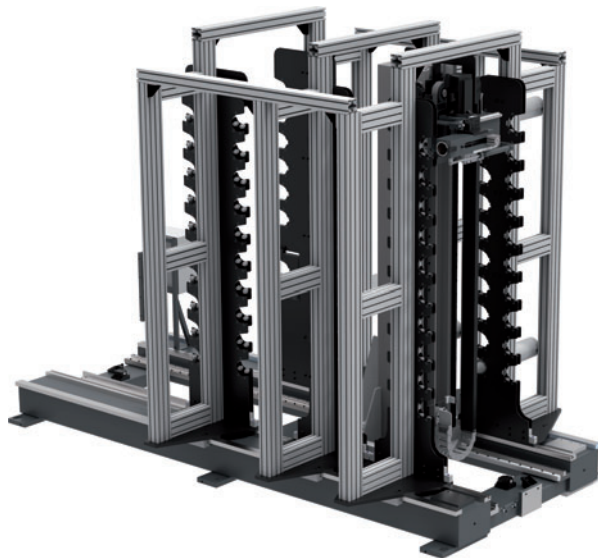
It consists of a chain-type or a rack-type magazine, a manipulator on the column or on the rack, and the manipulator with the swivelling two-arm grabber. The tools are searched using the coded pockets in the magazine.

The device allows automatic changing of the tools in the milling heads both horizontally and vertically.

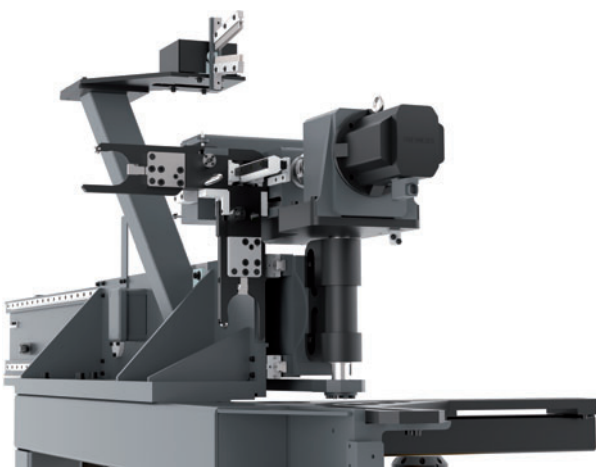
The number of pockets can be selected according to the customer's needs.



**Chain-type magazine**



**Rack-type magazine**



## Control systems

The specification range of the HEIDENHAIN iTNC 530 HSCI, Siemens Sinumerik 840 D-SL or FANUC 31i / 31i control systems comply with the control requirements of all the machines manufactured by TOS VARNSDORF a.s. as well as the requirements of any technological operations performed on these machines. The control systems ensure

an easy operation of the machines in the manual mode as well as in the fully automated service. The control systems are offered with a standard screen size of 15". The control systems can be supplied with an optional handwheel control and the automatic tool change control panel.



HR510



HR520



HR550



Heidenhain iTNC 530 HSCI



HT2



HT8



Mini HHU



Siemens Sinumerik 840 D-SL



HMOP



I-Pendant



Fanuc 31i

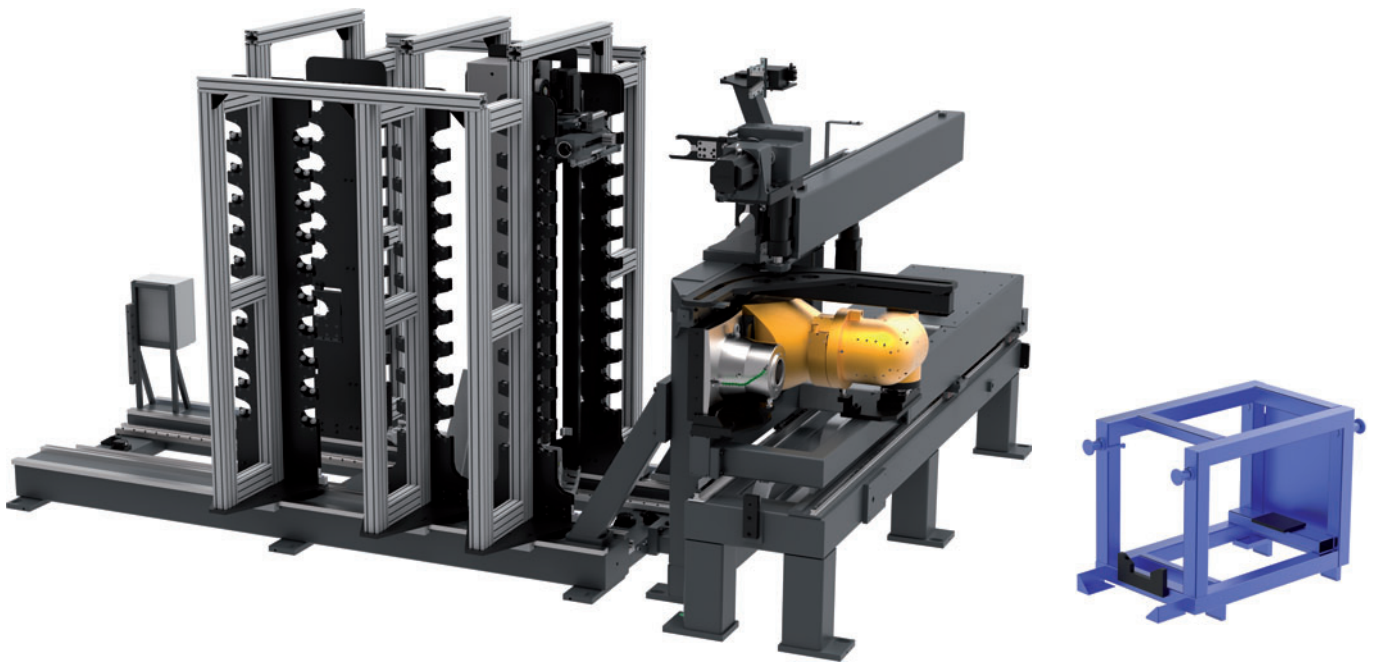


## Other accessories and services

### PICK UP system

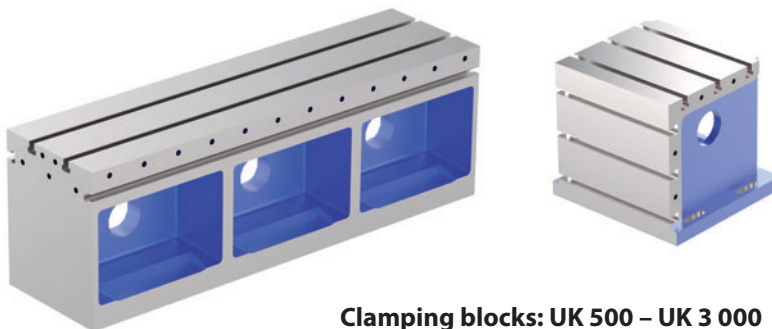
A special accessory support rack is used for stacking the special technological accessories and its changing with use of the PICK-UP system. Its design (the number of storage positions, way of stacking, etc.) is based on the customer's individual needs.

For table type machines, it is possible to choose one of two column cover designs: with the swivelling door or the roll-up door. It is also possible to specify an optional column that is attached and fixed to the rotary table, or a column that is attached to the swivelling arms on the rotary table, or a column mounted on the concrete floor at the machine; this solution may also be applied to the WHT 110 C machining centres.



### Clamping devices

Clamping devices are used for horizontal boring mills as a special technological accessory. They are used for clamping the workpieces.

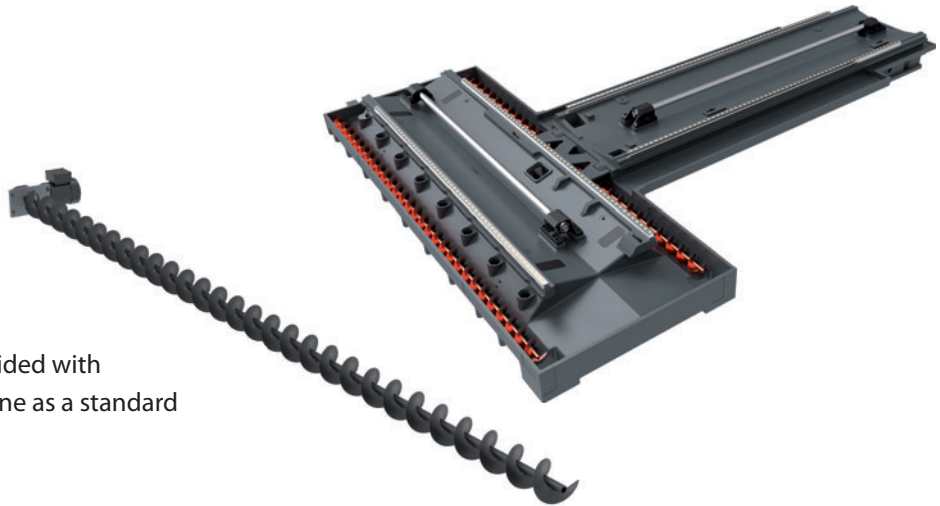


Clamping blocks: UK 500 – UK 3 000



## Tool cooling

Two tool cooling methods can be applied to the machines produced in TOS VARNSDORF: tool cooling with use of adjustable nozzles (CHZ) or internal axial tool cooling (CHOV). The axial cooling can also be used with the milling head attached.



## Chip conveyor

The chip conveyor is provided with each version of the machine as a standard part of delivery.



## Probes

Various probes can be selected for each control system.

## Other components

### Lubricating system

An automatic total loss lubrication system with a central lubricating unit ensures lubrication of the travelling group sliding guideways and the ball nuts in the feed drives. The spindle drive gear lubrication in the headstock is ensured by an automatic oil circulating lubrication system.



### Power supplies

The electrical equipment is primarily located in the four-piece electrical cabinet. It includes the control system basic module as well as the feed drive control and the spindle drive control with all the supply, switching and circuit breaking devices. The electrical equipment consists of the products of renowned manufacturers.

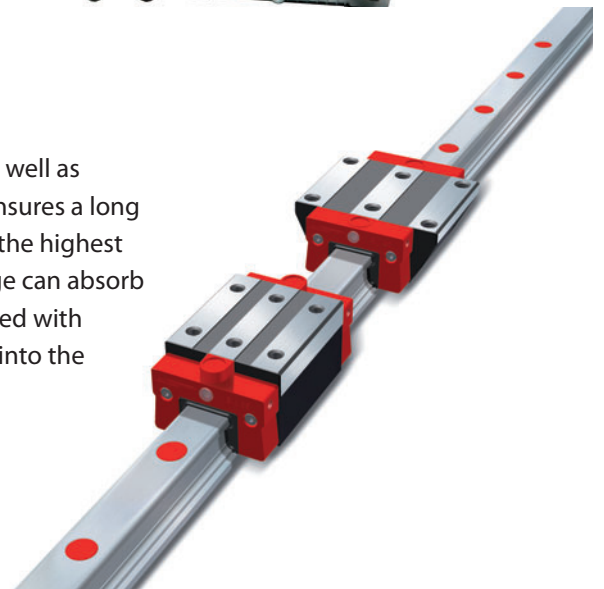
### Hydraulic unit

The pressure oil for lubrication of the guideways is supplied from the lubrication unit located together with a hydraulic unit in a separate cabinet.



### Linear guideways

This concept ensures a high accuracy and rigidity of the guideways as well as a low friction coefficient. It also allows using high travel speeds and ensures a long lifetime. Individual linear guideways are located at the positions with the highest load and force transmission. Due to the profiled rail design the carriage can absorb the forces both in vertical and horizontal directions. Machines equipped with linear guides can be fitted with a direct measuring system integrated into the linear guide.





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