VARNSDORF TOS

# WHN 110/130 (Q, MC)

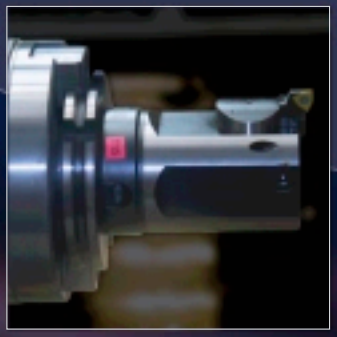
## HORIZONTAL MILLING AND BORING MACHINES


WHN 110 MC
WHN 110 Q
WHN 110
WHN 130 MC
WHN 130 Q
WHN 130

*New goals need new solutions*

1901 2013 PEOPLE AND MACHINES VARNSDORF TOS

Certifikovaný systém řízení VARNSDORF TOS SKQS reg. č. 12392-01 ISO 9001:2008



TOS VARNSDORF a.s.

04/2013

# ABOUT COMPANY

www.tosvarnsdorf.com

Company TOS VARNSDORF a.s. situated in Varnsdorf, Czech Republic has a years-lasting tradition in machine tool production. The company was founded, under the name of Arno Plauert Machine Works, as early as 1903 and up to now it grew up into a big engineering company, known with its products all around the world.

The company's manufacturing program is based on the development, manufacture and sale of machine tools, integrated with a wide offer of services, such as:

- training for operators and maintenance workers
- technological studies
- installations of new machines
- warranty and after-warranty (extended) servicing
- spare parts sales
- overhauls and modernizations

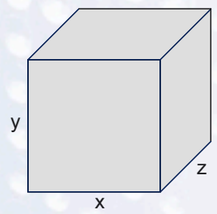
In addition, the company provides for the services in the form of outwork offers (Metalworking, Measuring services, Chemical and Heat Treatment of Metals).

High engineering standards of TOS VARNSDORF a. s. products were recognized in 1996 when the company was awarded the ISO 9001 certificate.

## PRODUCTION PROGRAM

### PRODUCTION OF MACHINE TOOLS

- HORIZONTAL MILLING AND BORING MACHINES
- FLOOR TYPE HORIZONTAL BORING MILLS
- MACHINING CENTRES
- PORTAL TYPE MACHINING CENTRES
- SPECIAL MACHINES
- ACCESSORIES

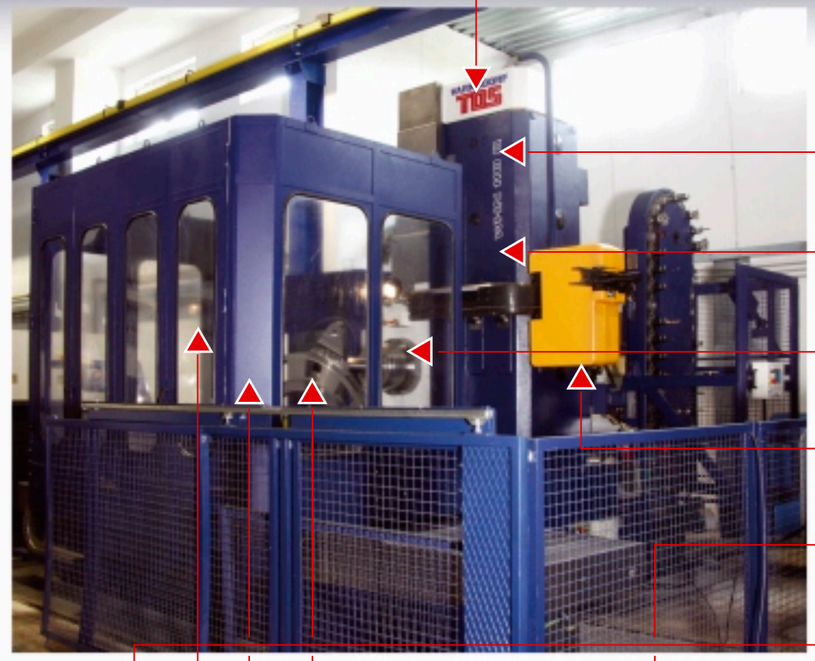


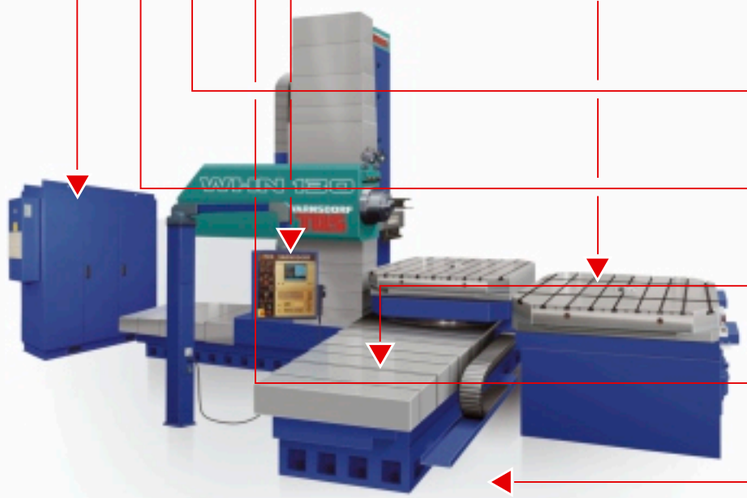

> 1 m³ (0,01mm)
x > 1 m
y > 1 m
z > 1 m

### SERVICES

- TECHNOLOGICAL SUPPORT: TRAINING, TECHNOLOGICAL STUDIES, ETC.
- SPARE PARTS, OVERHAULS AND MODERNIZATIONS
- COOPERATION (METALWORKING, MEASURING SERVICES, CHEMICAL AND HEAT TREATMENT OF METALS)

# CONTENT





# HORIZONTAL MILLING AND BORING MACHINE WHN 110/130 (Q, MC)

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**The WHN 110 (Q, MC)**
horizontal milling and boring machine belongs to the machine range of advanced generation launched by TOS VARNSDORF a.s. in 1993. The most significant features of this machine are high engineering level, outstanding parameters and wide range of executions.

| | | | |
|---|---|---|---|
| X | max. | 2,500 mm | 98.4 inch |
| Y | max. | 1,600 mm | 63 inch |
| Z | max. | 1,250 mm | 49.2 inch |
| W | max. | 710 mm | 28 inch |

**The WHN 130 (Q, MC)**
horizontal milling and boring machine is another leading edge technology machine corresponding with the needs of the up-to-date progressive machining. As well as the WHN 110 machine it is a modern cross bed type, multi-axis machine with movable column, transversally traveling table and live spindle.

| | | | |
|---|---|---|---|
| X | max. | 4,000 mm | 157.5 inch |
| Y | max. | 2,500 mm | 98.4 inch |
| Z | max. | 2,000 mm | 78.7 inch |
| W | max. | 800 mm | 31.5 inch |

The basic optional models of the machine according to the level of automation employed and their relevant type denominations:
**WHN 110/130** - the basic model
**WHN 110/130 Q** - the Automatic Tool Changer (ATC) equipped model
**WHN 110/130 MC** - the full-fledged machining center equipped with both, ATC and APC (automatic pallet changer).

## POSITIONING ACCURACY ACCORDING TO VDI/DGQ 3441

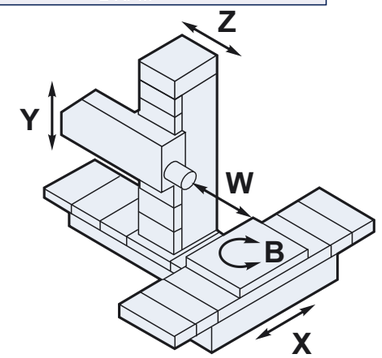
| X, Y, Z Axes | | guaranteed values | achieved values (average) |
|---|---|---|---|
| Positioning uncertainty | P | 0.015 mm | 0.008 mm |
| Positional scatter | Psmax | 0.010 mm | 0.007 mm |
| Reversal error | Umax | 0.010 mm | 0.003 mm |
| Positional deviation | Pa | 0.010 mm | 0.004 mm |

# WHN 110/130 (Q, MC) – TECHNICAL PARAMETERS

## BASIC SPECIFICATIONS

| | WHN 110 (Q, MC) | | WHN 130 (Q, MC) | |
|---|---|---|---|---|
| **Headstock version** | „N“ | „R” | „N” | „R” |
| Spindle diameter | 112 mm 4.4 inch | 125 mm 4.9 inch | 130 mm 5.1 inch | 140 mm 5.5 inch |
| Spindle taper | ISO 50 / ISO 50 BIG+ | ISO 50 / ISO 50 BIG+ | ISO 50 / ISO 50 BIG+ | ISO 50 / ISO 50 BIG+ |
| Spindle speed range | 10 – 2,800 RPM | 10 – 3,300 RPM | 10 – 2,500 RPM | 10 – 3,000 RPM |
| Main motor power (S1 / S6-60) | 37 / 46 kW | 49.6 / 61.7 HP | 37 / 46 kW | 49.6 / 61.7 HP |
| Spindle torque max. (S1 / S6-60) | 2,110 / 2,623 Nm<br>1,556 / 1,934 ft lb | 1,457 / 1,811 Nm<br>1,074 / 1,335 ft lb | 2,480 / 3,083 Nm<br>1,829 / 2,273 ft lb | 1,622 / 2,017 Nm<br>1,196 / 1,487 ft lb |
| **Column** | | | | |
| Headstock vertical travel **Y** | | | | |
| - machine with standard table | 1,250; 1,400; 1,600 mm<br>49.2; 55.1; 63 inch | | 1,600; 2,000; 2,500 mm<br>63; 78.7; 98.4 inch | |
| - machine with pallet | 1,120; 1,250; 1,400 mm<br>44.1; 49.2; 55.1 inch | | 1,400; 1,800; 2,240 mm<br>55.1; 70.9; 88.2 inch | |
| Minimum distance of the spindle axis above table / pallet | 50 / 0 mm 1.97 / 0 inch | | 50 / 0 mm 1.97 / 0 inch | |
| Column longitudinal travel **Z** | 800; 1,000; 1,250 mm<br>31.5; 39.4; 49.2 inch | | 1,000; 1,250; 1,600; 2,000 mm<br>39.4; 49.2; 63; 78.7 inch | |
| **Table or pallet** | | | | |
| Workpiece weight max | | | | |
| - machine with standard table | 8,000 kg 17,640 lbs | | 12,000 kg 26,460 lbs | |
| - machine with pallet | 5,000 kg 11,025 lbs | | 8,000 kg 17,640 lbs | |
| Table clamping surface | 1,250 x 1,400; 1,400 x 1,600 mm<br>49.2 x 55.1; 55.1 x 63 inch | | 1,600 x 1,800; 1,800 x 2,240 mm<br>63 x 70.9; 70.9 x 88.2 inch | |
| Pallet clamping surface | 1,250 x 1,400; 1,250 x 1,600 mm<br>49.2 x 55.1; 49.2 x 63 inch | | 1,600 x 1,800 mm<br>63 x 70.9 inch | |
| Table transverse travel **X** | 1,600; 2,000; 2,500 mm<br>63; 78.7; 98.4 inch | | 2,000; 2,500; 3,000; 3,500; 4,000 mm<br>78.7; 98.4; 118.1; 137.8; 157.5 inch | |
| **Feeds** | | | | |
| Feeds range | | | | |
| **- X, Y, Z, W** | 1 – 6,000 mm.min$^{-1}$ | 0.04 – 236.4 inch.min$^{-1}$ | 1 – 6,000 mm.min$^{-1}$ | 0.04 – 236.4 inch.min$^{-1}$ |
| **- B** | 0.003 – 1.5 RPM | | 0.003 – 1.5 RPM | |
| **Rapid traverse** | | | | |
| **- X, Y, Z, W** | 10,000 mm.min$^{-1}$ | 394 inch.min$^{-1}$ | 10,000 (8,000)* mm.min$^{-1}$ | 394 (315.2)* inch.min$^{-1}$ |
| **- B** | 2.5 RPM | | 2 RPM | |

***(*)X = 4,000 mm***




**NEW DESIGN OF MACHINE WHN 110 (Q, MC)**

# WHN 110/130 (Q, MC) – HEADSTOCK

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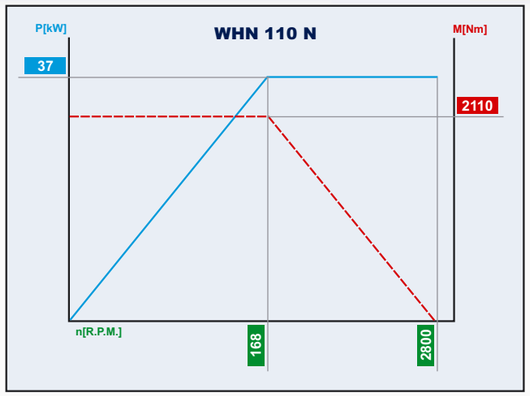
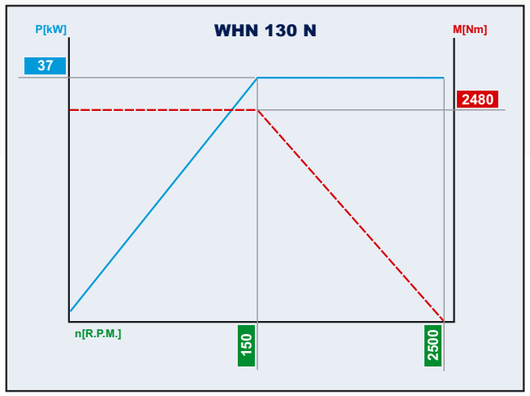
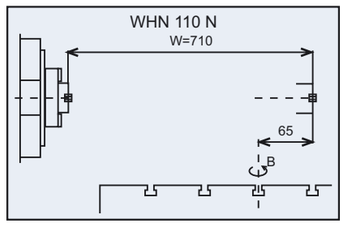
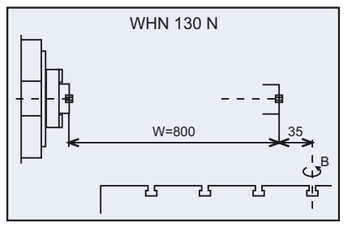
## HEADSTOCK "N"

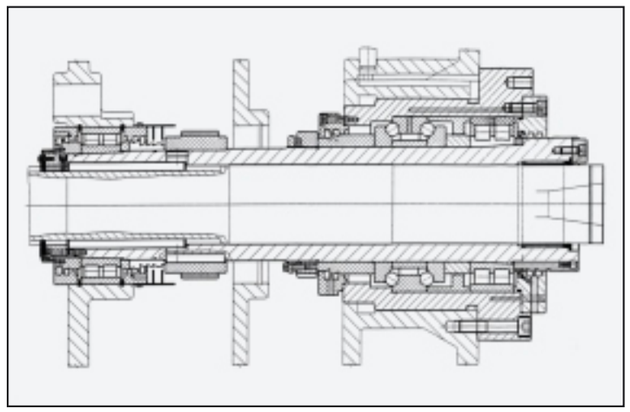


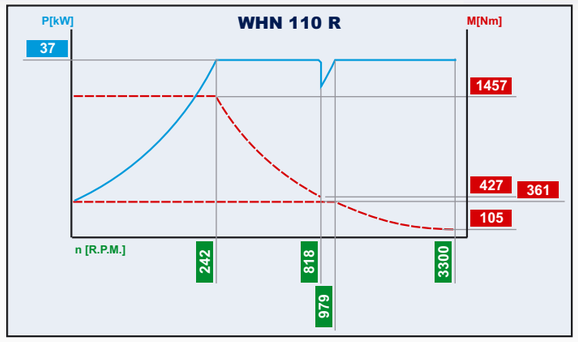

**HEADSTOCK VERSION „N"**
- designed as universal of two headstock models, good especially for power machining as well as for finishing operations. Torque characteristics predetermines the machine with this type of headstock for application of larger milling heads and facing heads.

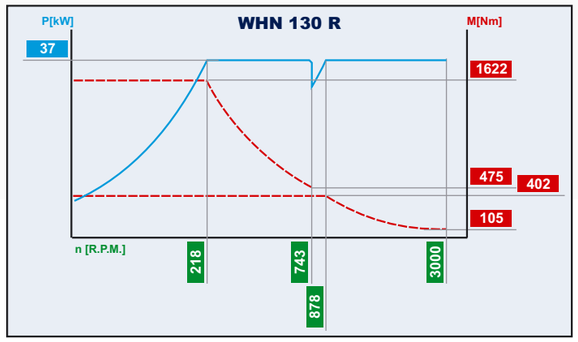


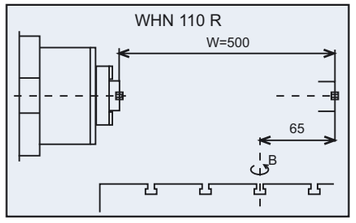



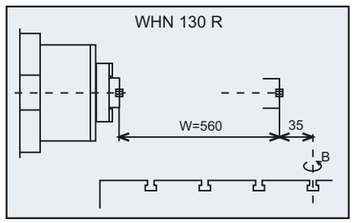
## HEADSTOCK "R"

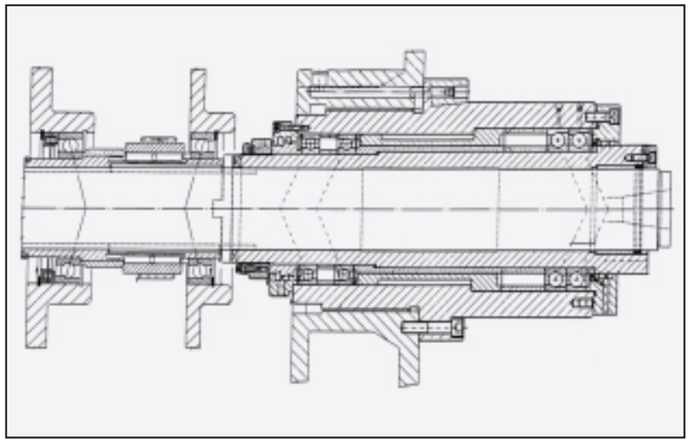



**HEADSTOCK VERSION „R"**
- high speed model, good for precision machining using wide range of high cutting speed with full power available.



# WHN 110/130 (Q, MC) – AUTOMATIC TOOL CHANGE (ATC)

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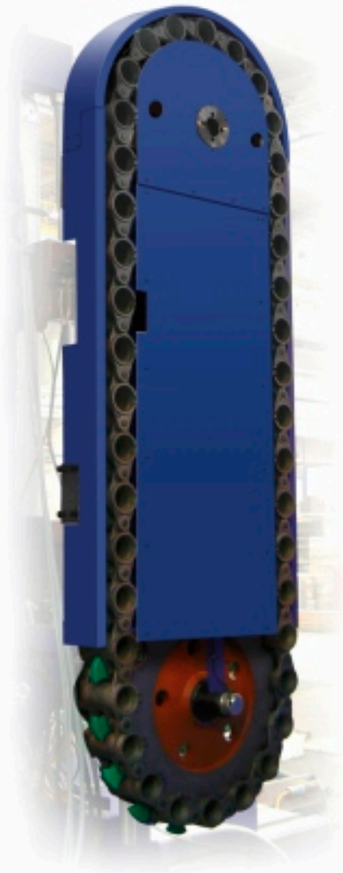
## TOOL MANIPULATOR

## CHAIN MAGAZINE



## WHN 110/130 Q (MC)

| | | |
|---|---|---|
| Quantity of pockets in magazine - on the column | 40, 60 | |
| Quantity of pockets in magazine - next to the machine | 80, 120 | |
| Pitch of pockets in magazine | 130 mm | 5.1 inch |
| Tool dia max | | |
| - with fully planted magazine | 125 mm | 4.9 inch |
| - with adjacent pockets | 320 mm | 12.6 inch |
| Dia max. of special flat tool | 390 (600) mm | 15.4 (23.6) inch |
| Tool length max. | 500 mm | 19.7 inch |
| Tool weight max. | 25 kg | 55.1 lbs |
| Total tool change time | 15 sec | |

ATC consists of a chain type tool magazine and horizontally traversing manipulator with swiveling mechanical two-armed hand fitted to the back of the column.
The ATC equipment adapted with respect to the tool standard can be as follows:

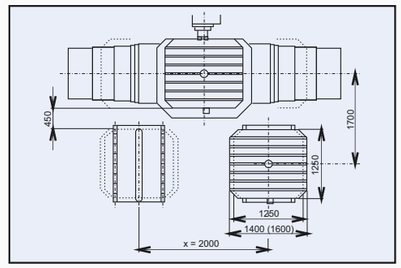
CSN 22 0432
CSN 22 0434
DIN 69871A/D
BT 50 MAS 403-1982
CAT ANSI/ASME B5.50-1985

# WHN 110/130 (Q, MC) – AUTOMATIC PALLET CHANGE (APC)

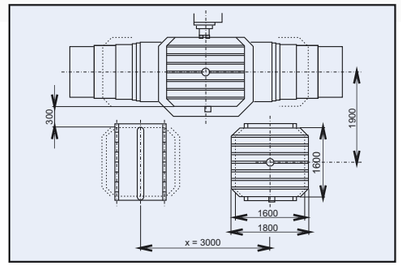
| | WHN 110 MC | | WHN 130 MC | |
|---|---|---|---|---|
| Quantity of pallets (including pallet stations) in the system | 2 | | 2 | |
| Maximum workpiece weight | 5,000 kg | 11,025 lbs | 8,000 kg | 17,640 lbs |
| Pallet clamping surface | 1,250 x 1,400; 1,250 x 1,600 mm<br>49.2 x 55.1; 49.2 x 63 inch | | 1,600 x 1,800 mm<br>63 x 70.9 inch | |
| Pallet T-slots | | | | |
| - dimension | 22H8 mm | 0.87H8 inch | 22H8 mm | 0.87H8 inch |
| - pitch | 160 mm | 6.3 inch | 160 mm | 6.3 inch |
| - quantity | 9 | | 9 | |
| Total pallet change time | 85 sec | | 85 sec | |

Machine with the MC execution consists of 2 pallets, which are in an automatic cycle shuttled between two stationary pallet stations and clamping rotary table on the machine. As to the quantity of pallets the system can be equipped with more pallets after discussion with manufacturer.

## APC FOR WHN 110 MC




## APC FOR WHN 130 MC



# WHN 110/130 (Q, MC) – DESIGN OF MACHINE GROUPS

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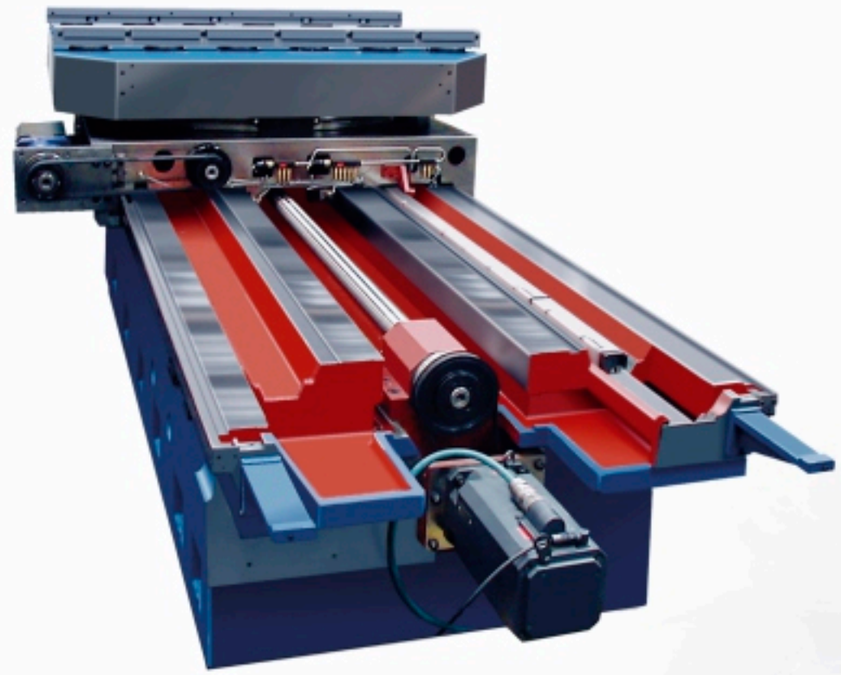
## ELECTRIC OUTFIT

Power supply units, switchgear, safety and protective elements and other electrical devices are housed within a separate compact electric cabinet. Component selection for each machine is individual, subject to the national regulations relevant to the destination country.

## FEED DRIVES

Feeds for each axes are driven by an independent SIEMENS AC servo-drive. The add-on rotary table is clamped hydraulically while the other movable machine axes are held in their target position by power of their relevant servo-motor working in the closed positional loop.



## OPERATOR PLATFORM

The WHN130 (Q, MC) machine in standard execution is equipped with operator lift upon which the central control panel is placed. The operator lift is autonomously convertible-vertically and parallel with spindle axis as well.



## HYDRO-AGGREGATE

Guideways of **X, Y, Z,** and **B** axes are lubricated automatically by means of oil metering unit placed together with hydro-aggregate on the column saddle.

## SYSTEM OF MEASURING

Linear moveable groups (**X, Y, Z** and **W**) are equipped with direct measuring with help of electro-optical rules HEIDENHAIN.

# WHN 110/130 (Q, MC) – MACHINE CONTROL

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### CONTROL PANEL OF SINUMERIK 840 D CONTROL SYSTEM

### CONTROL PANEL OF HEIDENHAIN iTNC 530 CONTROL SYSTEM

### CONTROL PANEL OF FANUC 31i CONTROL SYSTEM

### PORTABLE CONTROL PANEL SINUMERIK

### PORTABLE CONTROL PANEL HEIDENHAIN (OPTION TYPE HR 520)

## WORKPIECE AND TOOL PROBES

### WE DELIVER THE FOLLOWING PROBES AS STANDARD:

| | | |
|---|---|---|
| **MEASURING TOOL PROBE for the system:** | | |
| **iTNC 530** | HEIDENHAIN TT 140 | measuring touch probe with cable transport |
| **iTNC or Sinumerik 840D** | RENISHAW TS 27 R | measuring touch probe with cable transport |
| **MEASURING WORKPIECE PROBE for the system:** | | |
| **iTNC 530** | HEIDENHAIN TS 220 | measuring touch probe with cable transport |
| | HEID. TS 640 + SE 640 | measuring touch probe with optical transport |
| **TNC or Sinumerik 840D** | RENISHAW OMP 60 - set | measuring touch probe with optical transport |
| | RENISHAW RMP 60 - set | measuring touch probe with wireless transport |
| | M+H 20.41 Multi | measuring touch probe with wireless transport |

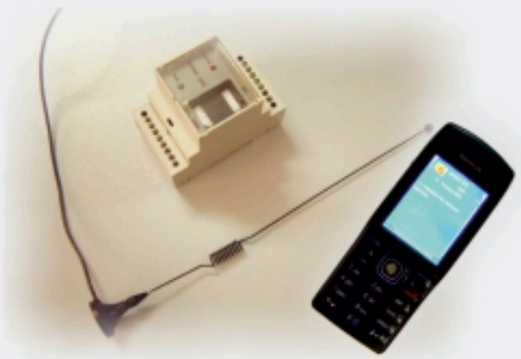
### TOOL CONTROL PROBE

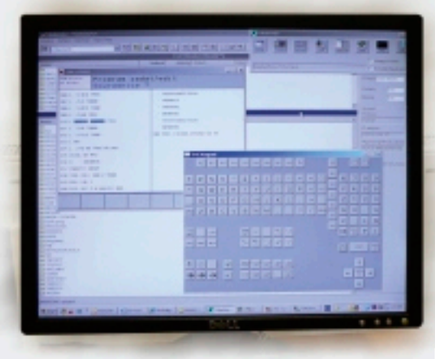
### MEASURING TOUCH PROBE

## WE ALSO OFFER A SYSTEM OF SERVICES FOR THE PERMANENT SUPPORT OF CUSTOMERS:

**TOS*message***
- ensures communication between the machine's control system and the customer's mobile phone. The customer is informed about the predefined statuses of the machine, e.g. the completion of an automatic cycle or possibly program interruption.

**TOS*wide***
- the remote diagnostic system allows our service engineer to obtain required data about the status of the machine necessary to specify possible diagnostic messages about the non-standard condition of the machine's control system.





# WHN 110/130 (Q, MC) – OPTIONAL ACCESSORIES

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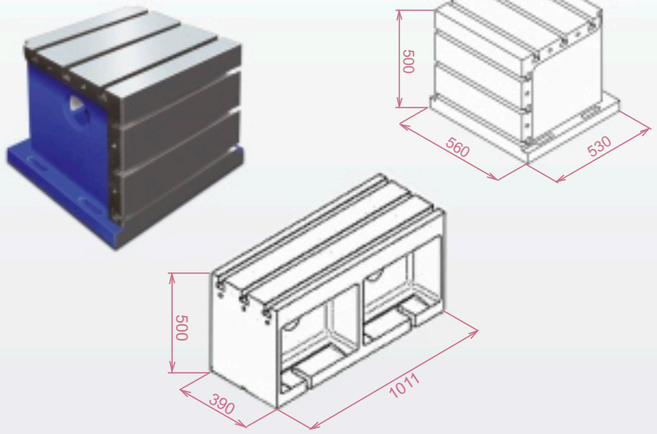
## CLAMPING ANGLE PLATE

His optional equipment is offered in dimension 800; 950; 1,120; 1,450; 1,620; 2,000; 2,500 mm.

## CLAMPING CUBE

UK 500, UK 1000

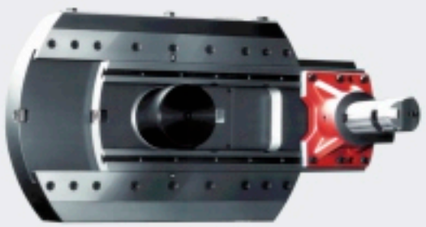



## HPR 50

## HUR 50

## HUI 50

## FACING HEAD LD 650



**HPR 50**
vertical milling head, manually adjustable.

**HUR 50**
universal milling head, manually adjustable.

**HUI 50**
universal milling head, automatically indexed - for WHN 130 (Q, MC) machines only

**FACING HEAD LD 650**
is particularly useful for demanding technological operations where the full CNC control of the slide may be exploited. It is designed for the WHN 110/130 machines with the headstock version „N".

ANOTHER OPTIONAL ACCESSORIES YOU CAN FIND ON **www.tosvarnsdorf.cz/en/products/accessories/**

# MACHINE COVERS

## CHIP CONVEYOR

The length of a chip conveyer and its discharge height can be accommodated to user's needs.

## TOOL COOLING UNIT

The customer may choose either CHZ 110/130 outer tool cooling kit or CHOV 110/130 through spindle tool cooling kit which brings coolant to the cutting edge through outside nozzles as well. As standard it is possible to choose 10, 20 or 30 bar.

## MACHINE COVERS

**On the customer's request we deliver following types of covers:**

## COMPLETE COVERING

**the top quality design without any residual risks**

## KVR CABIN

protective covers for working space

## MOBILE/MOVABLE

protective partitions

## C-COVER

compact and technically advanced design

# DIMENSIONS AND WEIGHTS OF WHN 110 (Q, MC)

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## MACHINE DIMENSIONS (mm // inch)

| Coordinate travel (mm // inch) | | | | Dimension (mm // inch) | | | |
|---|---|---|---|---|---|---|---|
| | | | | WHN 110 | WHN 110 Q* | WHN 110 MC* | |
| X | 1,600 // 63 | | | 4,550 // 179.1 | 4,550 // 179.1 | 4,550 // 179.1 | A |
| | | 2,000 // 87.7 | 2,000 // 78.7 | 4,950 // 194.9 | 4,950 // 194.9 | 4,950 // 194.9 | |
| Y | 1,250 // 49.2 | | | 3,850 // 151.6 | 4,650 // 183 | 4,650 // 183 | B |
| | | 1,40 // 55.10 | | 3,950 // 155.5 | 4,650 // 183 | 4,650 // 183 | |
| | | | 1,600 // 63 | 4,150 // 163.4 | 4,650 // 183 | 4,650 // 183 | |
| Z | 800 // 31.5 | | | 5,000 // 196.9 | 5,000 // 196.9 | 6,600 // 259.8 | C |
| | | 1,000 // 39.4 | | 5,200 // 204.7 | 5,200 // 204.7 | 6,800 // 267.7 | |
| | | | 1,250 // 49.2 | 5,450 // 214.6 | 5,450 // 214.6 | 7,050 // 277.6 | |

** Machine size (dimenzion „B") correspondents to the machine equipped with 60-pocket chain tool magazine.*

## MACHINE WEIGHT (kg // lbs)

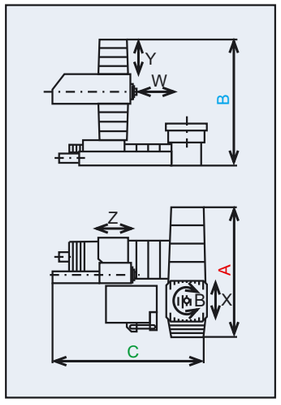
| Coordinate travel (mm // inch) | | | |
|---|---|---|---|
| X | 1,600 // 63 | | |
| | | 2,000 // 87.7 | 2,000 // 78.7 |
| Y | 1,250 // 49.2 | | |
| | | 1,400 // 55.1 | |
| | | | 1,600 // 63 |
| Z | 800 // 31.5 | | |
| | | 1,000 // 39.4 | |
| | | | 1,250 // 49.2 |
| **Machine weight (kg // lbs)** | | | |
| **WHN 110** | 19,450 // 42,890 | 21,320 // 47,010 | 21,820 // 48,110 |
| **WHN 110 Q** | 20,780 // 45,820 | 22,800 // 50,270 | 23,400 // 51,600 |
| **WHN 110 MC** | 24,690 // 54,440 | 26,350 // 58,100 | 27,100 // 59,760 |

** Machine rotary table 1,400 x 1,600 mm // 55.1 x 63 inch.*

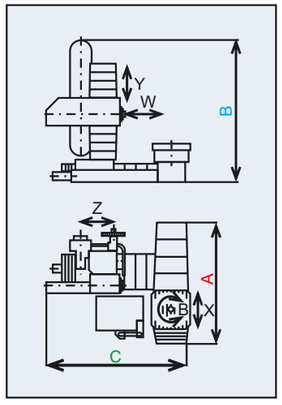
## FURTHER SPECIFICATION

| | | WHN 110 (Q, MC) | WHN 130 (Q, MC) |
|---|---|---|---|
| Vertical/horizontal travel of operator lift. | mm // inch | - | 1,600 / 600 // 63 / 23.6 |
| Hydraulic circuit operational pressure | Mpa | 6.5 - 8 | 6.5 - 8 |
| Compressed air source output requirements | | | |
| - pressure | Mpa | 0.6 | 0.6 |
| - volume | $l.sec^{-1}$ | 18 | 18 |
| Main voltage/frequency | V/Hz | 3 x 400/50; 3 x 400/60 | 3 x 400/50; 3 x 400/60 |
| Total power consumption | kVA | 83 | 86 |
| Noise level "A" at the operator side max. | dB(A) | 80 | 80 |

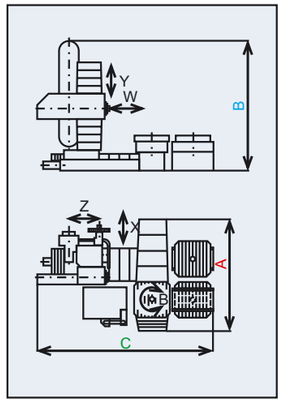
## WHN 110




## WHN 110 Q




## WHN 110 MC




# DIMENSIONS AND WEIGHTS OF WHN 130 (Q, MC)



## MACHINE DIMENSIONS (mm // inch)

| Coordinate travel (mm // inch) | | | | | | Dimension (mm // inch) | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | WHN 130 | WHN 130 Q* | WHN 130 MC* | |
| X | 2,000 // 87.7 | | | | | 5,350 // 210.6 | 5,350 // 210.6 | 5,350 // 210.6 | A |
| | | 2,500 // 98.4 | | | | 5,850 // 230.3 | 5,850 // 230.3 | 5,850 // 230.3 | |
| | | | 3,000 // 118.1 | | | 6,350 // 250 | 6,350 // 250 | 6,350 // 250 | |
| | | | | 3,500 // 137.8 | | 6,850 // 269.7 | 6,850 // 269.7 | 6,850 // 269.7 | |
| | | | | | 4,000 // 157.5 | 7,350 // 289.4 | 7,350 // 289.4 | 7,350 // 289.4 | |
| Y | 1,600 // 63 | | | | | 4,150 // 163.4 | 4,550 // 179.1 | 4,550 // 179.1 | B |
| | | 2,000 // 87.7 | | | | 4,500 // 177.2 | 4,550 // 179.1 | 4,550 // 179.1 | |
| | | | 2,500 // 98.4 | 2,500 // 98.4 | 2,500 // 98.4 | 4,950 // 194.9 | 4,950 // 194.9 | 4,950 // 194.9 | |
| Z | 1,000 // 39.4 | | | | | 5,650 // 222.4 | 5,650 // 222.4 | 7,500 // 295.3 | C |
| | | 1,250 // 49.2 | | | | 5,900 // 232.3 | 5,900 // 232.3 | 7,750 // 305.1 | |
| | | | 1,600 // 63 | 1,600 // 63 | | 6,300 // 248 | 6,300 // 248 | 8,150 // 320.9 | |
| | | | | | 2,000 // 87.7 | 6,700 // 263.8 | 6,700 // 263.8 | 8,550 // 336.6 | |

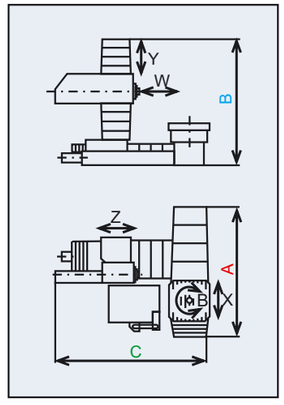
** Machine size (dimenzion „B") correspondents to the machine equipped with 60-pocket chain tool magazine.*

## MACHINE WEIGHT (kg // lbs)

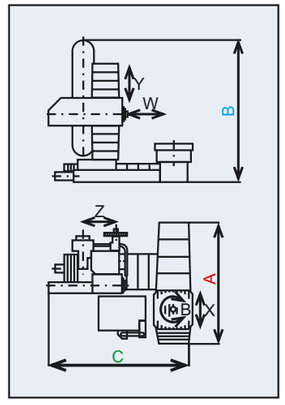
| Coordinate travel (mm // inch) | | | | | |
|---|---|---|---|---|---|
| X | 2,000 // 87.7 | | | | |
| | | 2,500 // 98.4 | | | |
| | | | 3,000 // 118.1 | | |
| | | | | 3,500 // 137.8 | |
| | | | | | 4,000 // 157.5 |
| Y | 1,600 // 63 | | | | |
| | | 2,000 // 87.7 | | | |
| | | | 2,500 // 98.4 | 2,500 // 98.4 | 2,500 // 98.4 |
| Z | 1,000 // 39.4 | | | | |
| | | 1,250 // 49.2 | | | |
| | | | 1,600 // 63 | 1,600 // 63 | |
| | | | | | 2,000 // 87.7 |
| **Machine weight (kg // lbs)** | | | | | |
| **WHN 130** | 22,000 // 48,51 | 25,000 // 55,130 | 29,000 // 63,950 | 31,000 // 68,360 | 33,500 // 73,870 |
| **WHN 130 Q** | 23,400 // 51,600 | 26,550 // 58,540 | 30,550 // 67,351 | 32,690 // 67,360 | 35,190 // 77,590 |
| **WHN 130 MC** | 30,400 // 67,030 | 33,550 // 73,980 | 37,550 // 82,800 | 39,690 // 87,520 | 42,190 // 93,030 |

** Machine rotary table 1,400 x 1,600 mm // 55.1 x 63 inch.*

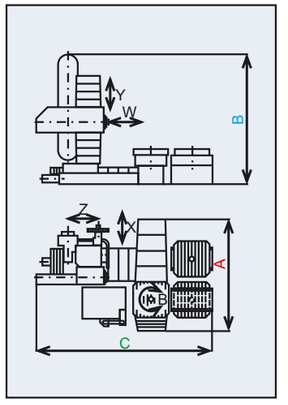
## WHN 130




## WHN 130 Q




## WHN 130 MC



# WHN 110/130 (Q, MC) – TECHNOLOGIES

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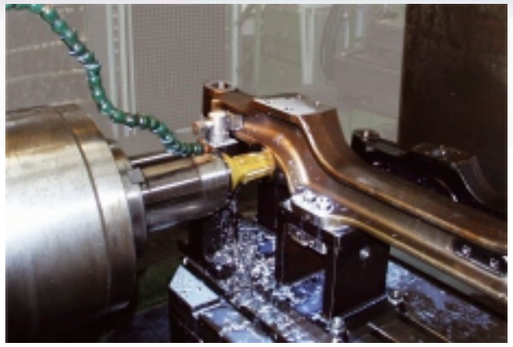
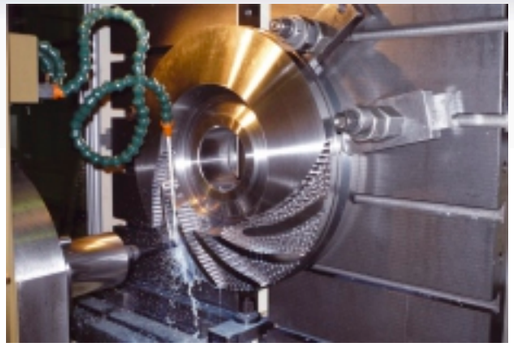
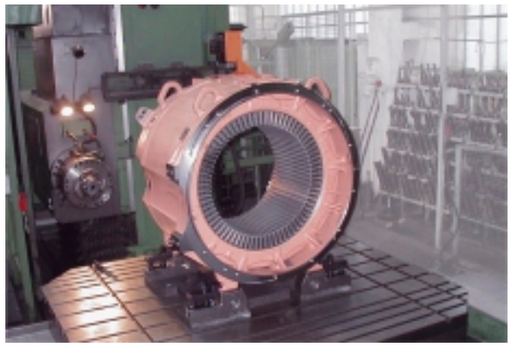
## PRODUCTION OF A CARGO TRUCK UNDERCARRIAGE



## MILLING OF A TURBINE BLADE WHEEL

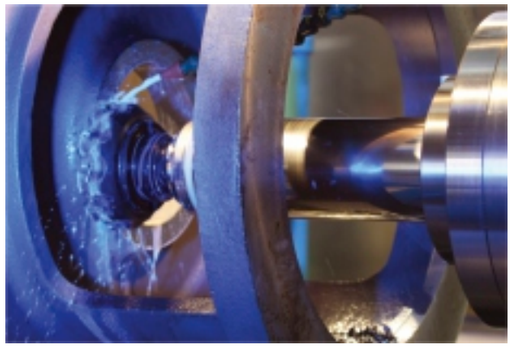


## MILLING AND DRILLING OF AN ELECTRIC MOTOR STATOR



## MILLING OF AND BORING OF A BUILDING MACHINE SHOVEL

## MILLING OF A VALVE



## MILLING OF A VALVE

**UPON THE CUSTOMER'S REQUEST, IT IS POSSIBLE TO EQUIP THE MACHINE WITH ADDITIONAL DEVICE OR PROCES ACCESSORIES.**

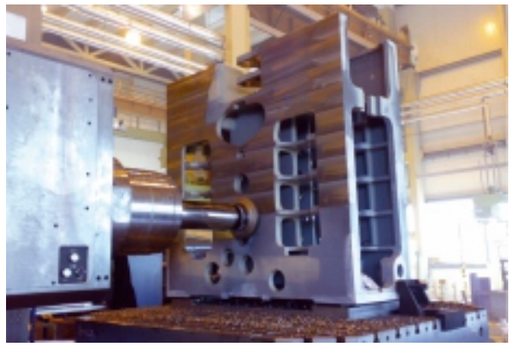
Data and features in the present catalogue are not binding. The producer reserves the right to alter them without advance notice at any time.

# WHN 110/130 (Q, MC) – TECHNOLOGIES / REFERENCES

## MILLING OF A BODY

## MILLING OF A BODY

## MACHINING OF A GEARBOX

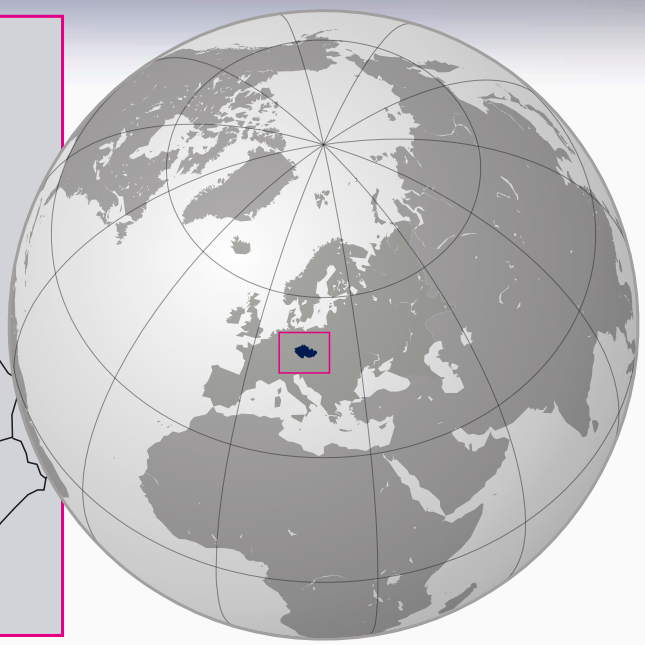


## MILLING AND DRILING OF A WORKPIECE FACE

## 260 WHN 110/130 ALL TYPES MACHINES ARE USED IN (from 1993 to 2012)

| | | | | | |
|---|---|---|---|---|---|
| Germany | 56 | India | 5 | Romania | 2 |
| Czech Republic | 33 | Italy | 4 | United Kingdom | 2 |
| Russia | 31 | Slovenia | 4 | Venezuela | 2 |
| Poland | 29 | Sweden | 4 | Brazil | 1 |
| Belarus | 15 | Croatia | 3 | Canada | 1 |
| Ukraine | 14 | Iran | 3 | Egypt | 1 |
| Belgium | 7 | Netherlands | 3 | Hungary | 1 |
| France | 7 | Norway | 3 | Israel | 1 |
| China | 6 | U.S.A. | 3 | Latvia | 1 |
| Slovakia | 6 | Austria | 2 | Mexico | 1 |
| Finland | 5 | Denmark | 2 | R.S.A. | 1 |
| | | | | Spain | 1 |
| | | | | **Total** | **260** |

# TOS VARNSDORF a.s.

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