



TOS KUŘIM



Gantry machining centre

TOS FRF

| | |
|--------------|---|
| 1942 | The production and the assembly of precise boring machines, lathes, knee type milling machines and special machines were started at TOS in the newly established halls. |
| 1950 | Origination of the national enterprise ČKD BLANSKO. Metallurgical and Engineering departments were expanded even more. The enterprise focused on the manufacture of water turbines, heavy machine tools and engineering metallurgy. |
| 1962 | First numerically controlled machine made by TOS KUŘIM. The initial steps aimed at automatization of the control of the linear machine axes were already performed in 1958. |
| 1991 | Earned ISO 9001 certificate. |
| 2007 | Focusing on large machining centres. |
| 2011 | New production hall (area of 2 600 m ² , crane capacity of 100 and 50 ton). Relocation of ČKD BLANSKO-OS company to the TOS KUŘIM facility. |
| 2015 | New design modernization of horizontal machining centres as well as gantry machining centres. |
| Current time | TOS KUŘIM and ČKD BLANSKO-OS have become a part of the TOSHULIN group. |

- + essential machine parts – castings
- + movable gantry, fixed cross-rail
- + portal travel guide in longitudinal axis integrated into table
- + optionally divided workspace
- + thermal stabilization of headstock and exchangeable spindle heads
- + linear roller guideways in all linear axes
- + axial tool cooling
- + spindle 4 000 (6 000) rpm with high torque
- + maximum use of floor space
- + machine foundation in level of hall floor
- + wide range of exchangeable spindle heads
- + option of turnkey solutions



General characteristics of gantry machining centre FRF



HEADSTOCK AND CROSS SLIDE

with indexable C-axis
with continual C-axis

SPINDLE HEAD

exchangeable Vx
non-exchangeable O
non-exchangeable MO, MK

TOOL EXCHANGE

chain type magazine

COVERING

OF WORKING SPACE
cabin with plastic curtain

SAFETY FENCE

wire fence

WORKING SPACE

longitudinal fixed table

CHIP MANAGEMENT

chip conveyor 2 pcs
chip container 2 pcs

PORTAL

columns and cross-rail

TOOL COOLANT SYSTEM

only low pressure or low
pressure and high pressure

OPERATOR STATION

height non-movable work
platform with CNC control system

SWITCHBOARD

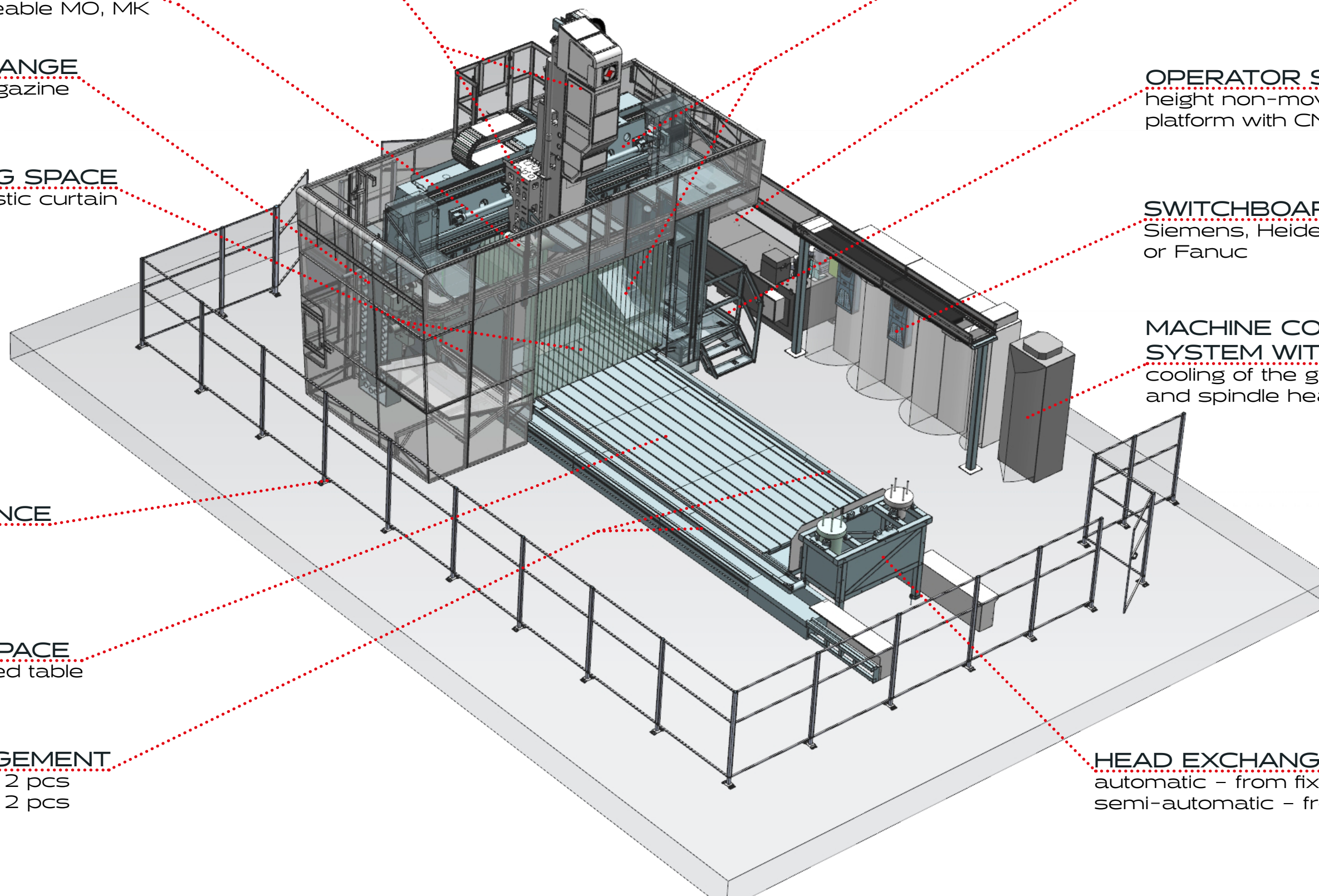
Siemens, Heidenhain
or Fanuc

MACHINE COOLING

SYSTEM WITH CHILLER
cooling of the gearbox
and spindle heads

HEAD EXCHANGE

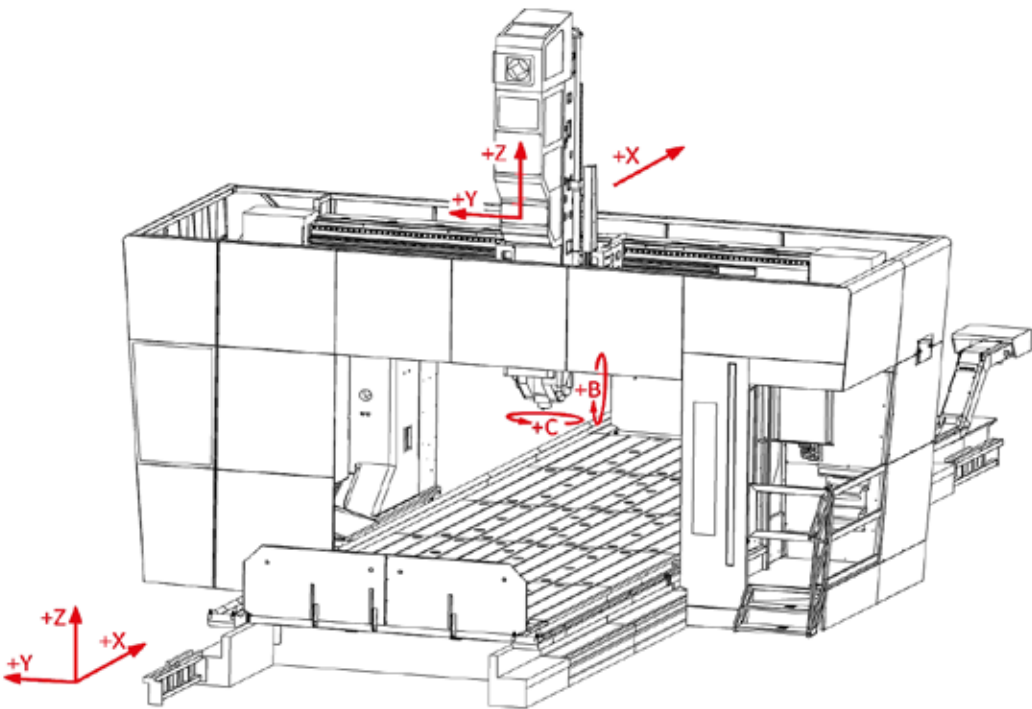
automatic – from fixed stand
semi-automatic – from manual carts



Technical parameters



| Basic parameters | | FRF 200 | FRF 250 | FRF 300 | FRF 350 | FRF 400 |
|--|-----------------------|------------------------|---|---|-----------|----------|
| Table width | [mm] | 2 000 | 2 500 | 3 000 | 3 500 | 4 000 |
| Clearance between the columns | [mm] | 2 550 | 3 050 | 3 550 | 4 050 | 4 550 |
| Clearance between table and cross rail | | | | 2 050 | | |
| Clamping T-slots | number x pitch | 9 x 220 | 11 x 220 | 13 x 220 | 15 x 220 | 17 x 220 |
| | width of central slot | [mm] | | 22H7 | | |
| | width of other slots | [mm] | | 22H11 | | |
| Clamping surface height from the base | [mm] | | | 700 | | |
| Loading capacity per 1 m² | [kg] | | | 4 000 (10 000) | | |
| Maximum power output of the main drive (headstock) S1/S6-60% | [kW] | | | 37/44,4 (30/36) | | |
| Headstock cross-section | [mm] | | | 500 x 500 | | |
| Maximum torque on the headstock | [Nm] | | | 2 000 for speed 4 000 [min ⁻¹]; 1 400 for speed 6 000 [min ⁻¹] | | |
| Total machine power input | [kVA] | | | ~ 100 | | |
| Protection of the supply | [-] | | | 400V/ 160A | | |
| Working stroke | Longitudinal axis „X“ | [mm] | 4 000 - 5 000 - 6 000 - 7 000 - 8 000 - 9 000 - 10 000 - 11 000 - 12 000 - 14 000 - 16 000 - 18 000 - 20 000 - 22 000 - 24 000 | | | |
| | Cross axis „Y“ | [mm] | 2 900 | 3 400 | 3 900 | 4 400 |
| | Vertical axis „Z“ | [mm] | | | 1 500 | |
| Working feed speed | Longitudinal axis „X“ | [m.min ⁻¹] | | | ≤ 8 | |
| | Cross axis „Y“ | [m.min ⁻¹] | | | ≤ 8 | |
| | Vertical axis „Z“ | [m.min ⁻¹] | | | ≤ 8 | |
| Rapid traverse | Longitudinal axis „X“ | [m.min ⁻¹] | | | ≤ 20 (30) | |
| | Cross axis „Y“ | [m.min ⁻¹] | | | ≤ 20 (30) | |
| | Vertical axis „Z“ | [m.min ⁻¹] | | | ≤ 20 (30) | |
| Acceleration | Longitudinal axis „X“ | [m.s ⁻²] | | | 1 | |
| | Cross axis „Y“ | [m.s ⁻²] | | | 1 | |
| | Vertical axis „Z“ | [m.s ⁻²] | | | 1 | |
| Maximum feed force in linear axes | [N] | | | 20 000 | | |
| Maximum torque of rotation about the headstock longitudinal axis | [Nm] | | | 2 500 | | |



Main components

Table



Gantry



Execution type 200 – 300: a servomotor drives the ball screw with a prestressed nut over the belt drive with a cog belt (Y axis)

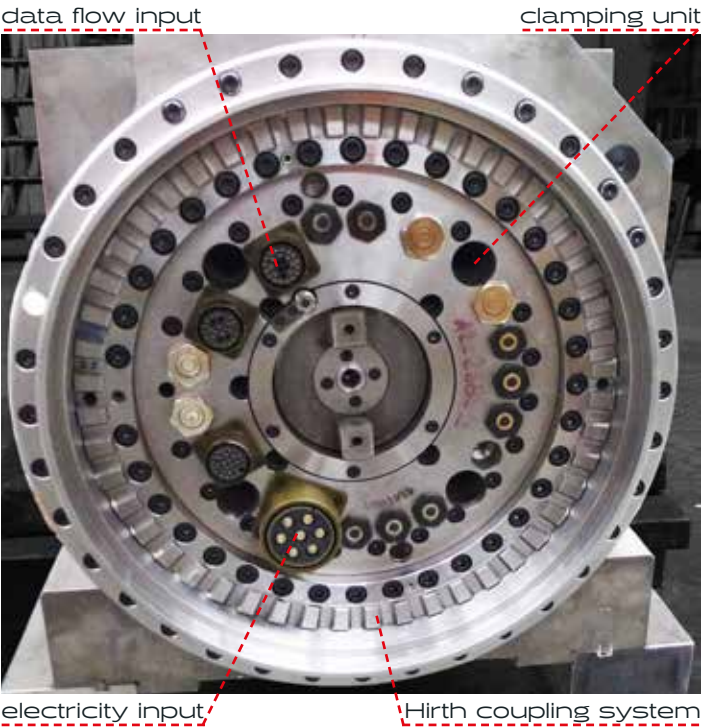


Execution type 350 – 400: two servomotors with the epicyclic gearboxes and a rack and pinion drive. The backlash is eliminated by means of the MASTER – SLAVE system (Y axis)



Headstock

- + the main carrying part of the headstock is a saddle of cast iron having the square section for the headstock 500 x 500
- + the headstock is equipped in its back part with two profile strips of guideways with bearing packs; these guideways are determined for the vertical headstock motion in the cross slide.



Thermal stabilization

- + temperature stabilization of the main drive gearbox and drive chain for the spindle in the spindle head.



Exchangeable spindle heads of our design and production

- + rotation around the headstock axis in the range of $\pm 185^\circ$ (C-axis), CNC axis having the contouring control system ($\pm 0,001^\circ$) with possibility of mechanical indexing by 1°
- + standard head types - straight, angle
- + heads type VK, VKE - swinging axis of the spindle tilt (B-axis), CNC axis having the contouring control system ($\pm 0,001^\circ$)
- + head type VO - vertical and horizontal spindle orientation, mechanical indexing by $2,5^\circ$ (1°) - the inclined axis is 45°



| Straight head | VA1 | VA2 |
|---------------------|-------------|-------------|
| Power line | A | A |
| Speed range [rpm] | 4 000/6 000 | 4 000/6 000 |
| Maximum torque [Nm] | 2 000/1 400 | 1 000 |
| Power output [kW] | 30/37 | 30/37 |



| Angular head | VP1 | VP2 |
|---------------------|-------------|-------------|
| Power line | A | A |
| Speed range [rpm] | 4 000/6 000 | 4 000/6 000 |
| Maximum torque [Nm] | 2 000/1 400 | 1 000 |
| Power output [kW] | 30/37 | 30/37 |



| Universal head | VO |
|---------------------|-------------|
| Power line | A |
| Speed range [rpm] | 4 000/6 000 |
| Maximum torque [Nm] | 1 250 |
| Power output [kW] | 30/37 |



| Two axis continuous head | VK |
|--------------------------|-------------|
| Power line | A |
| Speed range [rpm] | 4 000/6 000 |
| Maximum torque [Nm] | 1 000 |
| Power output [kW] | 30/37 |



| Two axis continuous head with electro spindle | VKE |
|---|--------|
| Power line | A |
| Speed range [rpm] | 16 000 |
| Maximum torque [Nm] | 87 |
| Power output [kW] | 25 |

- + wide range of spindle head options, type VA, VP
- + custom built solutions of spindle heads (grinding, planning etc.)

Main components



Automatic exchange of spindle heads



Trolleys for automatic exchange of spindle heads

- + spindle heads are located on the trolleys
- + working stroke extension in the X-axis by 1 000 mm is required for trolleys
- + the trolleys are locked in the positioning bases (min. 2pcs) in front of table face, when the exchange of spindle heads is performed



Frame for automatic exchange of spindle heads

- + the spindle heads are located on the fixed frame in front of the table face (2 - 6 spindle heads, in dependence on table width)
- + covering is provided by the electrically controlled protective guard
- + working stroke is extended in X-axis by 1 000 mm

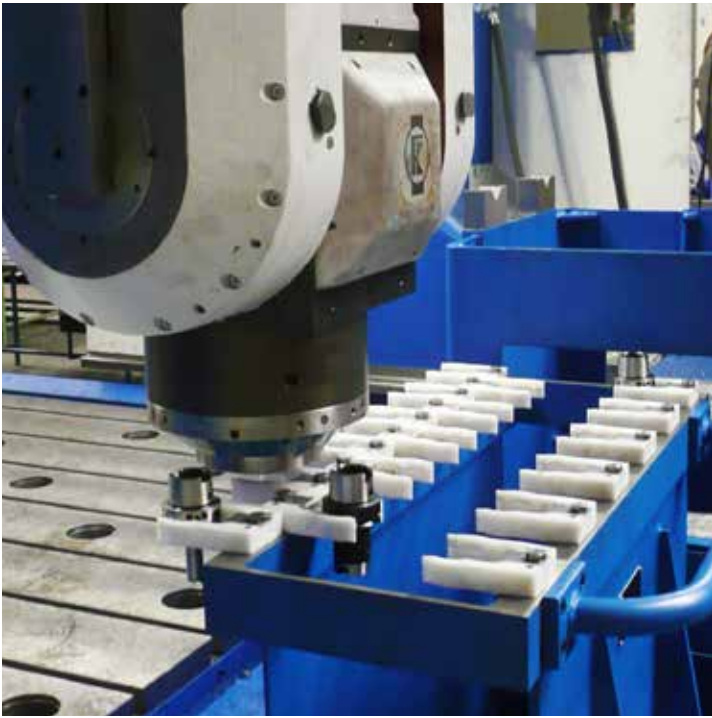
Automatic tool exchange

| Tool magazine | | R - chain magazine | | |
|--|------|---------------------------------|-----|-------|
| Number of positions | | 40 | 60 | 80 |
| Tool shank according to ČSN ISO 7388-1:2011 | | ISO 50 (HSK-63, HSK-100, BT 50) | | |
| Maximum diameter of tools stored next to each other | [mm] | 125 | | |
| Maximum diameter of tools, if one place remains empty between the neighbouring tools | [mm] | 245 | | |
| Maximum tool length | [mm] | 400 | | |
| Maximum tool weight | [kg] | 25 | | |
| Maximum weight of tools stored in the magazine | [kg] | 600 | 900 | 1 050 |



Chain tool magazine

- + automatic tool exchange in vertical or in horizontal position
- + automatic tool exchange is provided by dual gripper exchange arm



Tool magazine PICK-UP - optional

- + specified to store heavy tools with large dimensions
- + customized solutions on request

Main components

Characteristics of axes X, Y, Z



Travel of the vertical Z-axis

- + the servomotor drives the ball screw with the prestressed nut over the epicyclic gearbox and the backlash free clutch



Travel of the longitudinal X-axis

- + two feed units which are attached to the lower part of the left and right machine columns
- + two servomotors with epicyclic gearboxes and indented pinions which engage to the rack
- + the backlash is eliminated by means of the MASTER - SLAVE system
- + both feed units are controlled by the GANTRY system



Travel of the cross Y-axis

- + FRF 200-300 - the servomotor drives the ball screw with the prestressed nut over the belt drive with a cog belt
- + FRF 350 - 400 - two servomotors with epicyclic gearboxes and indented pinions which engage the rack. The backlash is eliminated by means of the MASTER - SLAVE system

| MATERIAL OF THE MAIN MACHINE COMPONENTS | BED | casting, GG-25 |
|---|---|--|
| | COLUMNS | casting, GG-25 |
| | CROSS RAIL | casting, GG-25 |
| | SLIDE | casting, GG-25 |
| | HEADSTOCK | casting, GGG 60 |
| X-axis | PROTECTIVE GUARDS | telescopic protective guards |
| | GUIDEWAYS | guideways with bearing packs, flat bar |
| | SIZE OF GUIDEWAYS | 53 x 125 |
| | NUMBER OF BEARING PACKS | rolling blocks - big 2 x 8, small 2 x 4 |
| | DRIVE | rack, GANTRY, MASTER-SLAVE |
| Y-axis | PROTECTIVE GUARDS | bellows protective guards - lower cross-rail part |
| | GUIDEWAYS | guideways with bearing packs, profile rails |
| | SIZE OF GUIDEWAYS | 55 |
| | NUMBER OF BEARING PACKS | 2x3 |
| | DRIVE | ball screw 80x30 (FRF 200/250/300); rack (FRF 350/400) |
| Z-axis | GUIDEWAYS | guideways with bearing packs, profile rails |
| | SIZE OF GUIDEWAYS | 55 |
| | NUMBER OF BEARING PACKS | 2 x 3 |
| | DRIVE | ball screw 80x30 |
| | TEMPERATURE COMPENSATION OF THE HEADSTOCK AND OF THE EXCHANGEABLE HEADS | YES |

Main components



Control system



Siemens Sinumerik 840D sl



Heidenhain TNC 640



Fanuc 31iB



Portable handwheel



Portable handwheel



Portable handwheel

Coolant System



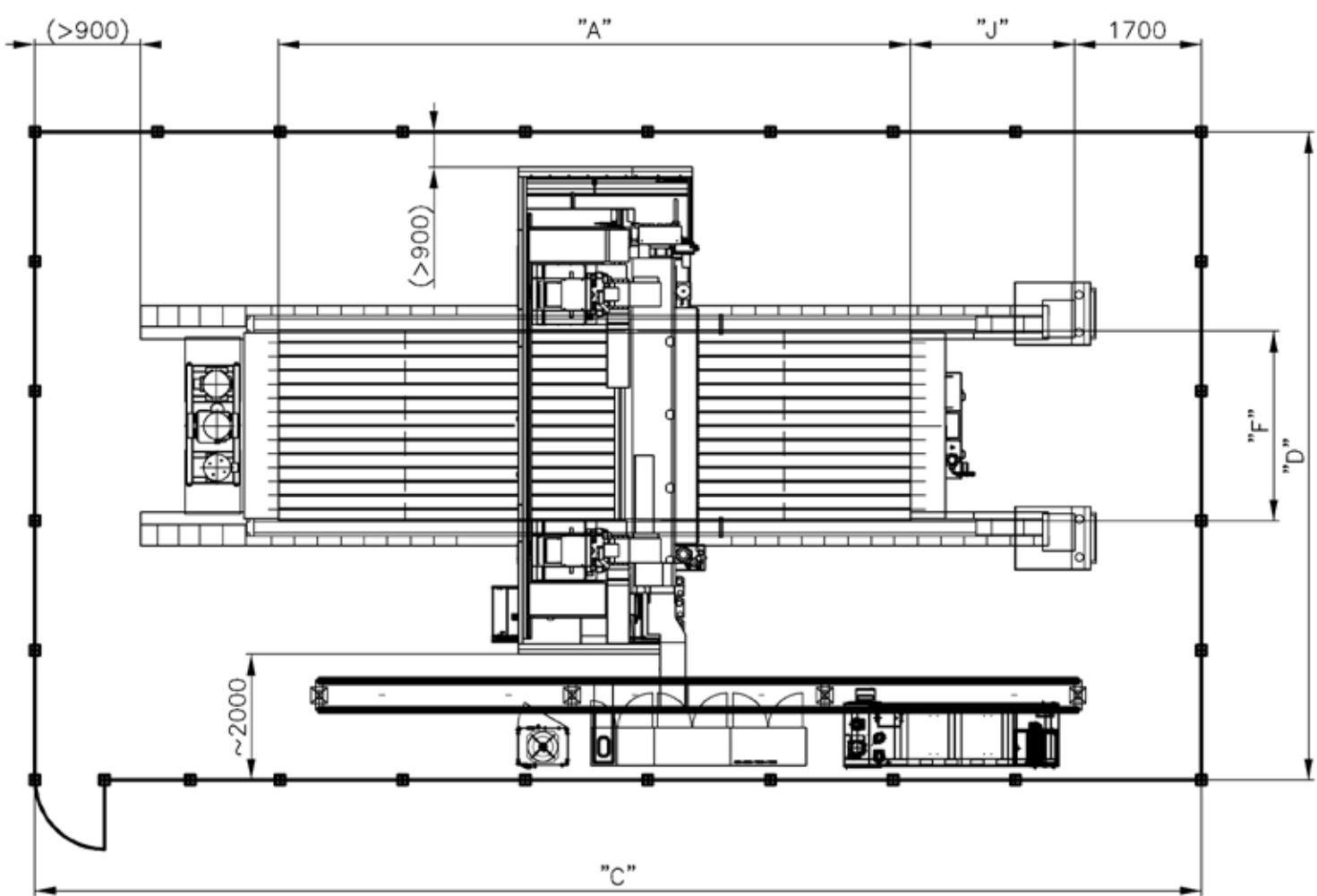
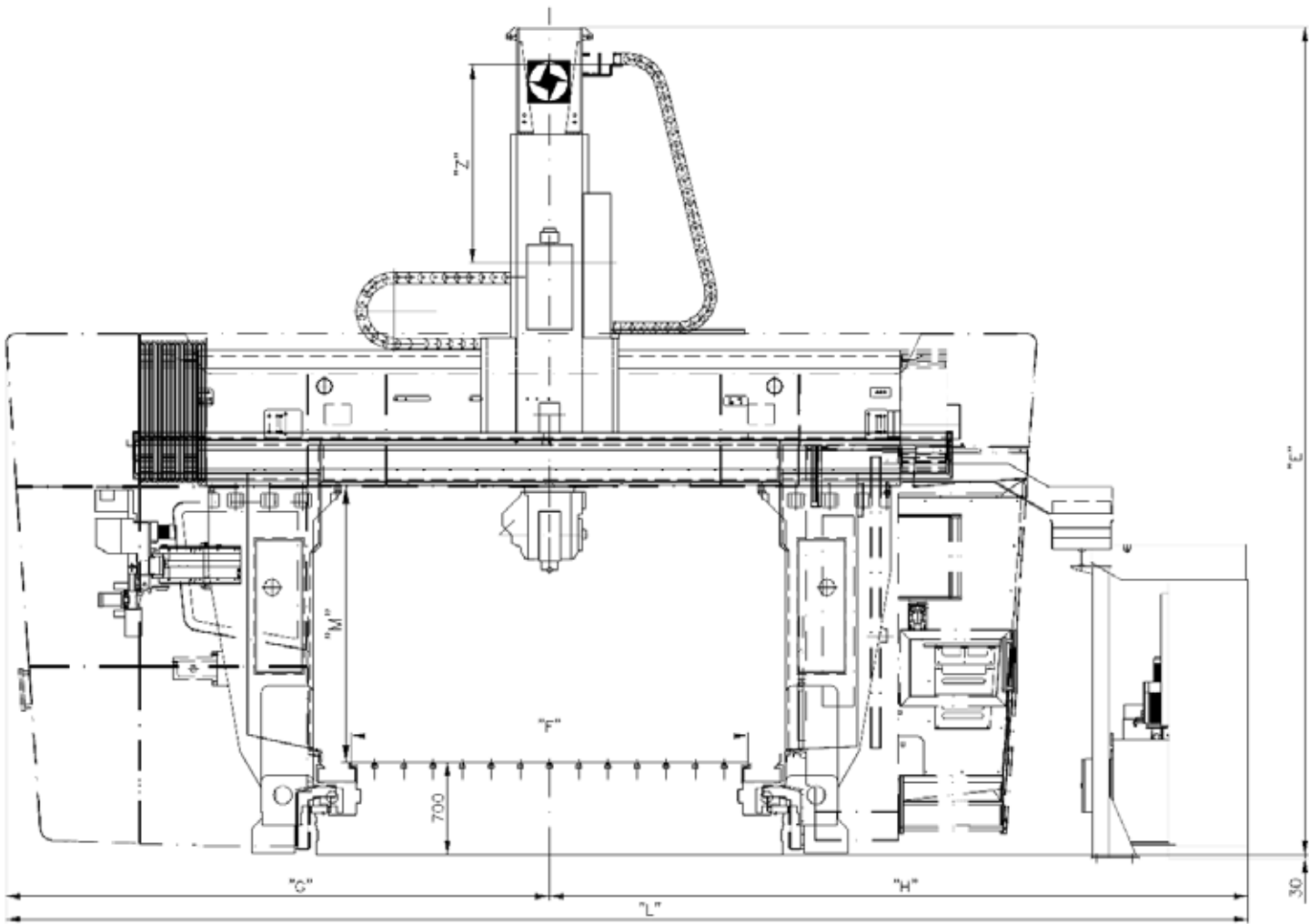
| Low-pressure tool cooling | |
|---|---------------------|
| Filtration method (filter type) | Magnetic filter |
| Tank volume [l] | 1 100; 1 600; 2 600 |
| Low-pressure pump: pressure [bar]/ supplied quantity [L.min ⁻¹] | 6/60 |

| Low-pressure and high-pressure tool cooling | |
|--|-----------------------------------|
| Filtration method (filter type) | Candle - filter cartridges (40µm) |
| | 1 100/250 |
| Tank volume [l]: low-pressure volume / high-pressure | 1 600/ 250 |
| | 2 600/400 |
| High-pressure pump: pressure [bar]/ supplied quantity [L.min ⁻¹] | 20/30 |

Machine accessories

| MACHINE ACCESSORIES | STANDARD ACCESSORIES | OPTIONAL ACCESSORIES |
|--|----------------------|----------------------|
| control system Siemens Sinumerik 840D sl; 19" screen | x | |
| digital spindle drive Siemens SINAMIC S120, digital feed drives Siemens SINAMIC S120 | x | |
| absolute linear measuring of the axes X,Y,Z Heidenhain (measuring rules), measuring of the rotary axes by means of the rotary sensors Heidenhain | x | |
| elevating chip conveyers - 2pcs, chip trolley - 2 pcs | x | |
| working platform for the operator on the right slide | x | |
| paint in the three-coloured type execution in the combination of colour shades RAL 7021, RAL 7035, RAL 3020 | x | |
| taper in spindle heads ISO 50 | x | |
| exchangeable spindle heads VA1, VA2, VP1, VP2, VO, VK, VKE (it is necessary to choose one of the spindle heads) | x | |
| storage magazine for spindle heads | | x |
| low-pressure coolant system (6 bar) | | x |
| through the tool high-pressure coolant system (20 bar) | | x |
| automatic tool exchange (chain tool magazine - 40/60/80 positions) | | x |
| aids for transport and external assembly | | x |
| control system Heidenhain TNC 640, FANUC 31iB | | x |
| rotary tables ISN 630/800/1000 | | x |
| machine safety fence - height 1,4m | | x |
| tool measuring probe Renishaw, Heidenhain, Blum, M&H | | x |
| workpiece measuring probe Renishaw, Heidenhain, Blum, M&H | | x |
| coolant spray gun | | x |
| air spray gun | | x |
| machine transport | | x |
| packing (road packing / overseas packing) | | x |
| another taper in spindle heads (BT, HSK, CAT) | | x |
| equipment for tool monitoring during the machining process – Prometec | | x |
| headstock with the non-exchangeable spindle heads MO or MK | | x |
| other coolant tank volumes | | x |





| Machine type | | | FRF 200 | FRF 250 | FRF 300 | FRF 350 | FRF 400 |
|--|-----|------|---------|---------|---------|---------|---------|
| Table width | „F“ | [mm] | 2 000 | 2 500 | 3 000 | 3 500 | 4 000 |
| From the table axis center to the left machine edge (tool magazine) | „G“ | [mm] | 3 595 | 3 845 | 4 095 | 4 345 | 4 595 |
| From the table axis center to the right machine edge (electrical switch box) | „H“ | [mm] | 4 885 | 5 135 | 5 385 | 5 635 | 5 885 |
| Total machine width without the fence, including the electrical switch box | „L“ | [mm] | 8 480 | 8 980 | 9 480 | 9 980 | 10 480 |
| Distance between the table clamping surface and the cross rail | „M“ | [mm] | 2 050 | | | | |
| Machine Z axis stroke | „Z“ | [mm] | 1 500 | | | | |
| Total machine height | „E“ | [mm] | 6 555 | | | | |

| | | | | | | | | | | |
|--|-----|------|--------|--------|--------|--------|--------|--------|--------|--------|
| Table length | „A“ | [mm] | 4 000 | 5 000 | 6 000 | 7 000 | 8 000 | 9 000 | 10 000 | 11 000 |
| Length of the chip conveyer elevating part | „J“ | [mm] | 3 730 | 3 730 | 3 730 | 3 730 | 3 730 | 3 730 | 3 880 | 3 880 |
| Length of the machine protective fence ¹⁾ | „C“ | [mm] | 12 850 | 13 850 | 14 850 | 15 850 | 16 850 | 17 850 | 19 150 | 20 150 |

| | | | | | | | | | |
|--|-----|------|--------|--------|--------|--------|--------|--------|--------|
| Table length | „A“ | [mm] | 12 000 | 14 000 | 16 000 | 18 000 | 20 000 | 22 000 | 24 000 |
| Length of the chip conveyer elevating part | „J“ | [mm] | 4 180 | 4 180 | 4 180 | 4 530 | 4 530 | 4 530 | 4 530 |
| Length of the machine protective fence ¹⁾ | „C“ | [mm] | 21 750 | 23 750 | 25 750 | 28 450 | 30 450 | 32 450 | 34 450 |

| | | | | | | | |
|---|-----|------|-------|--------|--------|--------|--------|
| Table width | „F“ | [mm] | 2 000 | 2 500 | 3 000 | 3 500 | 4 000 |
| Width of the machine protective fence ¹⁾ | „D“ | [mm] | 9 500 | 10 000 | 10 500 | 11 000 | 11 500 |

1) The dimensions are given by the minimum distances which are necessary for the operator's motion. The actual dimension can be larger, in dependence on the dimensions of the used fence fields.

References



FRF 350/10, Ukraine



FRF 200/6, Russia



FRF 300/11, Czech Republic



FRF 300/10, Turkey



FRF 300/10, Poland



FRF 300/12, Slovakia



FRF 200/4, China



FRF 250/4, Poland



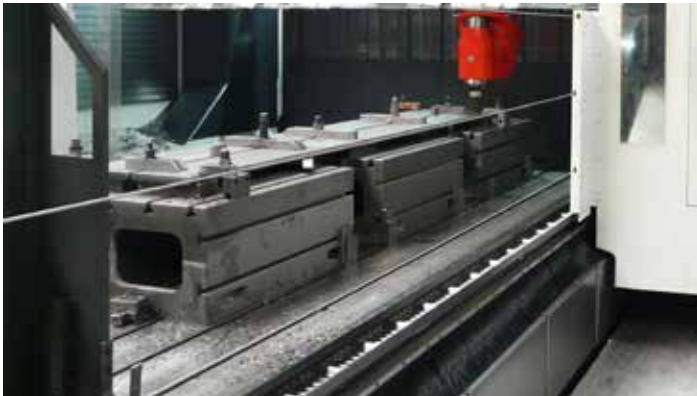
FRF 300/10, Czech Republic



pressure chamber machining



tram bogie frame machining



welded plate edge machining



railway carriage machining



cylinder block machining



electro motor shaft machining



aero-engine Fan CASE machining



locomotive bogie frame machining

Horizontal machining centres



FS

FUT



FU

Portal machining centres



FRF

FRU



FRP

Vertical lathes



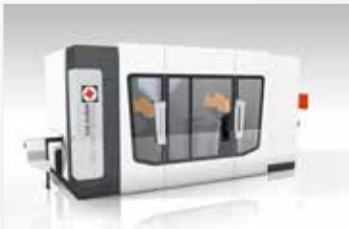
SKD

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SKJ

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