

THE NEWEST AND MOST ADVANCED BORING MILLING MACHINE AT STIMIN

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Keyword: Boring Milling Machine.

The company Stimin Oradea is specialized in machine tools production, having a long tradition in Romania and produces machine tools for prismatic parts machining: milling, drilling, presses, and special machines, including here CNC machines, machining centers, flexible cells, and many others.

The representative machine as the newest and the most advanced machine performed at Stimin is the new Horizontal Boring Milling Machine HBMC 130 x 4000, prepared for export.

The machine is special build for heavy parts in the energetic domain, special rotors or large rotating and ring forming parts, having many machined profiles inside.

The HBMC 130 x 4000 is provided with APC, ATC and other functions based on the last generation of CNC, Sinumerik 840 DSL from Siemens. In order to have idea about the machine dimensions, it can be mentioned the pallet dimensions of 3500x3500 able for 35 tones load, but also high accuracy, continuous X and B axes, able for complex profile generation.

INTRODUCTION

The horizontal boring milling center domain (HBMC) in the last years become to be very sophisticated, because the market need more end more new and special machines at the customer request, able to assures the most complex functions. Few years ago it was unimaginable to build these machines, and the machine tools domain was oriented on standard machine, having classical construction.

Now the standard machines are not required, but the special machines at the customer technical idea are more and more requested on the market.



Fig. 1 – General view left HBMC 130x4000

DESCRIPTION

The difficulty in order to assure this fact, consist by the limited technologic and also constructive possibilities, which need to be based on a large modular system, and also on many attachments, functions, software, etc, characteristic at the specialized companies.

The HBMC 130 x 4000 machine is a sample of special machine so build, in order to assures the most complex performance set requested by the customer.

So, it can be mentioned the following main characteristics:

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| -- Boring spindle diameter 130mm; | -- Nominal power 50 KW; |
| -- Speed domain 20 – 3000 rpm; | -- Main taper ISO 50; |
| -- Travels: X 4000, Y 2150, Z 750, W 1800 | -- Rotary table on B axis of 360° |
| -- Feed domain 0 – 12000mm/min; | -- Pallet dimensions 3500x3500 mm; |
| -- Load on the pallet 35 tones; | -- APC system with two front supports; |
| -- ATC chain type with 40 tools; | -- ATC hydraulic manipulator; |
| -- Hydrostatic guide ways on X and B axes; | -- Linear roller bearings on Y and W; |
| -- Spindle orientation and threading; | -- Cooling through the spindle (option); |
| -- Complete attachment set for internal milling.—Positioning accuracy ISO 230-2 | |

In the **figure 1** it showed the general view of the machine, but because the machine dimensions are so great, it is necessary to present more views from different directions.



Fig. 2 – X – base and APC

The **figure 2** shows the lateral view of the machine including the APC unit right. The machine is provided with two APC units, placed on the machine front, right and left, able to sustain the two machine pallets and to assure the pallet transfer at the machine table. The APC function is to assure the Automatic Pallet Changing, in order to make the machine table loading-unloading, without machining cycle stop. The transfer mechanism is

based on chain system placed on the board of the APC saddle, and the cycle programmed by PLC unit, as per the **figure 3**.



Fig. 3 – APC 2-3500 with two front pallet supports and the rotary feed mechanism of the table rotation



Fig. 4 – Rear view of the column

The **figure 4** shows the rear column view, including the machine headstock rear view, the hydraulic panel of the column and headstock part, the balancing system of the headstock weight. This balancing system is hydraulically, based on hydraulic cylinder inside the column, and chain mechanism, which is provided with balancing force from the gas pressure (nitrogen), form two large gas accumulators. In the picture is showed also the ATC chain type placed behind the column, and having also one ATC hydraulic manipulator (**figure 5**), able for tool transfer at the machine main spindle. The ATC sequences are programmed by PLC, as other machine functions.

The X and B guide ways are hydrostatic, having four DRK units, able to adjust the oil pressure and flow into the hydrostatic pockets, because the table assembly (including saddle, rotating table, pallet and working part) are heavy (**figure 6**).



Fig. 5 – The ATC chain type and hydraulic tool manipulator

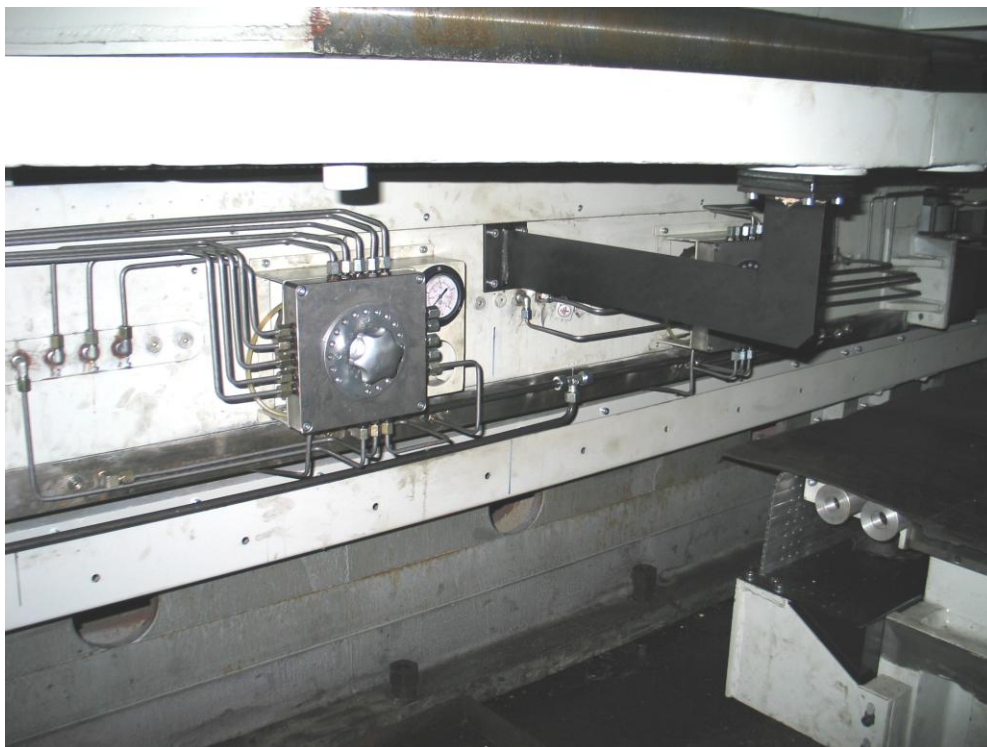


Fig. 6 – The DRK units (4 pcs) making the hydrostatic pressure / flow adjustment

The weight of these parts is up to 60 tones, and this fact requires special constructive solutions.

The main constructive new at the rotary-displaceable table (MRD unit) is the possibility of continuous feed with milling by contouring, as active CNC axes, and the pallet lifting mechanism, pallet transfer mechanism, specific for a large pallet.

Here the load on the pallet it can be placed anywhere on the pallet surface, and the lifting mechanism need to assures this condition.

The constructive solution of this is based on mechanical cinematic chain, using four screw jack synchronous units, and driving by hydraulic rotating motor. The pallet centering and clamping on the rotating table is assured by four conical pins and four Cytec anchor devices, able for high precision and clamping forces. Here, the problem consists in the oil distribution at the rotating table, because the dimensions of the table are so large. This aspect is solved by quick hydraulic coupling by Cy-Fit elements, on the board of the APC saddles during the pallet transfer time, and contained into the pallet transfer cycle.

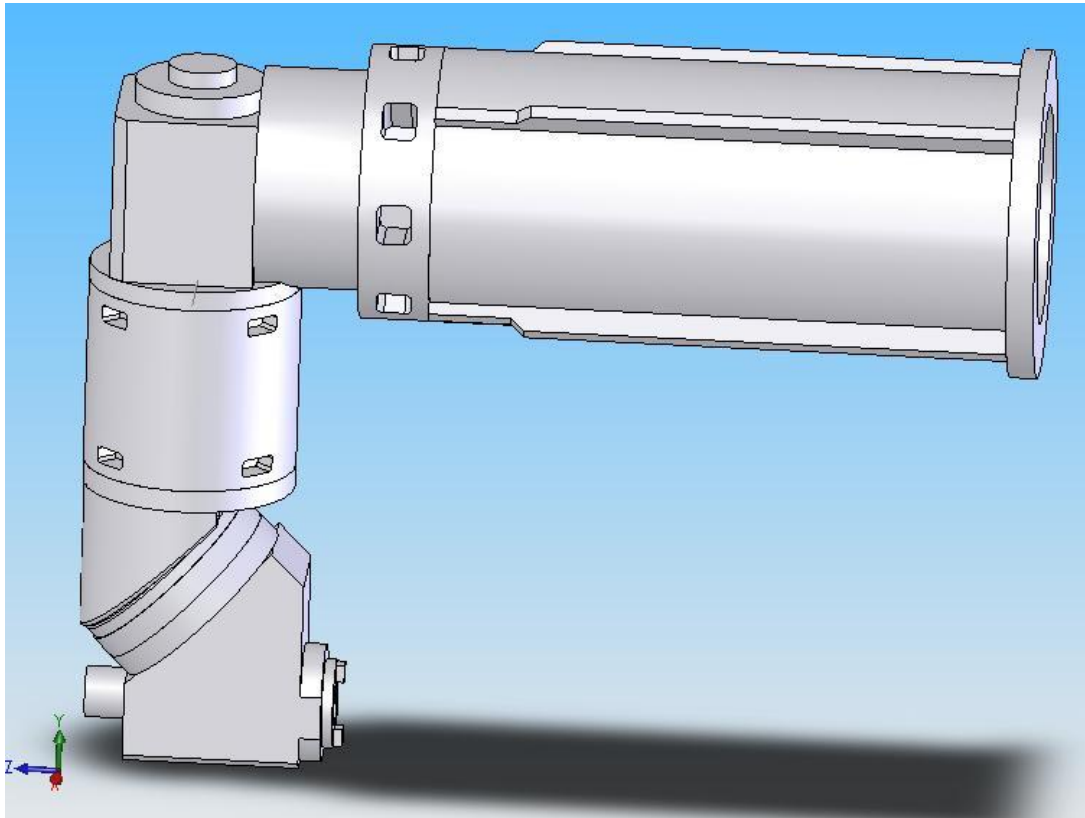


Fig. 7 – The attachment set of the machine able for the internal machining inside the customer part

One other specific think at this machine is the possibilities of machining inside the working part as large ring forming, and machining by CNC contouring, using the B-axis as table rotation. About this target the machine is equipped with one attachment set, containing more units as per **figure 7**, able to sustain the tool on the backward direction, as per the technologic plan for these working parts.

The main attachment set components are: attachment prolonger, vertical milling head (22 KW, ISO 50), spacer, universal H-V milling head, which one from the Stimin modular system.

About the machine quality, it can be mentioned that all the machine testes included into the machine protocol are performed according to the international standards,

requested by the customer to be checked at the pre-reception and at the putting into operation at the customer facilities.

From the most important set of testes it can be mentioned the following: geometric test of the basic machine, geometric test including the attachments, positioning accuracy by laser test, NAS standard prove out test, customer prove out test as: freeload test (vibration and noise), power consumption, functioning test.

CONCLUSIONS

The HBMC 130 x 4000 is the latest new machine until now; build by Stimin factory from Oradea, having very high performances, many new modern and advanced constructive solutions, large dimensions, respecting the newest standards, also one competitive machine at the actual international level.

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