Enclosure No 1 – Technical specification

High-speed Milling Centre (HSMC)

1. Technical description of the machine

Structure

The structure of the machine is that of a fixed bench. The basement is made of cast iron. The X axis Carriage and the Z axis ram are made of steel.

X, Y, Z axes

Axis movement occurs through recirculating ball screws powered by brushless motors and coupled by timing belts. The axis drives are digital command drives (wide possibility of parameterization and greater adjustment stability). The axes slide on guides with recirculating rolling packs. Optical scales provide the direct measuring of the axis positions. The position transducers are encapsulated and protected against dusts and coolant.

Workpiece table

Made of cast iron and fastened to the basement of the machine. Chips tank is located under the table.

Hydraulic and pneumatic systems

The units of hydraulic and the pneumatic systems are housed in a suitable integrated cabinet.

Axis lubrication

Recirculating ball screws, guides and slides are grease lubricated by an automatic system with pump and peripheral distributors, totally managed from the numerical control.

Tool cooling

Three different cooling systems:

• Through emulsion – the coolant is conveyed from adjustable nozzles and activated by a pump (50 l/min, 0,6 Mpa) connected to the tank collecting chips, equipped with suitable filter.

• Through air-oil mixture – a suitable unit delivers non – toxic oil in a minimum quantity. The mixture is conveyed on the tool by means of an adjustable nozzle.

• Through air – the air, drawn directly from the pneumatic supply, is conveyed on the tool by an additional adjustable nozzle.

The three systems can be programmed through the NC or manually activated through dedicated pushbuttons.

Electrical cabinet

The electrical cabinet is air-conditioned to guarantee a stable temperature and humidity and to protect the electric and electronic components. Equipped in an internal lighting system.

Accident protection

The machine is protected by accident prevention shields in accordance with regulations contained in the 2006/42/EC Machine Directive for machines with the EC mark. Polycarbonate windows with a 5mm thickness allow visibility of the working area. Two sliding doors assure access to the working area are equipped with electromechanical system and can be opened only after the spindle has come to a complete stop. Internal energy-saving lamps provide lighting of the working area are controlled from the NC pushbutton.

Operating volume cover

The working area is closed in the rear and in the upper sides by suitable bellows. By opening the door and manually moving the X-axis bellow, the cover is cleared over the table and the workpiece may be loaded from the top.

Tool magazine

This tool magazine is incorporated into the column of Y axis, suitably protected by pollution from working area and equipped with automatic doors. It includes the following:

• translating chain magazine with slots for 20 HSK toolholders, in accordance with the spindle used
• tool presence sensor
• sequence management software
• software managing the life of each tool.

2. **Technical Description of the Numerical Control machine**

Linear Axes

• Strokes X Y Z: min. 600 mm, 500 mm, 400 mm, respectively
• Positioning accuracy X Y Z (according to VDI/DGQ 3441 - ISO 230-2 norms): +/- 0,006 mm
• Repeatability X Y Z (according to VDI/DGQ 3441 - ISO 230-2 norms): 0,005 mm
• Max. axis speed: 30 m/min
• Max. acceleration: 5 m/s²
• Guide dimensions X Y Z: min. 45 mm, 35 mm, 35 mm, respectively
• Ball screw dimensions X Y Z: min. 40 mm, 30 mm, 25 mm, respectively

Workpiece table

- Workpiece table dimensions: min. 1000 x 500 mm
- Height on work surface: min. 800 mm
- Max. loadable weight on table: 700 kg

Installation data :

- Standard electrical power :
    - Voltage and frequency: 400 V ± 10%, 50 Hz
    - According to IEC/EN 60204-1 Directive
- Pneumatic power:
    - Pressure: 0.6 MPa ± 10% (6 bar ± 10%)
    - According to ISO 8573-1 Directive
- Machine weight: max 6500 kg
- Max height: 3500 mm

3. Three axis spindle

- Maximum power (S6 - 60%): 55 kW
- Spindle rotation speed: mx. 25000 1/min
- Tool holder (according to DIN 69 893): HSK
- Internal diameter of front bearing: max. 65 mm
- Maximum spindle nose - table surface distance: 650 mm

4. Tilting rotary table and accessories

Tilting rotary table with continuous axes in cast iron structure and aluminium alloy with high mechanical characteristics. The table is fixed to the machine basement. C axis movement is transmitted through direct drive motor. A axis movement is provided by a brushless motor transmitted through crown gear-worm screw. Direct measuring of rotary axis position is done through optical transducers. The axes are equipped with hydraulic brakes.

- Rotating max diameter: 570 / 520 mm
- Max height for rotating pieces: Φ570 / 520: 158 / 254 mm, respectively
- Platter dimensions: max. Φ 450 mm
- Max. loadable weight: 350 Kg

5. Laser automatic preset device

Automatic preset device with laser probe checks the length, diameter and shape of tools through automatic measuring cycles managed by the NC. It can check tools of 10 different shapes. The measuring laser probe is safely on X axis slide.
The device includes:
- An air-blow system for tool cleaning.
- An interface card and connection cables.
- A software for presetting the tool.
- A sample tool.

6. Measuring system with digital probe

The system includes:

- digital radio-wave probe with transmission of 433.100 – 434.650 MHz
- protection degree IP68
- radio-wave receiver with BNC antenna able to receive the signal transmitted by the probe on any position of the tool holder head of the machine;
- HSK adapter for mounting probe on spindle with integrated on/off switch;
- automatic workpiece alignment;
- software for the following:
  - calculating the error with respect to the theoretic coordinate
  - detecting shoulders along the three axes
  - calculating the mid-point of the distance between two shoulders along the three axes
  - calculating the diameter for 4 points
  - saving data on the points measured in a file.

7. Graphite and resin dust removal system

A suction unit mounted outside of the machine, connected by hoses to the intake manifolds assembled inside the working area of the machine. It is equipped with self-cleaning filtering cartridges according to USG certification (capable of filtering toxic dust and allows recycling of air filtered into the workplace) and fitted with a dust container. A high filtration efficiency (99.9%) is guaranteed so as to obtain a percentage of dust in the output air of <3 mg/ m³.
The intake manifolds mounted inside the working area of the machine with manual panel providing an environmental suction of the volatile dust, while hoses positioned in the vicinity of the piece being worked, improve the aspiration around the piece. A fan creates a direct air-flow towards the suction points. The system avoids scattering of dusts in the environment of the machine.
Technical data:
- Fan motor power: max. 7,5 kW
- Capacity: min. 3000 Nm³/h
- Noise : < 75 dBA

8. Technical Description of Numerical Control (NC) system

System sterownia panelem sterowania montowany na ustawnym wysięgniku z przodu obrabiarki.
The Numerical Control operator panel, is mounted on a adjustable arm in front of the machine.
Standard configuration
- **Industrial PC-based architecture**
  - WINDOWS XP Professional Operative System
  - CPU (eg. Pentium M) - 1,8 GHz min
  - 15" LCD TFT graphic monitor
  - 1 GB RAM memory
  - 120 GB hard disk
  - high-performance graphics card
  - control panel with electronic hand-wheel
  - 10/100/100MB/s Ethernet TCP/IP connection card

- **Software for high speed cutting (HSC) technology and management in 5 axis system ensures:**
  - Dynamic adaptation of feedback with tool path advanced control

- Algorithm of automatically controlled acceleration
- Active damping algorithms for better precision, surface quality and time execution
- G set of parameters adapted to both roughing, semi-finishing and finishing operations
- VIRTUAL QUILL and RTCP management
- Digital control for axes drives

- **CAD / CAM 2D ½ ISOGRAPH software installed on the operator panel includes / allows to:**
  - Defining of geometric profile
  - ISO files management
  - DWG/DXF input interface suitable for the automatic recognition of profiles, pockets and holes.
  - Creating and simulating CNC procedures
  - Creating outlines (contours) of open and closed profiles
  - Creating paths of re-treatment of residual material
  - Processing objects with sharp edges and round