**ANNEX 4 - TECHNICAL SPECIFICATIONS**

**TECHNICAL SPECIFICATIONS**

Tenderers are required to fill in column 3 with a detailed description of the supplies offered (words such as "compliant" or "yes" are not sufficient). The Tenderer shall not change the specifications stated in column 2.

For all manufacturers, types of products, standards or norms that are set out in the technical specifications applies "or equivalent”. Any supporting documentation which the Tenderer submits to complement the offer shall clearly indicate the models or options being offered. Offers which do not precisely identify the models and specifications may be rejected.

**Technical specifications** listed in the table in the check-list format represent minimum standard for every single item of the requested specifications and are sole basis for evaluating the technical compliance of the offers. The Tenderer can also offer products that meet higher standards or technical specifications better than the minimum.

In order for the offer to be considered valid, the offered supplies should satisfy all what is requested in the below table Technical specifications.

|  |  |  |  |
| --- | --- | --- | --- |
| **Ordinal Number:** | **Requested specifications** | | **Offered specifications** |
| **I.** | **II.** | | **III.** |
| **GROUP 1** |  |  |  |
| **1.** | **CNC 5-axis milling machine with pallet changer - for 18 pallets**  **Quantity: 1 piece** |  |  |
|  |  |  | **Quantity:** |
|  |  |  | **Manufacturer:** |
|  |  |  | **Model:** |
|  | ***Parameter / item*** | ***Characteristics (minimum requirements)*** |  |
| 1.1. Basics | **Type of processing** | High speed cutting |  |
|  | **Regulation** | Adjusted dynamics of axis movement depending on the weight of the piece |  |
|  | **Feed force X, Y, Z axis** | 6000 N |  |
|  | **Spindle - shock absorption** | Safety aluminium buffers |  |
|  | **Total power** | Min 44 kW |  |
|  | **Working table load** | Min 500 kg |  |
|  | **Tilt table load** | Min 300 kg |  |
|  | **A-axis of the tilt table** | One sided drive |  |
|  | **Slope of the A-axis** | ±135⁰ |  |
|  | **Slope of the C-axis** | ±360⁰ |  |
|  | **Axis C revolutions** | 40 rpm |  |
|  | **Axis A revolutions** | 25 rpm |  |
|  | **System** | gantry system or equivalent |  |
| 1.2. Pallet system | **Number of pallets** | 18 |  |
|  | **Pallets dimensions** | Min 300x300 mm |  |
|  | **Change speed** | Max 20 s |  |
|  | **Workpiece dimension** | 370/ ɸ 400 mm |  |
| 1.3. Performance | **Basic construction** | Mineral cast concrete |  |
|  | **Guideways in all axes** | Roller |  |
|  | **Linear measurement system** | In all axes |  |
|  | **Place of installation of all guideways, sensors, measuring strips and motors** | Above the working space |  |
|  | **Working Area X travel** | Min 400 mm |  |
|  | **Working Area Y travel** | Min 550 mm |  |
|  | **Working Area Z travel** | Min. 300 mm |  |
|  | **Drive motors for X, Y, Z axis** | Digitally regulated AC electromotor with high dynamics and built-in safety switches in all axes |  |
| 1.4. Feed | **Acceleration** | Min 8 m/s2 |  |
|  | **Rapid traverse** | Min 30 m/min |  |
| 1.5. Main spindle | **Motor** | Water cooled |  |
|  | **Overload** | Safety switch between spindle and motor in case of overload |  |
|  | **Main motor power (100%/40% ED)** | Min 17/25 kW |  |
|  | **Torque (100%/40% ED)** | Min 54/80 Nm |  |
|  | **Maximum number of revolutions** | Min 18,000 rpm |  |
|  | **Spindle cone** | HSK A 63 or equivalent |  |
| 1.6. Cooling system | **Coolant** | Coolant emulsion |  |
| 1.7. Management | **Management system** | Automatic pallet change system |  |
|  | **Monitor** | Coloured, min 19“ |  |
|  | **Memory** | Min 20 GB |  |
|  | **Connection** | With other internal computer systems  Remote management |  |
|  | **Management software** | Real time simulations  Programming software  Connectivity with CAD/CAM system  Contour milling of the residual material |  |
| 1.8. Measurement system | **Measuring strips - resolution** | Min 0.0001 mm |  |
|  | **Measuring strips – repeatability at 20⁰C±1⁰** | Min 0.008 mm |  |
| 1.9. Tool changer | **The change method** | Automatically |  |
|  | **Number of tools** | In the machine min 55 pieces  Additional tool magazine min 80 pieces |  |
|  | **Maximum tool diameter** | Min 120 mm |  |
|  | **Tool change speed** | Max 4.5 seconds |  |
| 1.10. Equipment | **Pallet system with possibility of adjusting the threads on the tilting table** | Min 3 clamping heads |  |
|  | **Pallet fit control** | Depression measuring |  |
|  | **Pallet base** | Rotary base in the pallet change area |  |
|  | **Cooling** | Spindle cooling 80 bar standard coolant liquid system |  |
|  | **Filters** | Paper rolls |  |
|  | **Guideways** | Rinsing |  |
|  | **Measurement system** | Air closure for measuring systems |  |
|  | **Cabin** | Tempered glass cabin doors |  |
|  | **Sensor** | Infra-red, wireless |  |
|  | **Temperature compensation** | Electronic  Between X and Y axis and the machine bottom |  |
|  | **Laser for tools control** | tool length and diameter correction  ±2µm for diameter > 0.3 mm |  |
|  | **Oil mist** | Suction system |  |
|  | **Lubrication** | Central automatic lubrication through the management system |  |
|  | **Chips** | Transporter for chips cleaning |  |
| 1.11. Warranty | **Warranty period** | Min 12 months |  |
|  | **Delivery of the spare parts - evaluation criterium** | Max 5 working days |  |
| 1.12. Education | **Education duration** | Min 9 days |  |
|  | **Type of education** | Basic education for programming for the work on the machine  Additional education for 5-axis programming  Basic education for manipulation with the pallet system for 18 pallets  Production education for machine management |  |
| **2.** | **CNC 5-axis milling machine with pallet changer – for 36 pallets**  **Quantity: 1 piece** |  |  |
|  |  |  | **Quantity:** |
|  |  |  | **Manufacturer:** |
|  |  |  | **Model:** |
|  | ***Parameter / item*** | ***Characteristics (minimum requirements)*** |  |
| 2.1. Basics | **Type of processing** | High speed cutting |  |
|  | **Regulation** | Adjusted dynamics of axis movement depending on the weight of the piece |  |
|  | **Linear feed force (x, y, z axis)** | 8500 N |  |
|  | **Spindle - shock absorption** | Safety aluminium buffers |  |
|  | **Total power** | Min 44 kW |  |
|  | **Working table load** | Min 500 kg |  |
|  | **Tilt table load** | Min 300 kg |  |
|  | **A-axis of the tilt table** | One sided drive |  |
|  | **Slope of the A-axis** | ±135⁰ |  |
|  | **Slope of the C-axis** | ±360⁰ |  |
|  | **Axis C revolutions** | 40 rpm |  |
|  | **Axis A revolutions** | 25 rpm |  |
|  | **Drive for machine input and output** | 3-axis servo manipulator |  |
|  | **System** | Gantry system or equivalent |  |
| 2.2. Pallet system | **Number of pallets** | 36 pieces |  |
|  | **Smaller dimension** | Min 200x300 mm |  |
|  | **Larger dimension** | Min 400x400 mm |  |
|  | **Change speed** | Max 20 s |  |
|  | **Maximum load** | Min 450 kg per pallet |  |
|  | **Maximum transport load of clamps** | Min 2x150 kg |  |
|  | **Workpiece dimension** | 370 / ɸ 400 mm |  |
| 2.3. Performance | **Basic construction** | Mineral cast concrete |  |
|  | **Guides in all axes** | Roller |  |
|  | **Linear measurement system** | In all axes |  |
|  | **Place of installation of all guideways, sensors, measuring strips and motors** | Above the working space |  |
|  | **Temperature compensation** | Electronic  Between X and Y axis and the machine bottom |  |
|  | **Working Area X travel** | Min 600 mm |  |
|  | **Working Area Y travel** | Min 600 mm |  |
|  | **Working Area Z travel** | Min 500 mm |  |
|  | **Guideway for Y axis** | Double |  |
|  | **Drive motors for X, Y, Z axis** | Digitally regulated AC motor with high dynamics and built-in safety switches in all axes |  |
| 2.4. Feed | **Acceleration** | Min 6 m/s2 |  |
|  | **Rapid traverse** | Min 45 m/min |  |
| 2.5. Main spindle | **Motor** | Water cooled |  |
|  | **Overload** | Safety switch between spindle and motor in case of overload |  |
|  | **Main motor power (100%/20% ED)** | Min 10/20 kW |  |
|  | **Torque (100%/20% ED)** | Min 87/180 Nm |  |
|  | **Maximum number of revolutions** | Min 18,000 rpm |  |
|  | **Spindle cone** | HSK A 63 or equivalent |  |
|  | **Cleaning** | 3 nozzles |  |
| 2.6. Cooling system | **Coolant** | Coolant emulsion |  |
| 2.7. Management | **Management system** | Automatic pallet change system |  |
|  | **Monitor** | Coloured, min 19“ |  |
|  | **Memory** | Min 20 GB |  |
|  | **Connection** | With other internal computer systems  Remote management |  |
|  | **Management software** | Real time simulations  Programming software  Connectivity with CAD/CAM system  Contour milling of the residual material |  |
| 2.8. Measurement system | **Measuring strips - resolution** | Min 0.0001 mm |  |
|  | **Measuring strips – repeatability at 20⁰C±1⁰** | Min 0.008 mm |  |
| 2.9. Tool changer | **The change method** | Automatically |  |
|  | **Number of tools** | In the machine min 36 pieces  Additional tool magazine min 80 pieces |  |
|  | **Maximum tool diameter** | Min 80 mm |  |
|  | **Tool change speed** | Max 4.5 seconds |  |
| 2.10. Equipment | **Pallet system with possibility of adjusting the threads on the tilting table** | Min 3 clamping heads |  |
|  | **Pallet fit control** | Depression measuring |  |
|  | **Pallet base** | Rotary base in the pallet change area |  |
|  | **Cooling** | Spindle cooling 80 bar standard coolant liquid system |  |
|  | **Filters** | Paper rolls |  |
|  | **Guideways** | Rinsing |  |
|  | **Measurement system** | Air closure for measuring systems |  |
|  | **Cabin** | Tempered glass cabin doors |  |
|  | **Sensor** | Infra-red, wireless |  |
|  | **Laser for tools control** | Tool length and diameter correction  ±3µm for diameter > 0.3 mm |  |
|  | **Oil mist** | Suction system |  |
|  | **Lubrication** | Central automatic lubrication through the management system |  |
|  | **Chips** | Transporter for cleaning the chips |  |
| 2.11. Warranty | **Warranty period** | Min 12 months |  |
|  | **Delivery of the spare parts – evaluation criterium** | Max 5 working days |  |
| 2.12. Education | **Education duration** | Min 20 days |  |
|  | **Type of education** | Basic education for programming for the work on the machine  Additional education for 5-axis programming  Basic education for manipulation with the pallet system for 36 pallets  Production education for machine management  Education for starting a complete activity via work orders and resolving technological bottlenecks  Education on workpiece measurement on a pallet, printout of measurement protocols for a sub-product, a protocol for repairing individual products and elaboration of product validation criteria |  |

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| **GROUP 2** |  |  |  |
| **3.** | **CNC 5-axis milling machine**  **Quantity: 1 piece** |  |  |
|  |  |  | **Quantity:** |
|  |  |  | **Manufacturer:** |
|  |  |  | **Model:** |
|  | ***Parameter / item*** | ***Characteristics (minimum requirements)*** |  |
| 3.1. Basics | **Type of processing** | Vertical machining centre, simultaneous 5-axes trochoidal milling, with automatic centerline probing |  |
|  | **Linear axes** | A-, C- |  |
|  | **Basic axes** | X, Y, Z |  |
|  | **Machine height** | Max 3,000 mm |  |
| 3.2. Performance | **Working method** | Controlled chip load and rest material detection |  |
|  | **Working Area X travel** | Min 500 mm |  |
|  | **Working Area Y travel** | Min 400 mm |  |
|  | **Working Area Z travel** | Min 400 mm |  |
|  | **A-axis slope** | +30 / -110 ° |  |
|  | **C axis slope** | 360° |  |
|  | **Table** | rotating |  |
|  | **Working table load** | Min 150 kg |  |
|  | **Tilt table load** | Min 150kg |  |
| 3.3. Main spindle | **Overload** | Safety switch between spindle and motor in case of overload |  |
|  | **Motor** | AC (3-phase electromotor) |  |
|  | **Main motor power** | Min 11 kW |  |
|  | **Maximum spindle torque** | Min 61 Nm |  |
|  | **Maximum number of revolutions** | Min 12,000 rpm |  |
|  | **Spindle cone** | SK 40 or equivalent |  |
| 3.4. Cooling system | **Coolant** | Coolant emulsion |  |
|  | **Tool clamping system** | Integrated hydraulic system |  |
| 3.5. Management | **Monitor** | Min 19“, coloured |  |
|  | **Connection** | With other internal computer systems  Remote management |  |
|  | **Management software** | Real time simulations  Programming software  Option of simultaneous display of simulations and programming  Connectivity with CAD/CAM system  Contour milling of the residual material |  |
|  | **Data storage** | Min 2 GB RAM |  |
|  | **Data transfer** | Ethernet  USB  Memory card |  |
| 3.6. Feed | **Rapid traverse for X/Y/Z axis** | Min 24 m/min |  |
|  | **Maximum feed rate A/C axis (rpm)** | Min 25 / 25 rpm |  |
| 3.7. Tool changer | **Tool change method** | Automatically |  |
|  | **Number of tools** | Min 20 pieces |  |
|  | **Maximum tool diameter** | Min 80 mm |  |
|  | **Tool change speed** | Max 2.5 seconds |  |
| 3.8. Equipment | **Clamping plates** | Set |  |
|  | **Lubrication** | Central automatic lubrication through the management system |  |
|  | **Chips** | Chips auger |  |
|  | **Oil mist** | Suction system |  |
| 3.9. Warranty | **Warranty period** | Min 12 months |  |
|  | **Delivery of the spare parts – evaluation criterium** | Max 5 days |  |
| 3.10. Education | **Education duration** | Min 1 day |  |
|  | **Type of education** | Basic education for work on 5-axis machine |  |
| **4.** | **CNC 3-axis milling machine**  **Quantity: 2 pieces** |  |  |
|  |  |  | **Quantity:** |
|  |  |  | **Manufacturer:** |
|  |  |  | **Model:** |
|  | ***Parameter / item*** | ***Characteristic (minimum requirements)*** |  |
| 4.1. Basics | **Type of processing** | Vertical machining centre, simultaneous 3-axes trochoidal milling |  |
|  | **Basic axes** | X, Y, Z |  |
|  | **Machine height** | Max 3,000 mm |  |
| 4.2. Performance | **Working Area X travel** | Min 600 mm |  |
|  | **Working Area Y travel** | Min 400 mm |  |
|  | **Working Area Z travel** | Min 500 mm |  |
|  | **Table** | Fixed |  |
|  | **Maximum table load** | Min 150 kg |  |
| 4.3. Main spindle | **Overload** | Safety switch between spindle and motor in case of overload |  |
|  | **Motor** | AC (3-phase electromotor) |  |
|  | **Main motor power** | Min 11 kW |  |
|  | **Maximum spindle torque** | Min 61 Nm |  |
|  | **Maximum number of revolutions** | Min 12,000 rpm |  |
|  | **Spindle cone** | SK 40 or equivalent |  |
| 4.4. Cooling system | **Coolant** | Coolant emulsion |  |
|  | **Tool clamping system** | Integrated hydraulic system |  |
| 4.5. Management | **Monitor** | Min 19“, coloured |  |
|  | **Connection** | With other internal computer systems  Remote management |  |
|  | **Management software** | Real time simulations  Programming software  Option of simultaneous display of simulations and programming  Connectivity with CAD/CAM system  Contour milling of the residual material |  |
|  | **Data storage** | Min 2 GB RAM |  |
|  | **Data transfer** | Ethernet  USB  Memory card |  |
| 4.6. Feed | **Rapid traverse for X/Y/Z axis** | Min 24 m/min |  |
| 4.7. Tool changer | **Tool change method** | Automatic |  |
|  | **Number of tools** | Min 20 pieces |  |
|  | **Maximum tool diameter** | Min 80 mm |  |
|  | **Tool change time** | Max 2.5 seconds |  |
| 4.8. Equipment | **Clamping plates** | Set |  |
|  | **Lubrication** | Central automatic lubrication through the management system |  |
|  | **Chips** | Chips auger |  |
|  | **Oil mist** | Suction system |  |
| 4.9. Warranty | **Warranty period** | 12 months |  |
|  | **Delivery of the spare parts – evaluation criterium** | Max 5 days |  |
| 4.10. Education | **Education duration** | Min 1 day |  |
|  | **Type of education** | Basic education for work on 3-axis machine |  |

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| **GRUPA 3** |  |  |  |
| **5.** | **3-axis milling machine**  **Quantity: 1 piece** |  |  |
|  |  |  | **Quantity:** |
|  |  |  | **Manufacturer:** |
|  |  |  | **Model:** |
|  | ***Parameter / item*** | ***Characteristics (minimum requirements)*** |  |
| 5.1. Basics | **Type of processing** | Vertical machining centre, 3-axix milling |  |
|  | **Machine height** | Max 3,000 mm |  |
|  | **Basic axes** | Linear X, Y, Z |  |
| 5.2. Performance | **Basic construction** | Monolith concept (in which the machine bed is integrated with the stand); cast iron |  |
|  | **Guideways implemented in all three axes** | Roller |  |
|  | **Working Area X travel** | Min 550 mm |  |
|  | **Working Area Y travel** | Min 550 mm |  |
|  | **Working Area Z travel** | Min 500 mm |  |
|  | **Table** | Fixed |  |
|  | **Maximum table load** | Min 600 kg |  |
| 5.3. Main spindle | **Overload** | Safety switch between spindle and motor in case of overload |  |
|  | **Motor** | Digital AC motor, directly connected to spindle |  |
|  | **Main motor power (40/100% DC)** | Min 13/9 kw |  |
|  | **Torque (40/100% DC)** | Min 83/57 Nm |  |
|  | **Maximum number of revolutions** | Min 12,000 rpm |  |
|  | **Spindle cone** | SK 40 or equivalent |  |
| 5.4. Coolant system | **Coolant** | Coolant emulsion |  |
| 5.5. Management | **Monitor** | Coloured, min 10“ |  |
|  | **Connection** | With other internal computer systems  Remote management |  |
|  | **Management software** | Real time simulations  Programming software  Connectivity with CAD/CAM system  Contour milling of the residual material |  |
|  | **Data storage** | Min 5 MB |  |
|  | **Data transfer** | Ethernet  USB  Memory Card |  |
|  | **Probes** | Touch probe with optical signal transmission  For tool measurement, measuring cycles calibration tool, calibration ring and case for equipment |  |
| 5.6. Feed | **Rapid traverse for X, Y, Z axis** | Min 24 m/min |  |
|  | **Max. force (40% DC)** | Min 4 kN |  |
|  | **Accuracy of positioning of X, Y, Z axis** | 15 μm |  |
| 5.7. Tool changer | **Tool change method** | Automatic |  |
|  | **Number of tools** | Min 24 pieces |  |
|  | **Maximum tool diameter** | Min 80 mm |  |
|  | **Tool change speed** | Max 2.4 seconds |  |
| 5.8. Equipment | **Clamping plates** | Set |  |
|  | **Oil mist** | Mechanical suction system |  |
|  | **Lubrication system** | Automatic lubrication for guideways and  recirculating ball-screw |  |
|  | **Chips** | Transporter for chip cleaning |  |
| 5.9. Warranty | **Warranty period** | Min 12 months |  |
|  | **Delivery of the spare parts – evaluation criterium** | Max 5 days |  |
| 5.10. Education | **Education duration** | Min 3 days |  |
|  | **Type of education** | Basic education for work on 3-axis machine |  |

**Place and date:**

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**For Tenderer:**

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Name and surname of authorised person

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Signature of authorised person