## TECHNICAL PRODUCT SPECIFICATIONS

### System Configuration
- Ultra precision 4-6 axes (XYZC;B;W) CNC high dynamic machining center

### Machine Base
- Natural granite base for excellent accuracy

### Vibration Isolation
- Self leveling pneumatic isolation system (option: passive or electronically controlled active leveling)

### Control System
- Beckhoff TwinCAT 3 CNC high performance machine controller; Intel® Core™ i5 CPU, 4 Cores; operating system Windows 10; 21.5" color flat panel touch screen display and 22" color flat panel display; EtherCAT bus communication technology; Digital Servo drives with 100 kHz current & position control loop frequency

### Programming Resolution
- 1 nm linear (0.01 nm optional), 0.0000001° rotary

### Set Points (pts/sec)
- Up to 2,000 in CNC mode; 10,000 in DirectDrive3D

### File Transfer Requirements
- USB, Ethernet
- Air: 7-10 bars, 300 l/min, 10 μm prefiltered; Electrical: 400 V, 16 A, 50/60 Hz; Water: 8-10 °C, 30 l/min; Connectivity: Ethernet

### Machine Size
- 2400 * 2800 * 2200 mm (D * W * H)
- Standalone Panel Size 610 * 610 mm (D * W)

### Linear Axes

<table>
<thead>
<tr>
<th>Travel</th>
<th>X-Axis</th>
<th>Y-Axis</th>
<th>Z-Axis</th>
</tr>
</thead>
<tbody>
<tr>
<td>600 mm</td>
<td>250 mm</td>
<td>400 mm</td>
<td></td>
</tr>
<tr>
<td>0.03125 nm</td>
<td>0.03125 nm</td>
<td>0.03125 nm</td>
<td></td>
</tr>
<tr>
<td>&lt; +/- 0.2 μm</td>
<td>&lt; +/- 0.2 μm</td>
<td>&lt; +/- 0.2 μm</td>
<td></td>
</tr>
<tr>
<td>6,000 mm/min</td>
<td>4,000 mm/min</td>
<td>2,000 mm/min</td>
<td></td>
</tr>
<tr>
<td>Brushless linear motor</td>
<td>Brushless linear motor</td>
<td>Brushless linear motor</td>
<td></td>
</tr>
<tr>
<td>420 N / μm vertical</td>
<td>420 N / μm vertical</td>
<td>420 N / μm vertical</td>
<td></td>
</tr>
</tbody>
</table>

### Rotary Axes

<table>
<thead>
<tr>
<th>Type</th>
<th>C-Axis</th>
<th>B-Axis (Option)</th>
<th>Milling Spindle (Option)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Workholding Spindle; groove compensated air bearing</td>
<td>Oil hydrostatic axis, 360° continuous</td>
<td>Air bearing</td>
<td></td>
</tr>
<tr>
<td>70 kg at 6.9 bar (radial)</td>
<td>&lt; 300 kg (axial)</td>
<td>&lt; 30 kg (radial)</td>
<td></td>
</tr>
<tr>
<td>228 N/μm</td>
<td>370 N/μm</td>
<td>65 N/μm</td>
<td></td>
</tr>
<tr>
<td>98 N/μm at 6.9 bar</td>
<td>125 N/μm</td>
<td>40 N/μm</td>
<td></td>
</tr>
<tr>
<td>&lt; 15 nm</td>
<td>&lt; 50 nm</td>
<td>&lt; 15 nm</td>
<td></td>
</tr>
<tr>
<td>&lt; 15 nm</td>
<td>&lt; 80 nm</td>
<td>&lt; 30 nm</td>
<td></td>
</tr>
<tr>
<td>&lt; 10,000 rpm</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>0-3,000 rpm</td>
<td>20 rpm</td>
<td>60,000; 80,000; 90,000 rpm</td>
<td></td>
</tr>
<tr>
<td>0.008 arcsec</td>
<td>0.005 arcsec</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Integrated cooling</td>
<td>Integrated cooling</td>
<td>Integrated cooling</td>
<td></td>
</tr>
<tr>
<td>NanoGrip</td>
<td>NanoGrip</td>
<td>HSK 25</td>
<td></td>
</tr>
</tbody>
</table>
### Automation | NanoGrip Interface

Ultra-precise clamping system for workpiece & tool
- **Clamping mechanism:** Spring loaded mechanical clamping, pneumatic unclamping
- **Repeatability / Accuracy:** < 0.5 μm radial & axial
- **Clamping force:** > 20,000 N for excellent stiffness and accuracy
- **Interfaces for workpiece:** Vacuum chuck, three jaw chuck, individual mounting or blocking

### Automation | 3D Tactile Probe (Option)

X, Y, Z tactile probe system with strain gauge technology
- **Stylus:** Length up to 100 mm, ruby and diamond tips, fast exchange
- **Tactile Force:** XY plane: 0.02 N; Z: 0.07 N
- **Unidirectional Repeatability:** Trigger level 1: 0.40 μm
- **Form Measurement Deviation:** Trigger level 1: ± 0.80 μm

### Metrology | LVDT (Option)

- **2D Surface Line Scan**
  - Working Distance / Range: 0.5 mm
  - Resolution: < 10 nm
  - Stylus Tip: Ruby, diamond

- **Measurement of Optical Surface**
  - Working Distance / Range: 6 mm / 0.3 mm
  - Resolution of Sensor: < 10 nm
  - Data Acquisition: 1,000 pts/sec in spiral or orbit scan, full surface

### Metrology | Confocal Probe (Option)

- **Scanning chromatic confocal probe**
  - Working Distance / Range: 6 mm / 0.3 mm
  - Resolution of Sensor: < 10 nm
  - Data Acquisition: 1,000 pts/sec in spiral or orbit scan, full surface

### ILSONIC (Option)

- **Transversal ultrasonic unit for diamond turning of steel**
  - Working Frequency: 100 kHz
  - Max. Depth for Concave Parts: 70 mm
  - NanoGrip Interface to Machine: 55° Insert tool, monocrystalline diamond

### Overdrive (Option)

- **High dynamic axis for freeform generation**, hydrostatic bearing
  - Total travel: 50 mm
  - Max. acceleration: 10 G
  - Drive: Linear Motor
  - Feedback: encoder resolution 0.03125 nm
  - CNC Standard Integration
  - DirectDrive3D

### Circulating Air Shower (Option)

- **Air conditioning unit with filtration system**
  - Air Flow Rate: 400 l/min
  - Temperature Constancy < 0.1 °C
  - Required Room Temperature < 3 °C

### Part | General Description

- **Size:** Ø < 600 mm; length < 250 mm; possible by crane
- **Turning Performance:** Form accuracy (PV) < 0.1 μm; Surface roughness (Ra) < 1 nm
- **Overdrive Tilted Plane:** Ø < 100 mm; angle 3°; form accuracy (PV) < 0.2 μm
- **Overdrive Freeform HUD:** 250 * 200 mm; total stroke 2.1 mm; form accuracy (PV) < 0.5 μm; machining time 3.5 h