3D Workstation

I. Working Process

A 3D workbench is an intelligent operation platform that integrates multi axis motion control and high-precision machining capabilities. Its core is based on three-axis/four axis/five axis linkage CNC technology, relying on precision linear guides, ball screw transmission systems, and high-performance CNC systems to achieve precise displacement and complex trajectory motion of tools or execution terminals in the X, Y, and Z axes of space. During work, operators input processing programs through programming software or control panels

Path parameters and process instructions, the system parses the instructions into electrical pulse signals, drives the servo motor to rotate precisely, and then converts them into linear motion through a reducer, driving the slide table to move in a directional manner along the guide rail; At the same time, the supporting power head, spindle or actuator (such as drill bit, welding gun, fixture, laser head) synchronously completes cutting, welding

Inspection, assembly and other operational actions. The entire process is monitored in real-time by the CNC system for feedback signals such as position, speed, and force, and closed-loop error compensation is carried out to ensure that the machining positioning accuracy is repeatedly controllable. It can meet the diverse three -dimensional operation requirements from simple drilling to complex surface forming, and is widely applicable to flexible production and multi variety customized machining scenarios.

II. Core Parameters

3D Workstation series products have flexible parameter customization based on application scenarios and load capacity. Core indicators of mainstream models are as follows:

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Motion Parameters

Travel Range: X-axis 500mm-3000mm, Y-axis 500mm-2000mm, Z-axis 300mm-1000mm, supporting large-size workpiece cross-regional machining

Positioning Accuracy: ± 0.01mm- ± 0.05mm, Repeatability ≤ ± 0.008mm, meeting precision machining requirements

Max Travel Speed: 10m/min-30m/min, Machining Speed: 3m/min-15m/min, balancing efficiency and precision

Number of Controlled Axes: 3-axis/4-axis/5-axis optional, 5-axis models can achieve spatial arbitrary angle inclined machining, suitable for complex shaped workpieces

Load and Structure Parameters

Rated Load: 300kg-5000kg, suitable for small parts to large fixture machining

Table Size: Customized design, standard specifications from 1000 × 1000mm to 4000 × 2000mm

Guide Rail Type: Heavy-duty linear guide/rectangular guide, hardness ≥HRC60, strong wear resistance

Transmission Structure: Ball screw (precision C3/C5 grade)/planetary roller screw, transmission efficiency ≥95%

Drive System: Servo motor/linear motor, power 1.5kW-55kW, stable torque output

Control and Performance Parameters

Control System: Industrial-grade PLC/CNC system, supporting G-code, human-machine interface programming, offline programming

Protection Level: IP54-IP65, dust and water resistant, suitable for humid and dusty workshop environments

Operating Noise: ≤75dB, low vibration design, ensuring operation stability

Power Supply: AC380V/50Hz, power 5kW-100kW, customized according to model power

III. Usage Instructions

Installation and Debugging: Before installation, confirm the site is flat and load-bearing capacity meets standards. The workstation must be fixed on concrete foundation or steel structure platform using expansion bolts/anchor bolts, ensuring levelness deviation ≤0.1mm/m. During installation, ensure parallel alignment of each axis guide rail. When connecting power cables and control cables, provide shielding protection to avoid signal interference. Before powering on, check axis wiring connections and lubrication status.

Perform manual jogging tests for each axis motion direction.After confirming correctness, perform empty running debugging. Calibrate each axis home position, limit switches and emergency stop functions. Test whether the联动trajectory is smooth. Parameter settings must match actual machining load and process requirements.

Daily Operation: After powering on, first perform system self-test. Check each sensor, motor, and guide rail status. After confirming the lubrication system is normal, start no-load operation and preheat for 10-15 minutes. Before machining, based on workpiece material and process requirements, select appropriate cutting tools/execution tools. Set reasonable machining parameters (spindle speed, feed rate, cutting depth). When clamping workpieces, ensure precise positioning and firm clamping to avoid workpiece offset during machining. During operation, monitor running status in real-time. Observe indicators such as current, vibration, and noise. Stop immediately for inspection if abnormalities occur. Never exceed rated load or speed. After machining completion, promptly clean the table surface and guide rail debris.
Apply rust prevention treatment. Turn off power and lock the system.

Maintenance: Regularly check ball screw and guide rail lubrication status of each axis. Apply specialized lubricating grease/oil every 1-3 months to maintain good lubrication of transmission components and reduce wear. Check servo motor and coupling tightness. Handle loosening issues promptly to avoid increased transmission errors. Regularly calibrate positioning accuracy. Test sensitivity of safety components such as limit switches, emergency stop devices, and sensors to ensure safe operation. Every 6-12 months, perform firmware upgrades and program backups for the control system. Check for cable aging and wear. Replace wearing parts promptly to extend equipment service life. During long-term shutdown, disconnect power. Apply rust and dust prevention treatment to guide rails, lead screws, motors and other components. Perform comprehensive testing before restart.

IV. Product Advantages

The 3D Workstation uses high-precision structural design plus intelligent control system, featuring multi-axis linkage and flexible machining core capabilities. It can complete drilling, milling, engraving, cutting, welding, assembly and other various 3D operations in one station, replacing traditional multi-machine collaboration and greatly

simplifying production processes. The equipment has high positioning accuracy and good repeatability stability. Machining error is controllable, meeting high-precision machining requirements for precision parts and complex curved surface workpieces, suitable for multi-variety small-batch customized production needs. Rich model selection can be customized based on load, travel, and accuracy requirements, covering light precision machining to heavy-duty heavy-load operation scenarios. Simultaneously supports explosion-proof, high-temperature resistant, dust-proof and other special condition customization with extremely strong compatibility. High operating efficiency, high automation degree, reducing human operation errors and physical labor consumption, lowering production costs. With intelligent control system, it supports remote monitoring and data traceability, suitable for Industry 4.0 digital production management. The equipment has sturdy and durable structure. Core components use wear-resistant, high-strength materials, capable of adapting to 24-hour continuous operation. Simple post-maintenance, low wearing parts replacement cost, combining cost-effectiveness and practicality.

V. Applicable Industries

As a core intelligent 3D operation equipment, the 3D Workstation is widely used in mechanical manufacturing, automotive parts, electronics and appliances, aerospace, medical devices, mold machining and other fields, suitable for various 3D machining, inspection, and assembly scenarios.

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