Bed guideway inspection plan for a CNC lathe

cnc-lathe-bed

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Application template; not a claim of a completed customer project.

Scope

For straightness in the vertical and horizontal planes and twist of the two guideways of a CNC lathe bed (2000 mm long, example/teaching data). The dual-axis autocollimator reads the main guideway; a bridge spanning both guideways reads roll. Level the bed and record the wedge state first, then measure, convert and reverse-repeat.

Equipment and configuration guidance

• Dual-axis photoelectric autocollimator (0.1″ class)

• 200 mm reflector base and a bridge spanning both guideways (span B measured, example)

• Levelling wedge state recording tools

• Temperature logger

Principle and calculation

Δh=L·tanθ; horizontal-plane straightness Δy=L·tanψ (ψ the yaw angle); twist height equivalent =B·tanφ (φ the roll angle). With L=200 mm, 1″≈0.970 μm (example/teaching data).

On-site checklist

• Levelling wedge state recorded

• Bridge span B measured

• Sign conventions of both axes unified

Suggested records

• Vertical/horizontal straightness profiles

• Guideway twist curve

• Before/after levelling comparison and acceptance record

Limitations

Does not cover bed thermal deformation, cutting dynamic accuracy or spindle accuracy; acceptance tolerances follow the machine builder's specification or contract — this plan provides geometric data only.

Detailed teaching example

CNC Lathe Bed Guide Inspection · Tutorial Case

Scenario and task

Teaching demonstration, not a real customer project: segmented straightness measurement of a CNC lathe bed guide in the vertical plane; data are instructional settings.

Workflow overview

Clean guides → End station → Short-span survey → Angle conversion → Straightness

Preparation and measurement steps

01. Clean the bed guides and check for scratches

02. Fix the autocollimator on a stand at the end of the bed

03. Move a 100 mm bridge along the guide step by step

04. Record the pitch reading per segment

05. Cumulate and convert for vertical-plane straightness

Teaching example readings

• Bridge span L=100 mm; segment 1 autocollimator reading θ□=+0.6″

• Segment 2 autocollimator reading θ□=-0.4″

• Segment 3 autocollimator reading θ□=+0.8″

Calculation procedure

Height conversion: Δh = L·tan(θ·π/648000)×1000 (μm). Segment 1: 100×tan(+0.6″)=+0.29 μm; Segment 2: 100×tan(-0.4″)=-0.19 μm; Segment 3: 100×tan(+0.8″)=+0.39 μm. Cumulative heights: 0→+0.29→+0.10→+0.49 μm; peak-to-valley PV=+0.49−(+0.00)=+0.49 μm.

Example result and interpretation

Tutorial result PV≈0.49 μm, demonstrating short-span high-accuracy guide measurement on a lathe.

Example verification checklist

• Bridge feet contact the guide without gaps

• Repeat reading difference within 0.2″ per segment

• Measurement direction matches the carriage travel

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