Alignment inspection plan for a boring headstock vertical traverse

boring-head-alignment

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

Scope

For the alignment of a floor/horizontal boring machine headstock traversing the column (1500 mm travel, example/teaching data) relative to the spindle axis. A test mandrel with an end-face mirror establishes the spindle axis datum; the autocollimator reads two-axis angular deviation over the full traverse, which is integrated into an axis-offset curve. Bidirectional measurement with averaging separates stick-slip and backlash effects.

Equipment and configuration guidance

• Dual-axis photoelectric autocollimator (0.1″ class)

• Test mandrel with end-face mirror (mandrel runout verified)

• Existing column-verticality data or tools to measure it concurrently

• Station positioning and temperature logging tools

Principle and calculation

Each station angle θi is the axis tilt; transverse offset δ=ΣL·tanθi; the traverse squareness error is the algebraic difference of the end angles. With L=150 mm, 1″≈0.727 μm offset equivalent (example/teaching data).

On-site checklist

• Mandrel runout verified and recorded

• Sufficient settling time, no creeping readings

• Bidirectional differences recorded and averaged

Suggested records

• Full two-axis angle and offset table

• Alignment error curve

• Bidirectional comparison and adjustment advice

Limitations

Excludes spindle rotation accuracy, thermal growth and droop under long overhang tool loads. Conclusions apply only to the load and temperature state at measurement and do not replace boring trial-cut acceptance.

Detailed teaching example

Boring Machine Headstock Alignment Inspection · Tutorial Case

Scenario and task

Teaching demonstration, not a real customer project: segmented geometry measurement along the column guide during headstock travel on a boring machine; data are instructional settings.

Workflow overview

Clean datum → Set optical axis → Step upward → Read angles → Compute deviation

Preparation and measurement steps

01. Clean the column guide face and check for damage

02. Fix the autocollimator on the table with the optical axis vertical along the guide

03. Step a 100 mm magnetic bridge with reflector upward along the guide

04. Record the pitch reading of each segment

05. Cumulate three segments to evaluate guide straightness

Teaching example readings

• Bridge span L=100 mm; segment 1 autocollimator reading θ□=+2″

• Segment 2 autocollimator reading θ□=+1″

• Segment 3 autocollimator reading θ□=-1.5″

Calculation procedure

Height conversion: Δh = L·tan(θ·π/648000)×1000 (μm). Segment 1: 100×tan(+2″)=+0.97 μm; Segment 2: 100×tan(+1″)=+0.48 μm; Segment 3: 100×tan(-1.5″)=-0.73 μm. Cumulative heights: 0→+0.97→+1.45→+0.72 μm; peak-to-valley PV=+1.45−(+0.00)=+1.45 μm.

Example result and interpretation

Tutorial result PV≈1.45 μm, demonstrating the evaluation of headstock travel geometry error.

Example verification checklist

• Magnetic base securely attached with fall protection

• Repeat reading difference per segment within 0.2″

• Instrument stand isolated from floor vibration

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