Geometric inspection plan for gantry mill crossbeam guideways

gantry-mill-beam

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

Scope

For the vertical/horizontal straightness and mutual parallelism of the two guideways of a gantry mill crossbeam (4000 mm useful travel, example/teaching data). The long travel is measured in segments with overlapping splices and merged into one profile. Agree support and ram position first, then acquire segments, register splices, reverse-repeat and deliver records.

Equipment and configuration guidance

• Dual-axis photoelectric autocollimator (0.1″ class)

• 200 mm reflector base and a bridge spanning both guideways (example)

• Stable stands and station markers

• Multi-point temperature logging

Principle and calculation

Δh=L·tanθ; with L=200 mm, 1″≈0.970 μm (example/teaching data). Splice registration minimises the sum of squared height differences in the overlap. Parallelism is the peak-to-valley of paired-point reading differences converted by the span.

On-site checklist

• Ram position and loading state recorded

• Splice overlap at least 2 intervals

• Reverse differences and thermal drift assessed

Suggested records

• Full straightness profile and splice parameters

• Parallelism (twist) evaluation of both guideways

• Raw segment data and reverse comparison

Limitations

Excludes the ram-position-dependent gravity sag of the crossbeam and cutting-force deformation. Under large temperature gradients, shorten each measuring run or apply segment corrections; this plan does not replace machining acceptance tests.

Detailed teaching example

Gantry Mill Beam Guide Geometry Inspection · Tutorial Case

Scenario and task

Teaching demonstration, not a real customer project: segmented straightness measurement of a gantry mill cross-beam guide in the vertical plane; readings are instructional settings.

Workflow overview

Lock the beam → Mount instrument → Segment survey → Angle conversion → Straightness result

Preparation and measurement steps

01. Confirm the beam is clamped at one fixed height

02. Mount the autocollimator beside the beam, optical axis aimed at the guide in the vertical plane

03. Move a 200 mm bridge with reflector along the guide face step by step

04. Record the pitch angle of each segment

05. After three segments, compute the cumulative straightness

Teaching example readings

• Bridge span L=200 mm; segment 1 autocollimator reading θ□=+1.5″

• Segment 2 autocollimator reading θ□=-2″

• Segment 3 autocollimator reading θ□=+0.5″

Calculation procedure

Height conversion: Δh = L·tan(θ·π/648000)×1000 (μm). Segment 1: 200×tan(+1.5″)=+1.45 μm; Segment 2: 200×tan(-2″)=-1.94 μm; Segment 3: 200×tan(+0.5″)=+0.48 μm. Cumulative heights: 0→+1.45→-0.49→-0.01 μm; peak-to-valley PV=+1.45−(-0.49)=+1.94 μm.

Example result and interpretation

Tutorial result PV≈1.94 μm, demonstrating vertical-plane straightness evaluation of the beam; compliant with a 0.005 mm/1000 mm teaching tolerance.

Example verification checklist

• Beam height locked to prevent vertical drift

• Bridge contacts the guide face without gaps

• Reading repeatability within 0.2″

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