Verification plan for a CMM granite table

cmm-granite-table

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

Scope

For periodic verification and post-repair re-checks of a CMM granite table (1000×800 mm, example/teaching data). Autocollimator diagonal and grid lines are primary; an electronic level cross-checks shared lines. Confirm the support state and evaluation datum first, then measure, unify the datum and evaluate, run a reverse check and deliver verification records.

Equipment and configuration guidance

• Photoelectric autocollimator (0.1″ class) with 150 mm reflector base (example)

• Calibrated electronic level

• Means to confirm the three-point support per drawing

• Temperature and station marking tools

Principle and calculation

$\Delta h = L \cdot \tan\theta$; with L=150 mm, 1″≈0.727 μm (example/teaching data). Instrument agreement is expressed as the rms height difference on shared lines. Flatness is computed on the agreed datum (minimum zone or least squares) and explicitly named.

On-site checklist

• Support state matches the drawing and is recorded

• Sign conventions and spans of both instruments unified

• Closure at shared nodes and inter-instrument differences checked

Suggested records

• Verification layout and raw readings

• Height matrix and flatness conclusion

• Inter-instrument comparison log

• Traceability and environment information

Limitations

Does not cover long-term granite ageing stability or the CMM probing error. The verification interval, tolerance and verdict follow the user's metrology specification or contract; this plan provides geometric data and comparison records only.

Detailed teaching example

CMM Granite Table Verification · Tutorial Case

Scenario and task

Teaching demonstration, not a real customer project: segmented angular measurement along a diagonal of a CMM granite table in a metrology room; data are instructional settings.

Workflow overview

Thermal soak → Segment setup → Acquire readings → Convert heights → Cumulate & evaluate

Preparation and measurement steps

01. Stabilise the table at 20 °C±0.5 and clean the surface

02. Set up the autocollimator and a 200 mm bridge along the diagonal

03. Measure segment by segment from one corner along the diagonal

04. Take two readings per segment and average them

05. After three segments, evaluate straightness by the cumulative method

Teaching example readings

• Bridge span L=200 mm; segment 1 autocollimator reading θ□=+0.5″

• Segment 2 autocollimator reading θ□=-0.3″

• Segment 3 autocollimator reading θ□=+1″

Calculation procedure

Height conversion: Δh = L·tan(θ·π/648000)×1000 (μm). Segment 1: 200×tan(+0.5″)=+0.48 μm; Segment 2: 200×tan(-0.3″)=-0.29 μm; Segment 3: 200×tan(+1″)=+0.97 μm. Cumulative heights: 0→+0.48→+0.19→+1.16 μm; peak-to-valley PV=+1.16−(+0.00)=+1.16 μm.

Example result and interpretation

Tutorial result PV≈1.16 μm, demonstrating micrometre-level verification of a granite table straightness against teaching criteria.

Example verification checklist

• Bridge support points rest on sound granite, clear of pores

• Difference between repeat readings must not exceed 0.2″

• Check instrument zero drift; return-to-zero error within 0.1″

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