Granite plate grid flatness

granite-plate-grid

SHANGHAI MICROCRE OPTICS-MECH TECH CO.,LTD

Telephone: 400-812-7833 | 021-58391850

Address: 1478 Nanfeng Road, Fengcheng Town, Fengxian District, Shanghai, China | Postal code: 201411

Contact email: shanghai@yr17.net

Service email: rockwei@yr17.net

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

Scope

Flatness of surface plates, machine tables and large bases, including grid design, closure checks and before/after lapping.

Equipment and configuration guidance

• Autocollimator and bridge

• Electronic level for fast screening

• Equal-height blocks, temperature log

Principle and calculation

$\Delta h = L \cdot \tan\theta$ between nodes; closure beyond the threshold means re-measure the path.

On-site checklist

• Support matches service

• Closure recorded

• Evaluation method stated

• Same grid before/after

Limitations

A sparse grid misses local defects; flatness does not cover hardness or roughness.

Detailed teaching example

Worked nine-point grid flatness example on an 800×800 mm plate

Scenario and task

Teaching example: nine nodes on a 400 mm grid over 800×800 mm; a least-squares plane is removed and the residual range is reported as flatness. Synthetic data.

Preparation and measurement steps

01. Design the grid and closed paths; define support points.

02. Stabilise the plate thermally and set it on three or four supports.

03. Measure line by line on a common height datum and check closure.

04. Evaluate by least squares and minimum zone separately, stating which applies.

Teaching example readings

• Node heights in μm: +0, +1, +2, +0, +1, +3, -1, +0, +2 in 3×3 row order.

• Fitted plane slopes a = −0.00083, b = 0.00333 μm/mm.

• Residuals in μm: 0.111, −0.222, −0.556, 0.444, 0.111, 0.778, −0.222, −0.556, 0.111.

Calculation procedure

Least-squares plane $z = \bar{z} + a(y-\bar{y}) + b(x-\bar{x})$; residual range = 1.333 μm. A coarse grid misses local waviness between nodes.

Example result and interpretation

Flatness is about 1.333 μm with a high lower-right corner. Nine points only indicate a trend; formal acceptance needs the diagonal method and the specified point density.

Example verification checklist

• Cover corners and edges; that is where deviation peaks.

• Measure on the specified free supports; shimming hides the true form.

• Log temperature and scan direction; granite anisotropy is small but not zero.

Document generated: 2026-11-16