Splice flatness inspection plan for optical breadboards

optical-breadboard-splice

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

Scope

For splice flatness and seam steps after joining multiple optical breadboards into one surface (2×1 pieces of 600×900 mm, example/teaching data). Support per the vendor's recommended array, measure the full surface on a grid, evaluate against a least-squares reference and report seam steps separately.

Equipment and configuration guidance

• Photoelectric autocollimator (0.1″ class) with 100 mm reflector base (example)

• Equal-height levelling supports per the vendor's recommended array

• Seam densification station markers

• Temperature logger

Principle and calculation

The least-squares plane z=ax+by+c minimises squared residuals; flatness is the residual peak-to-valley. Seam step is the height difference of the nearest stations on both sides of the seam. With L=100 mm, 1″≈0.485 μm (example/teaching data).

On-site checklist

• Support array matches the vendor recommendation

• Seam densification stations included

• Re-clamp repeatability difference recorded

Suggested records

• Full-surface height matrix and contour map

• Splice flatness result

• Seam step table and clamping repeatability record

Limitations

Local stiffness variations of the honeycomb make high-frequency waviness between spans unmeasurable; this plan evaluates the mechanical mounting surface only, not optical figure or isolation performance.

Detailed teaching example

Optical Breadboard Splice Flatness Inspection · Tutorial Case

Scenario and task

Teaching demonstration, not a real customer project: segmented measurement of step height and alignment across a splice between two optical breadboards; data are instructional settings.

Workflow overview

Splice set-up → Aim at joint → Cross-joint survey → Compare readings → Step evaluation

Preparation and measurement steps

01. Splice and clamp the two breadboards on the isolation table

02. Aim the autocollimator along the splice direction

03. Survey with a 150 mm bridge crossing the joint step by step

04. Record the angular reading per segment

05. Compare heights of joint-crossing and plain segments

Teaching example readings

• Bridge span L=150 mm; segment 1 autocollimator reading θ□=+0.3″

• Segment 2 autocollimator reading θ□=-0.6″

• Segment 3 autocollimator reading θ□=+0.9″

Calculation procedure

Height conversion: Δh = L·tan(θ·π/648000)×1000 (μm). Segment 1: 150×tan(+0.3″)=+0.22 μm; Segment 2: 150×tan(-0.6″)=-0.44 μm; Segment 3: 150×tan(+0.9″)=+0.65 μm. Cumulative heights: 0→+0.22→-0.22→+0.43 μm; peak-to-valley PV=+0.43−(-0.22)=+0.65 μm.

Example result and interpretation

Tutorial result PV≈0.65 μm, demonstrating evaluation of the splice step height.

Example verification checklist

• Dowels and screws torqued to specification

• When crossing the joint the bridge feet straddle both boards

• Do not touch the table during readings

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