Inspection plan for theodolite sighting axis versus trunnion axis

theodolite-sight-axis

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

Scope

For laboratory determination of a theodolite/total station sighting-axis error (collimation c) and trunnion-axis tilt error (i). The autocollimator in collimating mode provides an infinity reference target; face-left/face-right observations separate collimation, and targets at high and low elevations separate trunnion tilt.

Equipment and configuration guidance

• Autocollimator in collimating mode with adjustable reticle target

• Stand for high and low target positions

• Forced-centring and levelling base for the instrument

• Temperature equilibrium and reading log tools

Principle and calculation

Collimation c=(R_FL−R_FR±180°)/2; trunnion tilt i is solved from the i·tan(h) term in the high/low elevation difference, h the target elevation angle. Reading resolution per instrument specification (0.5″ example, teaching data).

On-site checklist

• Instrument levelling and thermal equilibrium confirmed

• Scatter of three sets recorded

• Target beam stability checked

Suggested records

• Face-left/face-right reading table

• Computed collimation c and trunnion tilt i

• Repeatability and environment records

Limitations

Does not cover vertical index error, distance-measuring performance or compensator accuracy; results apply only to the environment and setup at measurement. Conformity verdicts follow the verification regulation adopted by the user.

Detailed teaching example

Theodolite Line of Sight and Trunnion Axis Test · Tutorial Case

Scenario and task

Teaching demonstration, not a real customer project: collimation error 2C and trunnion axis inclination i tests on a theodolite; readings are instructional settings.

Workflow overview

Set up & level → Face-left reading → Face-right reading → Compute 2C → Test i angle

Preparation and measurement steps

01. Set up and carefully level the theodolite on the test pier

02. Collimate the crosshair of the parallel plate collimator as a near target

03. Read the horizontal circle on the same target in face left and face right

04. Determine the collimation error at high and low points

05. Compute 2C and i as tutorial results

Teaching example readings

• Face-left horizontal reading 0°00′12″

• Face-right reading on same target 180°00′06″

• High-point collimation error +4.0″, low point +2.0″

Calculation procedure

2C = (FL − (FR − 180°))/2 = (12″ − 6″)/2 = +3.0″; trunnion inclination i = (high-point error − low-point error)/2 = (4.0″ − 2.0″)/2 = +1.0″.

Example result and interpretation

2C = +3.0″ and i = +1.0″, both within the teaching limits (2C ≤ ±10″, i ≤ ±15″).

Example verification checklist

• Bubble shift after levelling within half a division

• Same target collimated in both faces

• High and low points symmetric about the horizontal line of sight

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