Coaxiality and level inspection plan for wind turbine mainshaft bearing seats

wind-mainshaft-seat

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

Scope

For coaxiality and installation level of the front and rear mainshaft bearing seats on a wind turbine bedplate (3500 mm centre distance, example/teaching data). The autocollimator establishes a reference optical axis; an adjustable target mirror reads lateral offset and tilt at each seat, and an electronic level checks the mounting faces. Four rotational target orientations cancel target eccentricity; keep before/after adjustment data sets.

Equipment and configuration guidance

• Long-focus photoelectric autocollimator (0.1″ class)

• Adjustable target mirror with centring fixture for seat bores

• Calibrated electronic level

• Shim set and adjustment log

Principle and calculation

Coaxiality is the vector offset of each seat centre from the reference axis, $\delta=\sqrt{(\delta y^2+\delta z^2)}$; the shaft-line angle combines the two axis tilts. Shim correction $\Delta\approx\delta+\alpha\cdot D$ with D the seat spacing (at 3500 mm, 1″≈16.97 μm lateral equivalent, example/teaching data).

On-site checklist

• Target eccentricity cancelled by four orientations

• Optical axis drift monitored (example criterion ≤0.5″/h)

• Before/after adjustment data kept in pairs

Suggested records

• Offset and angle measurement table

• Coaxiality evaluation and shim calculation

• Before/after adjustment comparison

Limitations

Does not replace laser shaft alignment of the whole drivetrain (mainshaft-gearbox-generator). The nacelle state on the tower under wind load differs from the shop state; the report must state the measuring condition.

Detailed teaching example

Wind Turbine Main Shaft Bearing Seat Inspection · Tutorial Case

Scenario and task

Teaching demonstration, not a real customer project: segmented level survey of a wind turbine main bearing bore axis; data are instructional settings.

Workflow overview

Rig set-up → Bore axis set → Bore segments → Read per step → Coaxiality check

Preparation and measurement steps

01. Fix the bearing seat mock-up on the teaching rig

02. Place the autocollimator at one end of the bore with the optical axis through the bore centre

03. Move a 250 mm reflector gauge along the bore generatrix step by step

04. Record the pitch reading of each segment

05. Cumulate and convert for axis level results

Teaching example readings

• Bridge span L=250 mm; segment 1 autocollimator reading θ□=+1.2″

• Segment 2 autocollimator reading θ□=-0.8″

• Segment 3 autocollimator reading θ□=+0.6″

Calculation procedure

Height conversion: Δh = L·tan(θ·π/648000)×1000 (μm). Segment 1: 250×tan(+1.2″)=+1.45 μm; Segment 2: 250×tan(-0.8″)=-0.97 μm; Segment 3: 250×tan(+0.6″)=+0.73 μm. Cumulative heights: 0→+1.45→+0.48→+1.21 μm; peak-to-valley PV=+1.45−(+0.00)=+1.45 μm.

Example result and interpretation

Tutorial result PV≈1.45 μm, demonstrating segmented geometric inspection of the bearing bore axis.

Example verification checklist

• Gauge guided in the bore without play

• Check autocollimator zero before and after readings

• Survey both bores separately for coaxiality cross-check

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