Robot cell installation and calibration

robot-cell-calibration

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

Scope

Base level, tool frame and relative pose of external axes or vision systems.

Equipment and configuration guidance

• Autocollimator or electronic level

• Laser tracker or calibration spheres

• Shims and record sheets

Principle and calculation

Base tilt enters the tool pose directly; check residual distribution, not only the mean.

On-site checklist

• Both directions logged

• Frames consistent

• Multi-pose residuals

• Compensation traceable

Limitations

Temperature and payload affect results; re-calibrate after tool change or collision.

Detailed teaching example

Worked robot base tilt and calibration residual example

Scenario and task

Teaching example: base tilt 30″ over a 1500 mm reach, plus calibration residuals at six poses to contrast mean and maximum error.

Preparation and measurement steps

01. Confirm mounting face, foot preload and working envelope.

02. Level the base in both pitch and roll.

03. Establish robot and workpiece frames with a tracker or spheres.

04. Calibrate TCP and external-axis relations; check residuals.

Teaching example readings

• Base tilt 30″ gives 218 μm at the working radius.

• Residuals at six poses in mm: 0.04, 0.07, 0.05, 0.18, 0.06, 0.09.

• The largest residual occurs at an extended pose near the workspace edge.

Calculation procedure

Offset = R·tanθ = 218 μm. Residual mean is 0.082 mm against a maximum of 0.18 mm; the mean hides the edge poses.

Example result and interpretation

A base tilt of 218 μm grows downstream; level the base before calibrating or the calibration absorbs geometric error.

Example verification checklist

• Inspect residuals per pose, not only the mean.

• Temperature and payload change robot geometry; log the state during calibration.

• Confirm anchor and floor stiffness; looseness turns error into noise.

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