Why parts move after machining

Separate stress redistribution, clamp springback, cutting deflection and thermal effects before choosing a remedy.

01 / Clamped condition

A restrained reading does not establish the released shape.

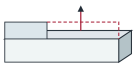
02 / Released condition

Recheck using the drawing's specified support and restraint.

A change after unclamping is a symptom, not a diagnosis.
Clamp recovery and stress redistribution can occur together. It is not proof that the machine is correct or incorrect.

Four mechanisms to separate

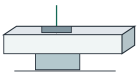
01 Residual-stress redistribution



Removing material changes the balance of stresses already in the stock. Machining can also introduce near-surface stress.

Review stock condition and removal sequence; leave planned finishing allowance.

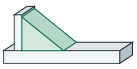
02 Clamp springback



A fixture can elastically bend a part. Cutting it in that shape can leave a different geometry after the load is removed.

Support near the clamp and cutting loads; use enough force to hold safely without needless distortion.

03 Cutting-force deflection



A flexible wall or tool can move during a pass and recover afterward, leaving a dimensional or form error.

Shorten unsupported spans where permitted and review tool reach, engagement and support.

04 Temperature & material response

Uneven temperature can bend a part; temperature changes also affect size. Some polymers respond to moisture and time.

Define temperature and conditioning for acceptance; compare parts in the same measurement state.

Build a review point into the process

1
PLAN
Specify grade, temper, support areas and final acceptance condition.

2
ROUGH
Review balanced removal where practical and reserve finish stock.

3
RECHECK
Release safely; measure movement and decide whether the plan needs adjustment.

4
FINISH & VERIFY
Re-establish the setup, finish and inspect in the specified condition.

Heat treatment is not an automatic step. Stress relief or annealing requires a material-specific, approved process and may change properties. True Precision coordinates heat treatment through outside partners.

Make the comparison meaningful

- Record support, restraint and measurement method.
- Check the required surface or feature, not one indicator point.
- Use comparable temperature and conditioning.
- Keep actual readings separate from the suspected cause.

A single indicator reading is not a full flatness assessment. Agree coverage, fixturing and acceptance before judging the result.

NIST: temperature effects in dimensional measurement (temperature section only)

Illustrative comparison, not a measured part. Bow is exaggerated; no predicted distortion or pass/fail result. Drawing and approved process requirements govern.