

Tolerances & datums

Define the functional relationship, then agree how it will be made and measured.

DESIGN INTENT Control the span that the assembly actually needs.

01 Three toleranced segments

LINEAR DIMENSION SCHEME / mm

10.00
+/-0.05

10.00
+/-0.05

10.00
+/-0.05

Derived: 30.00 +/-0.15

29.85 to 30.15 mm worst case

Worst-case overall variation: +/-0.15 mm

02 One functional span

LINEAR DIMENSION SCHEME / mm

30.00 +/-0.05

29.95 to 30.05 mm specified

Inner locations need separate controls.
Do not add conflicting duplicate dimensions.

Specified overall variation: +/-0.05 mm

WORKED EXAMPLE / mm
Worst-case chain: add absolute tolerance contributions
0.05 + 0.05 + 0.05 = +/-0.15 mm on the sum

03 Choose assembly references

Datums are references for controlling geometry. Start with how the part seats, locates and clocks in its assembly.

CAD: select accessible functional datum features.

04 Make the feature measurable

A probe or gauge needs access. Discuss critical features and inspection fixturing early; a tolerance needs a suitable measurement method.

CAD: leave access to the controlled feature.

05 Put precision where it matters

Identify sealing, sliding, bearing and alignment interfaces. Blanket tight tolerances add work without necessarily helping function.

CAD: apply tight controls locally where needed.

06 Define when size must be met

Coating, heat treatment and temperature can change size or form. The inspection condition belongs in the definition of the part.

CAD: state pre-process versus final dimensions.

WHAT THIS DOES NOT PROVE
Changing the dimension layout does not improve the process. The tighter direct span is a new requirement to manufacture and inspect.

- BEFORE RELEASE** Protect fit, loads, sealing and required material sections when changing geometry.
- ☐ Identify function-critical interfaces.

☐ Define and order required datum references.

☐ Confirm access for the proposed inspection method.
- ☐ Check the complete tolerance stack.

☐ Avoid conflicting duplicate dimensions.

☐ State final condition and applicable standard.