Tolerance and Why ±1/32" Matters

> "Measure twice, cut once"

What Is Tolerance?

Tolerance defines how far a part can deviate from its intended dimension while still working correctly.

Example:

- 10.000" ± 1/32"
- This means the part can be slightly larger or smaller and still be acceptable

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Why ±1/32" Matters in FRC

A tolerance of **1/32 inch (0.031")** may seem small, but in robotics it can:

- Prevent holes from lining up correctly
- Cause shafts or bearings to bind
- Create misalignment in drivetrains or elevators
- Stack into larger errors across assemblies

Small errors add up when multiple parts depend on each other.

When Tight Tolerances Are Needed

Tight tolerances (like ±1/32") are important when:

- Aligning bearing holes
- Mounting shafts or gears
- Building drivetrain frames
- Connecting pre-cut or CAD-matched parts

When Loose Tolerances Are Acceptable

Looser tolerances are acceptable when:

- Mounting non-critical brackets
- Creating sensor mounts with adjustment
- Working with slots or oversized holes
- Designing parts that need adjustability

Best Practice

- Measure twice before cutting or drilling
- Use the same datum for all features
- Center punch hole locations before drilling
- Drill pilot holes before final sizing when precision is critical

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Key Idea

Tolerance is not just a number—it is what determines whether parts fit together correctly or create assembly problems. In FRC, ±1/32" can be the difference between a smooth assembly and a misaligned mechanism.

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