

Process Capability

Mechanical Engineering

Cp and Cpk, what each one counts, and why only one of them is honest.

Capability compares the tolerance width with the process spread, and Cpk also accounts for centring.

$$\text{Cp} = (\text{USL} - \text{LSL}) \div 6\sigma \cdot \text{Cpk} = \text{nearest gap} \div 3\sigma$$

Tolerance ± 0.1 , $\sigma = 0.02$

Cp = 1.67

$0.2 \div 0.12$.

Mean drifts 0.04 off

Cpk falls to 1.0

$0.06 \div 0.06$.

Cpk = 1.33

About 63 parts per million

Common target.

THE COMMON MISTAKE

✗ **Reporting Cp on an off-centre process**

✓ **Cp is only the best you could do**

Cp ignores where the mean sits. A process can show Cp = 2 and still make scrap if it is centred hard against one limit. Cpk is the honest number.

Both assume a stable, roughly normal process. Check a control chart for stability before quoting either.