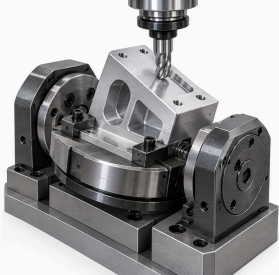


# 3-axis vs 5-axis: choose the machining route

Compare fixed-axis, indexed 3+2 and simultaneous 5-axis milling by access, orientation and total process needs.

|                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <div>01</div> <div>3-axis</div> <div></div> <div><b>FIXED ORIENTATION</b><br/>X, Y and Z motion; the tool axis stays fixed relative to the part during a setup.<br/><b>Consider for:</b> Accessible pockets, holes, plates and many 3D contours.<br/><br/>Other faces may need re-fixturing. A curved surface alone does not require 5-axis.</div> | <div>02</div> <div>Indexed 3+2</div> <div></div> <div><b>POSITION, THEN CUT</b><br/>Two rotary axes orient the part or tool, then stay fixed during each 3-axis cutting operation.<br/><b>Consider for:</b> Angled holes, multiple faces and fixed-angle access.<br/><br/>Can reduce re-clamping. Verify the fixture, rotation envelope and every approach.</div> | <div>03</div> <div>Simultaneous 5-axis</div> <div></div> <div><b>ORIENT WHILE CUTTING</b><br/>Linear and rotary axes coordinate; tool orientation can change along the cutting path.<br/><b>Consider for:</b> Selected sculpted surfaces, blade passages and changing tool-angle needs.<br/><br/>Requires suitable CAM, postprocessor, machine kinematics and collision verification.</div> |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

## Start with the feature, not the machine label

|                                                                                 |                                                                                                          |
|---------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------|
| <div>1</div> <div>Can the feature be reached from a fixed tool direction?</div> | <b>YES: evaluate 3-axis for that feature.</b><br>NO: review another orientation or process.              |
| <div>2</div> <div>Do a few fixed angles provide the necessary access?</div>     | <b>YES: compare indexed 3+2 with separate setups.</b><br>Check grip, datums and tool/holder clearance.   |
| <div>3</div> <div>Must the tool angle change during the cut?</div>              | <b>YES: evaluate simultaneous 5-axis.</b><br>If access still fails, redesign or discuss another process. |

Review every feature. One part can use several modes; the gripping face may still need a second operation.

## Four checks that apply to every route

|                                                                                                                     |                                                                                                               |                                                                                                            |                                                                                                                         |
|---------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------|
| <b>Tight tolerances</b><br>Axis count is not an accuracy rating. Review datums, machine capability and measurement. | <b>Thin walls</b><br>Support, clamp force and cutting load still govern. Extra axes do not make a wall rigid. | <b>Deep features</b><br>Tilting may shorten reach only if the holder, fixture and surrounding walls clear. | <b>Cost &amp; lead time</b><br>Compare setup, programming, cycle, inspection and quantity. No route is always cheapest. |
|---------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------|

**Bring to the machining review**  
Revision-matched model & drawing / material & condition / quantity / critical interfaces & datums / finish / inspection & delivery needs

Illustrative machining scenes, not verified setups. Static views do not show motion. No capability, price or lead-time guarantee.