

ESPRIT ProfitMilling

High-Speed Machining

High-Speed Machining with ESPRIT's patented ProfitMilling® cycles for 2.5-, 3-, 4- and 5-axis roughing significantly reduces cycle times and dramatically increases tool life.

The ProfitMilling strategy combines optimized, high-speed toolpath patterns, chip thinning with light radial engagements and full depths of cut, and dynamically optimized feedrates to maintain consistent chip loads and minimized cutting forces throughout the cut. This results in increased productivity and reduced operating costs.

When compared to conventional machining, ProfitMilling can deliver:

- 75% cycle-time reduction
- 500% increase in tool life

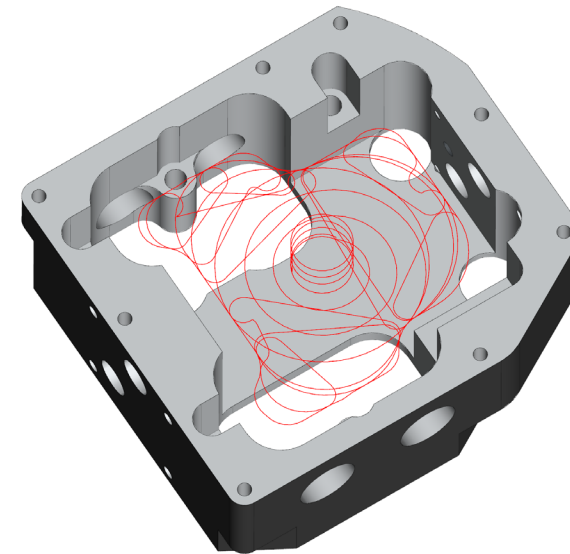
How It Works

The ProfitMilling cycle's dramatic improvements in cycle time and tool life are the result of a patented method of cycle optimization that produces consistent chip loads and reduced cutting forces. The optimized, high-speed toolpath patterns reduce the need for rapid machine accelerations and abrupt changes in direction which would otherwise negatively affect chip loads and increase cutting forces. A chip thinning technique cuts at full axial depth and reduced radial width, allowing significantly higher feedrates. To maintain the programmed chip load throughout the cut, the ProfitMilling cycle dynamically adapts the actual feedrate to account for the geometry and toolpath variances. Offset, spiraling, and trochoidal motions reduce the need for rapid machine acceleration/deceleration, increasing the overall velocity; therefore, the programmed feedrate is easier for the CNC to attain and overall material removal rates are maximized.

- Optimized high-speed toolpath patterns
- Chip thinning with light radial engagement and a full depth of cut
- Dynamic feed rates to compensate for geometric and toolpath variances
- Spiraling to open cavities for fast chip evacuation
- Trochoidal motions to open channels and slots
- Offsets of part boundary when machining "open" zones
- Inverted bottom-up strategy for pocketing and Z-level roughing

ProfitMilling Benefits

ProfitMilling is a universal high-speed roughing cycle for 2-5 axis milling that requires no extra investments in specialized cutting tools, workholding, spindles, or machines. This cycle is designed to reduce loads on CNC machines, drives, and spindles, therefore it can even be used on light-duty machines. ProfitMilling is proven to work exceptionally well on most materials, with added value in Inconel, titanium, and others where the chip is hard to break. The combination of optimized toolpaths cutting at full depth with reduced radial engagement results in improved cutting performance and shorter cycle times. These techniques also transfer more heat to the chip instead of the tool and the workpiece, reducing the temperature at the cutting zone to extend tool life.



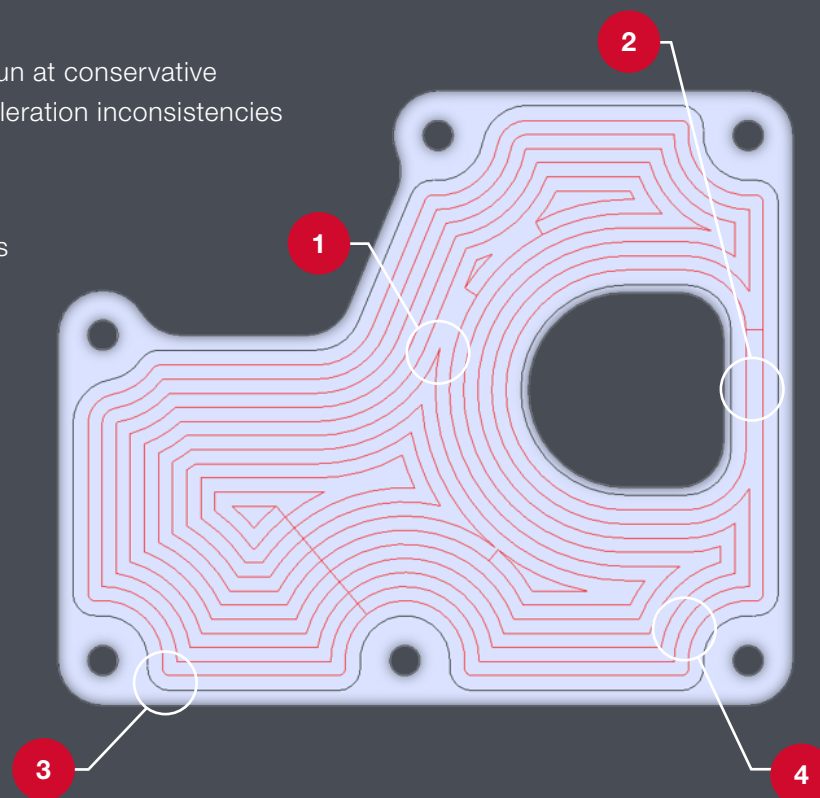
- High-speed machining for 2.5-, 3-, 4-, and 5-axis roughing
- Productivity improvements even with light- and medium-duty machine tools
- Works exceptionally well with most materials
- Reduced temperatures for longer tool life and improved surface quality
- 75% cycle-time reduction
- 500% increase in tool life

CONVENTIONAL VS. PROFITMILLING

Conventional Roughing

Cycle times are longer because machines must run at conservative cutting speeds to account for chip load and acceleration inconsistencies common to conventional roughing toolpath.

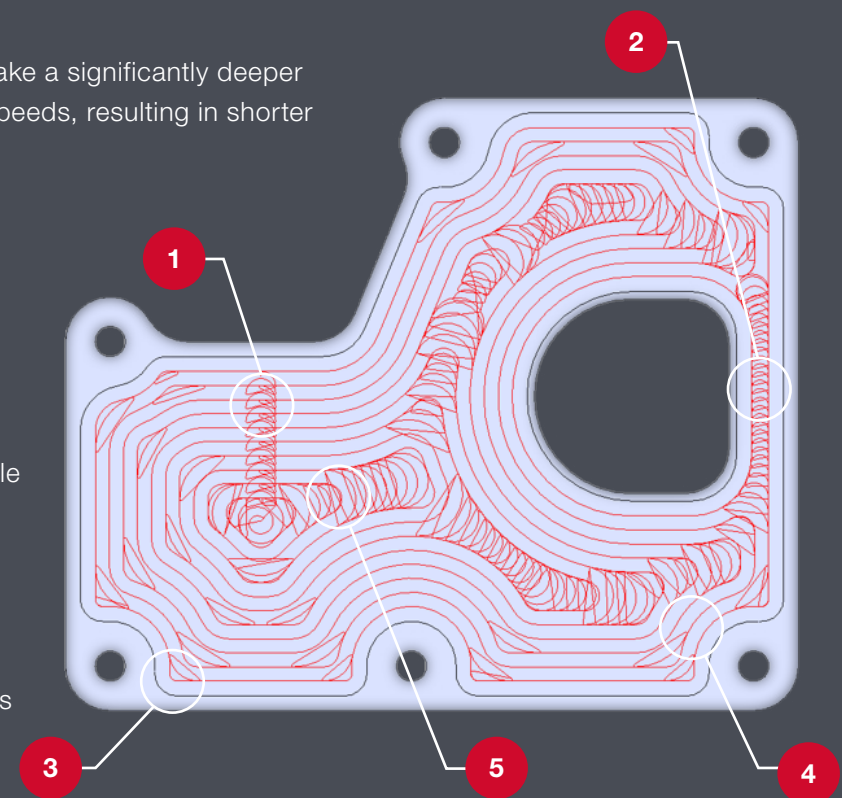
1. Sharp corners result in high cutting forces and acceleration rates, and "jerks"
2. Full-width slotting overloads the cutter
3. Varying high tool-engagement angles increase chiploads
4. Constant centerline feedrates result in varying chip loads
5. Cutting at multiple incremental depths increases cycle times



Roughing with ProfitMilling

A high-speed roughing cycle that allows you to take a significantly deeper cut while also drastically increasing the cutting speeds, resulting in shorter cycle time and longer tool life.

1. Smooth toolpath patterns with blended transitions
2. Trochoidal slotting strategy for a constant chip load
3. Corner picking to eliminate chatter and provide a constant tool-engagement angle
4. Dynamically optimized feedrate during the cut
5. Optimized transitional moves with small Z lifts to reduce tool drag
6. Cutting at full depth reduces or eliminates multiple incremental depth passes



ProfitMilling



Using ProfitMilling

- Double or triple tool-manufacture recommended feed, speed and surface speed in MMPT or IPT. Adjust to specific tool wear and performance needs.
- For steel, titanium and other hard metals, use a radial engagement between 27 – 37%. For softer materials, use a radial engagement just under 90%. Most parts can be cut at a depth of two times the tool diameter.
- Whenever possible, use tools with a high flute count. Coolant is generally discouraged as it can increase thermal shock on the cutting edge. The ProfitMilling toolpath puts most of the generated heat into the chip and away from the part and tool. High pressure air may help with chip evacuation.
- Check your machine's control settings. The geometry "look-ahead" or corner-control setting may adversely affect cycle times. Ensure that the programmed feedrates are being attained.

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High-Performance CNC Programming

Using the ESPRIT Digital Machine: Machine skin models, controller emulators, machine parameters, and post processors, ESPRIT delivers powerful programming, accurate simulation, and edit-free, machine-optimized G-code. The ESPRIT CAM system is backed by world-class technical support to get the job started quickly and to keep it running at top efficiency.