ESPRIT FreeForm 3-Axis

ESPRIT offers a powerful suite of 3-axis machining cycles for roughing, prefinishing, finishing, and remachining of complex freeform parts. ESPRIT SolidMill FreeForm™ is extensively used by customers in mold and die, tool making, discrete parts, and model-making markets.

Each of ESPRIT's 3-axis machining cycles are optimized for machining 3D models that may include surfaces, solids, and STL geometry. With ESPRIT's Modeless Programming™, the FreeForm cycles may be used on any configuration of mill, lathe, mill-turn, and Swiss-style machine. These 3-axis cycles may also be combined within any other ESPRIT cycle to create one complete part program for the entire part.

FreeForm

Dynamic Stock-Aware Toolpath

ESPRIT's FreeForm milling cycles are dynamically optimized based on the real-time state of the stock, cutting tool, tool holder, workpiece setup, and machine tool, resulting in minimizing repositioning, eliminating air cutting, and providing collision-free machining. This allows for programs with shorter cycle times that are safe to run on the machine.

- Roughing and reroughing optimized to remaining stock in real time
- Immediate visualization of the machining result
- Autotilt uses 3+2 for reach into deep pockets
- Multithreading, GPUs, and background calculation for maximum performance

Simulation and Verification

See exactly what will happen at the machine before a single chip is ever cut. View the entire machining environment, including stock materials, fixtures, and clamps in dynamic, solid-shaded graphics. All the kinematic action of the machine is displayed in real time, providing an incredibly accurate verification of the entire machining process. Using ESPRIT's built-in part inspection, the original "as-designed" part can be compared to the "as-machined" workpiece to ensure part accuracy.

- Analysis provides a detailed view of the toolpath
- Comparison offers a color map of remaining stock
- Simulation provides an animated view of the entire machining process
- Analytics provide views of potential collisions, axes overtravel, acceleration exceptions
- Minimum required tool length calculation allows for tool optimization

Adaptive High-Speed Machining

High-speed machining (HSM) functionality is built into all of ESPRIT's FreeForm machining cycles for shorter cycle times and longer tool life. ESPRIT's patented ProfitMilling® allows for the removal of more material in less time by maintaining a consistent cutter load throughout the machining process. The FreeForm cycles provide for the capacity to cut hardened materials in minimal time by utilizing the smooth, continuous movements so critical in 3D HSM.

ESPRIT's Adaptive cycles may be used with a 3+2 strategy, whereby a fourth or fifth axis orients the workpiece prior to machining. This results in the ability to use shorter, more rigid tooling, which has a significant impact on reducing cycle times and improving surface finishes. Additionally, the 3D FreeForm cycles support Rotary Machining, which is the use of rotary axes, used to overcome overtravel conditions that would otherwise be encountered due to exceeding the machine's travel limits.

High-Performance Roughing

ESPRIT's roughing cycles will machine workpieces down to a near net shape using the highest possible material removal rates, resulting in the shortest cycle times. ESPRIT's ProfitMilling strategy does this by maintaining a consistent tool engagement angle, chip load, lateral cutter force, and machine acceleration to achieve optimal results.
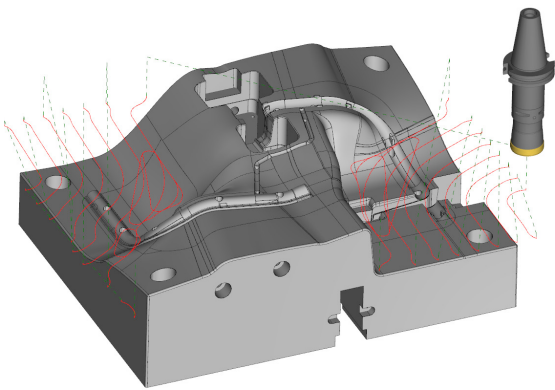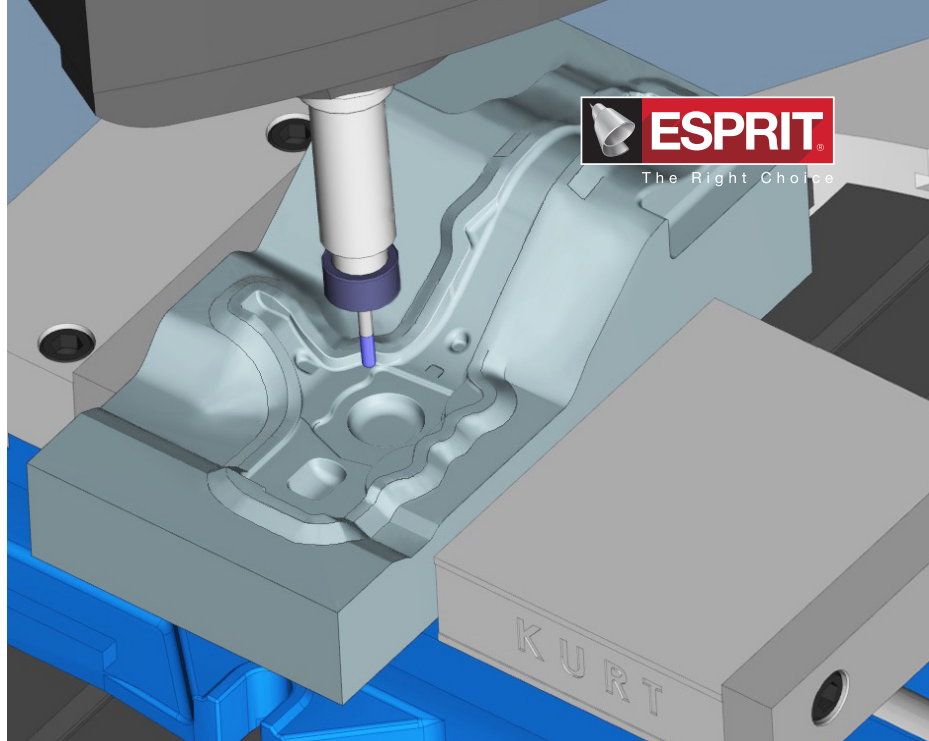

Prefinishing

Following roughing, ESPRIT has a variety of prefinishing cycles available to ensure the varying surfaces of the workpiece all have the exact required stock allowance. As a result, the finishing tool(s) have a constant volume of material to remove, which results in maximizing tool life and optimal surface finishes.

Finishing

With the idea of superior surface finish in mind, the ability to select from a wide range of ESPRIT finishing strategies guarantees that a suitable strategy will be found for any surface. Select from nine different finishing cycles to machine the workpiece — use one cycle for finishing the entire part or define containment boundaries to machine zones differently using the most appropriate cutting styles for each.
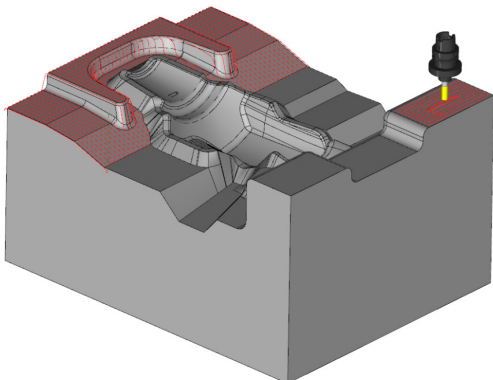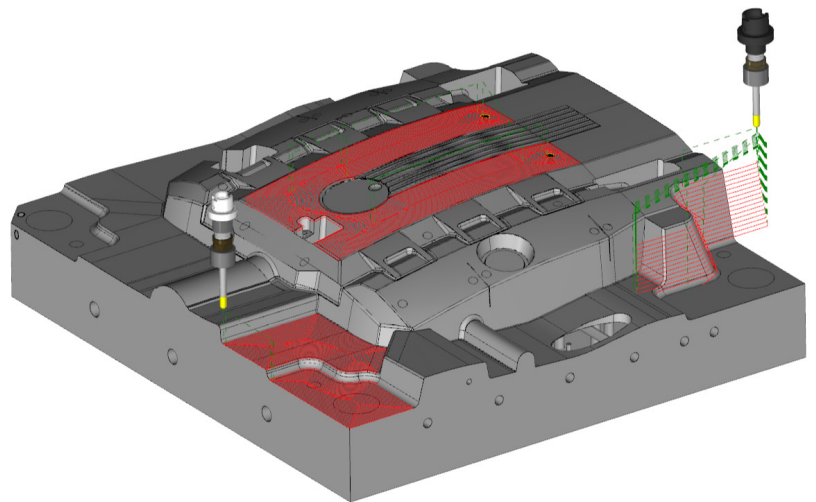
Remachining

Maximize part quality and minimize bench work by remachining areas where the nose radius of the finish cutter could not follow the surface. ESPRIT's remachining cycles automatically calculate where material remains from larger cutters and creates toolpaths for a smaller cutter to finish just these areas. Remove material in tight places without the risk of tool breakage with strategies for vertical corners, horizontal corners, and pencil tracing.

FreeForm

ESPRIT
The Right Choice

3D Contouring: milling along the workpiece guided by one or more 3D curves

Between Curves Finishing: morphed, parallel, or perpendicular between two curves

Concentric Finishing: following an offset of the part boundary or a set of curves

Corner Remachining: removes excess material in tight corners that the previous, larger tools did not cut

Floor Finishing: use in combination with Z-Level Finishing to ensure excellent finishes on all zones of the workpiece

Global Finishing: combines Z-level Finishing for steep areas and Concentric Finishing for shallow areas

Parallel Planes: roughing or finishing for vertical, sloped, or horizontal areas

Parametric Finishing: following the parametric flow lines of a selected face on the part

Pencil Tracing: for finishing internal corners

Radial Cycle: roughing or finishing with the cutter radiating outward from a center point

Spiral Cycle: a continuous outward spiral pattern for roughing or finishing

Z-Level Finishing: machine the entire part or selected areas using up to two tools

Z-Level Roughing: maintains constant loads on the cutters for smooth, high-speed toolpaths

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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.