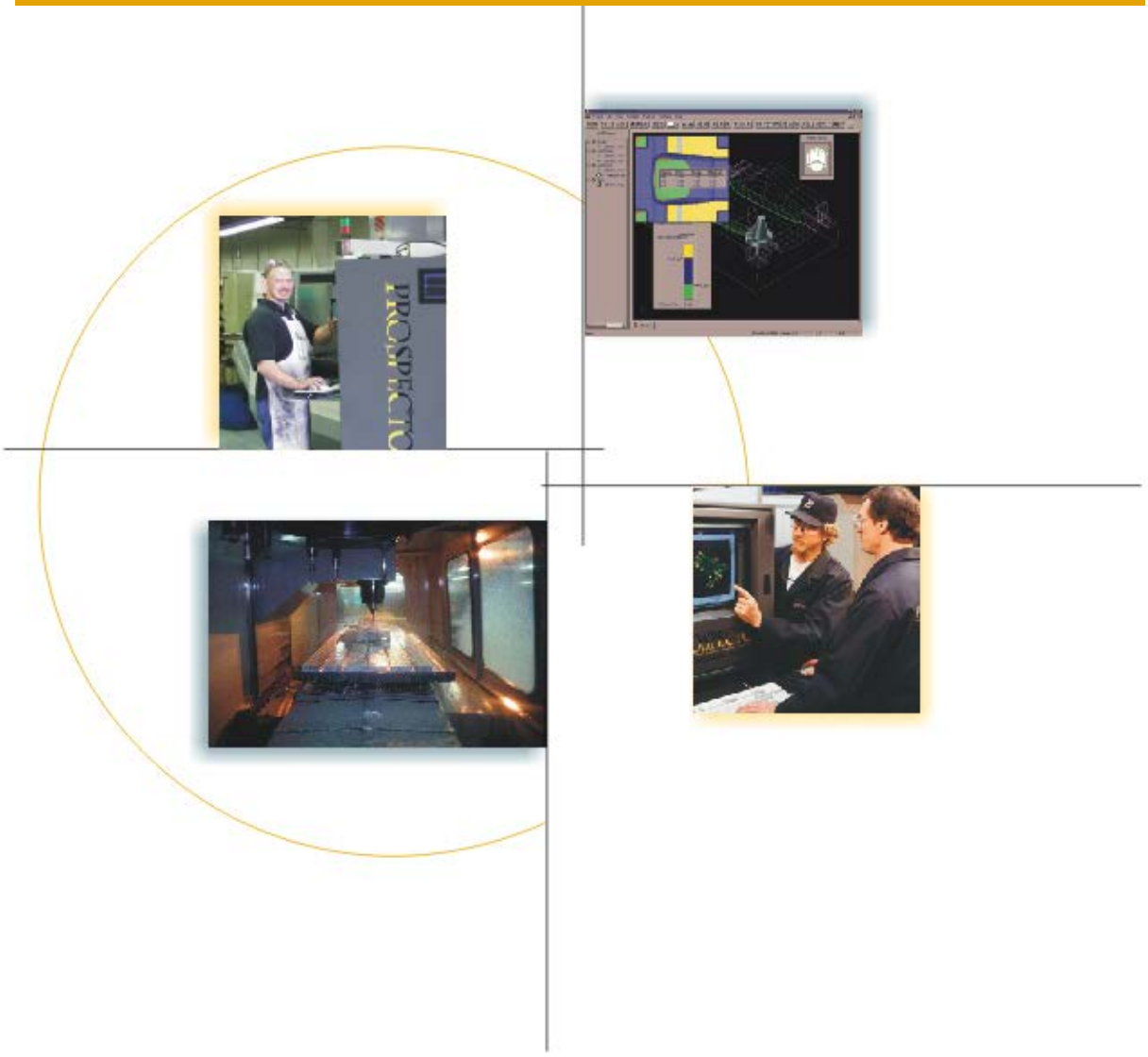
PROSPECTOR
THE GOLD STANDARD IN MOLDMAKING

with powersource TECHNOLOGY

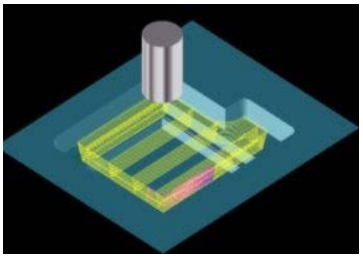
Machining Capabilities: An Overview

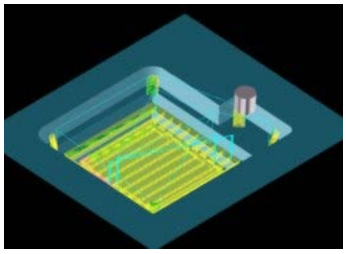


3D Rough Remachining

High Efficiency Roughing

Rough remachining automatically generates a series of efficient programs to fully rough any job. It does this by precisely comparing where the current rouging tool can machine against the areas that all previous roughing programs have machined. It then chooses only those paths or portions of paths where the previous program(s) did not already machine.





Rough Remachining Benefits

More efficient programs. Precise calculations determine exactly where smaller cutters should machine to remove material left behind by the preceding larger cutters. This ensures that machine time is never wasted cutting in areas that don't need to be machined. This precise knowledge of remaining stock also ensures that every area that requires machining is machined. It's simply not possible to miss an area of the job.

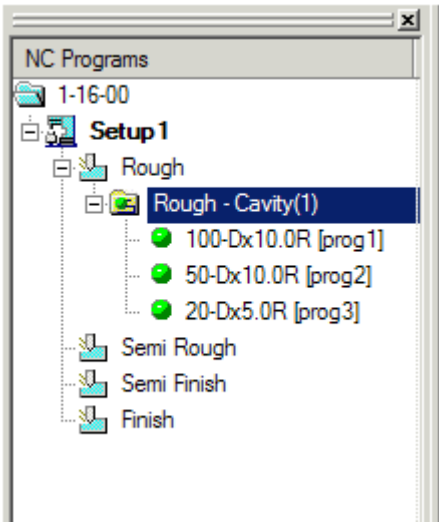
Easier to program. Because remachining is automatic, there is no need for the operator to create multiple programs using conventional programming techniques. All parameters for all the programs are configured according to established rules and standards. This minimizes the effort required to produce proper roughing programs and dramatically reduces the possibility of human error.

Consistent results. Regardless of whether a veteran or less experienced machinist programs the job, the results will be the same. The rules and standards for roughing are stored in Prospector's PowerSource database. This information directs Prospector to create the proper series of programs and parameters for every job every time.

Machining Sequences

Machining sequences are definitions of the sequence of programs required to rough a job. Any number of different sequences may be defined to address various situations. For example, the programs and parameters to rough jobs with very deep cavity areas versus shallow jobs would warrant the definition of a machining sequence for each. Larger jobs would probably call for different techniques and tooling than smaller jobs. Horsepower or other restrictions of different machine tools might call for different sequences to address each machine. Roughing techniques for a certain class of tools can be captured as a machining sequence to ensure that best practices for roughing a given type of job are always used.

Any combination of Z-Planar With Clear and Z-Planar No Clear machining strategies may be used for a machining sequence. Each program will have its own rules and parameters.



Options

Configurable cusp height filter controls whether or not stair-step cusps left behind by previous programs are to be machined.

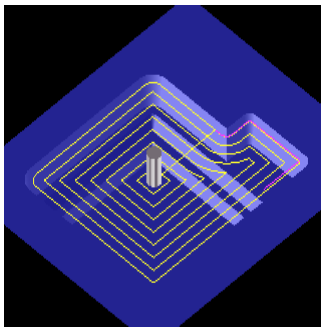
All options and features for Z-Planar With Clear and Z-Planar No Clear are available.

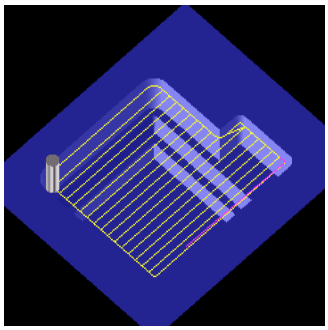
3D Z-Planar With Clear

Clearing

Zig-Zag Clearing – clears using linear scans at a specified angle. Islands can be climb-cut as they are encountered to minimize interrupted cuts. Clearing scans are ordered to minimize machine time.

Spiral Clearing - Inside Out or Outside In – clearing passes follow the natural contours of the part data. Contours are optimally ordered in groups to maximize machine efficiency.





Z-Level Transition

Contour Ramp – remain in the material cutting down to the next level at a designated angle and plunge feed rate. Minimum pocket radius control prevents the possibility of the tool bottoming out in tight pockets.

Off-the-block – start at and always return to the closest designated plunge point off the part to descend in Z to the next level. Options to contour ramp, helical ramp or avoid inaccessible cavity areas.

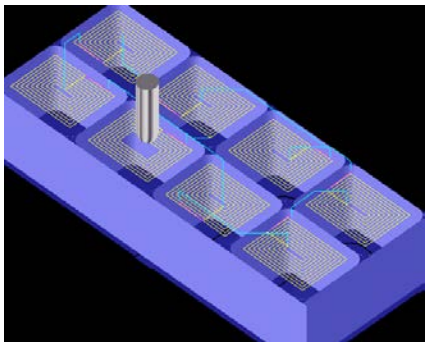
Pre-Drilled Hole – start at and return to the closest designated pre-drilled hole to descend in Z to the next level to machine. Options to contour ramp, helical ramp or avoid inaccessible cavity areas.

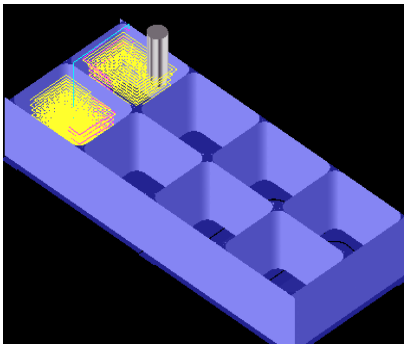
Helical Ramp – helical path machining at plunge feed down to the next level. Ramps are placed in the most optimal position for machining. Diameter of helix is automatically adjusted to allow cutter to reach tight pockets but will not go below a designated minimum diameter to prevent the tool from bottoming cutting.

Machine By-Pocket or By-Level

Machine By Pocket – completes machining each cavity area before proceeding to the next area to machine.

Machine By Level – each Z-Level is completed before descending to the next level to machine. Useful for thin-wall part conditions.

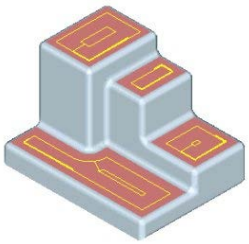


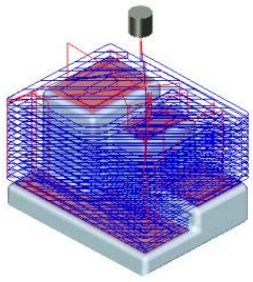


Machining Floors

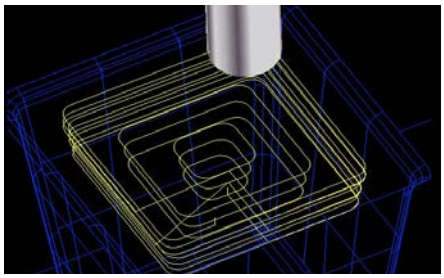
Insert Levels – levels are inserted to machine only flat areas of the job that fall in between levels.

Floors Only – only flat areas of the job are machined.





Smooth Interior Corners



This high speed machining technique inserts blends of a specified radius when sharp interior corner conditions are encountered. This is useful to improve machine performance because the machine does not need to decelerate to a full stop to change direction. Wear on inserts is reduced and the machine runs smoother.

Features & Options

Variable step down for a shallower depth of cut to minimize tool deflection at lower levels.

Separate feed rates for cutting, ramping and retracing.

Optional retract & rapid to start of next level or retrace at the retrace feed rate.

Quick Start generates initial levels of the job while processing continues for lower levels.

Climb or Conventional cutting.

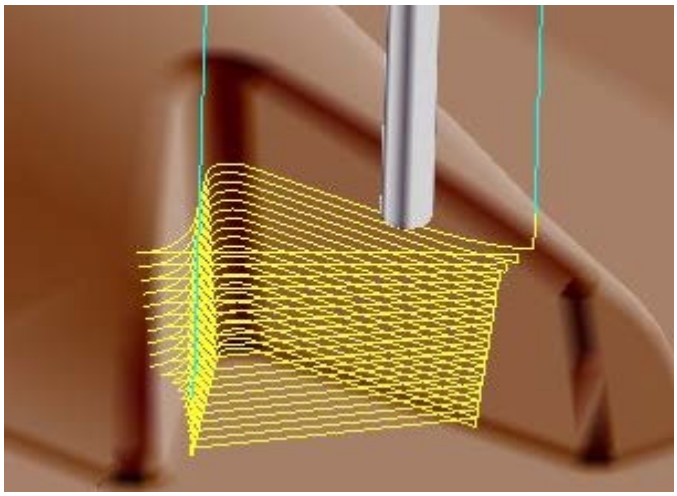
Minimum pocket size to prevent tool from bottoming out when ramping to lower levels.

Quick Rough option for faster program generation for rough machining.

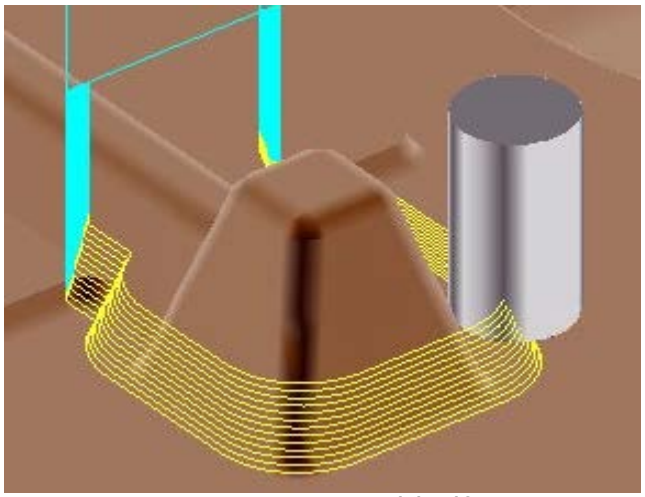
Configurable approach and retract distances to decelerate & accelerate a safe distance from material.

3D Z-Planar No Clear

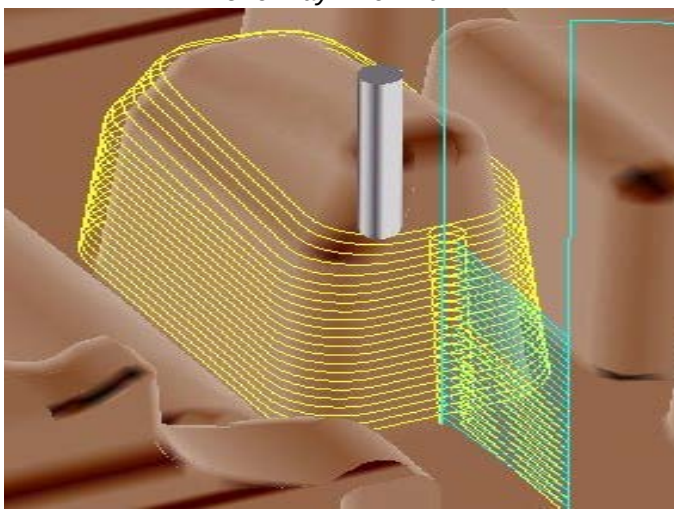
Cutting Styles



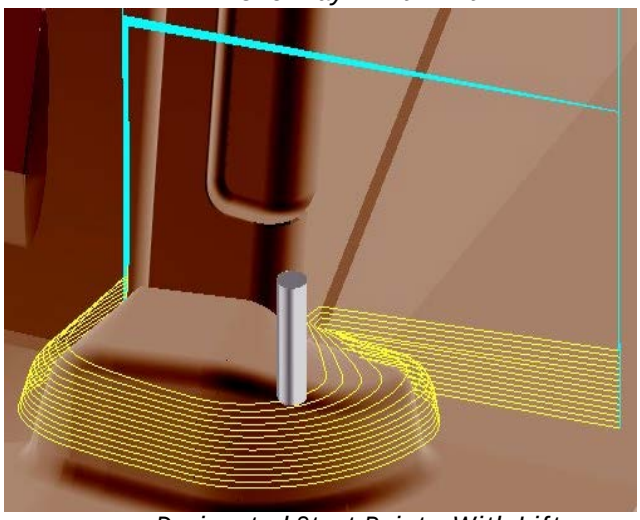
One-Way – No Lift



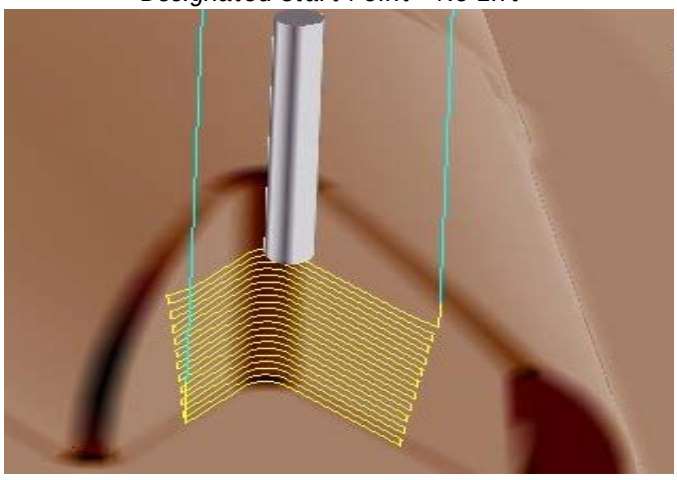
One-Way - With Lift



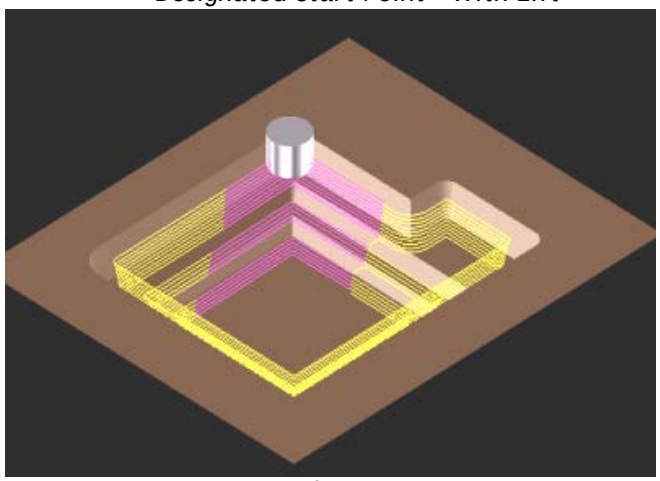
Designated Start Point – No Lift



Designated Start Point – With Lift



Zig-Zag



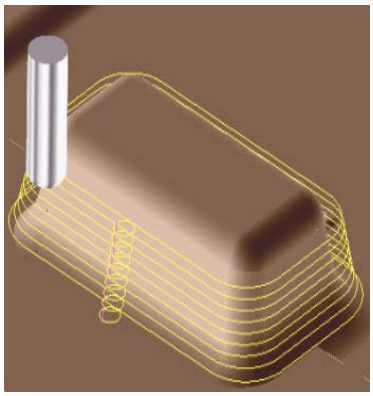
Continuous Ramp

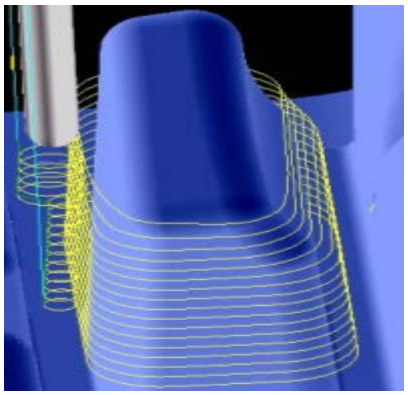
Circular Leads

Smooth lead-in and lead-out for closed and open conditions.

Variable radius automatically adjusts when needed to fit into tight areas to prevent the possibility of gouging part data.

Full control of radius, maximum and minimum sweep angle.

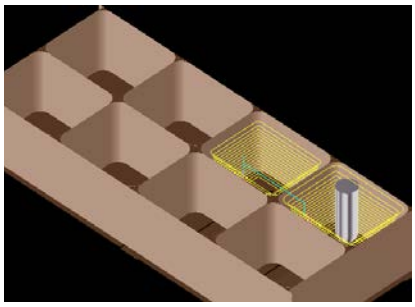


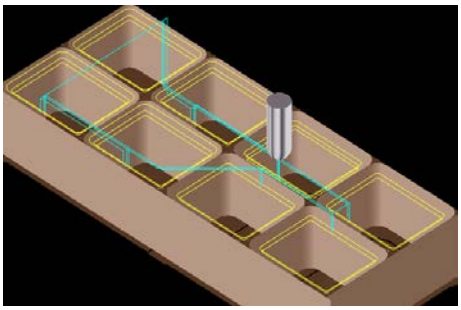


Machine By-Pocket or By-Level

Machine By Pocket – completes machining each cavity or boss feature before proceeding to the next.

Machine By Level – each Z-Level is completed for all cavity or boss features before descending to the next level to machine.

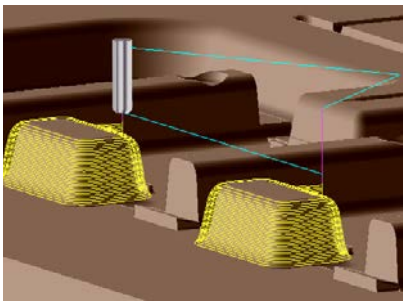


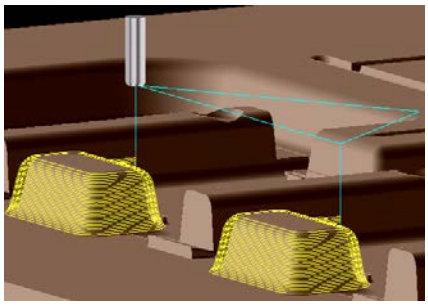


Optimized Lifts

Optimized lifts will retract the tool a safe distance to avoid collision with the part and stock when traversing from one area to another.

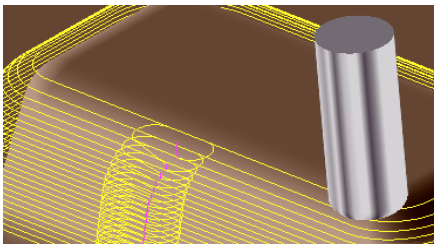
A fixed clear plane may be used instead for those wishing to take a more conservative approach at the expense of machine time.





Overlap Closed Contours

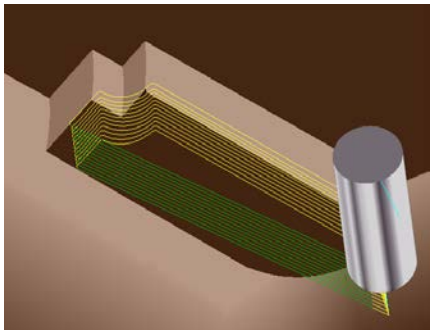
For closed boss and pocket conditions, the cutter path can be overlapped by a specified distance before descending to the next level. This eliminates the possibility of leaving a cusp at the initial contact point of the cutter with the part on each level.



Smooth Interior Corners

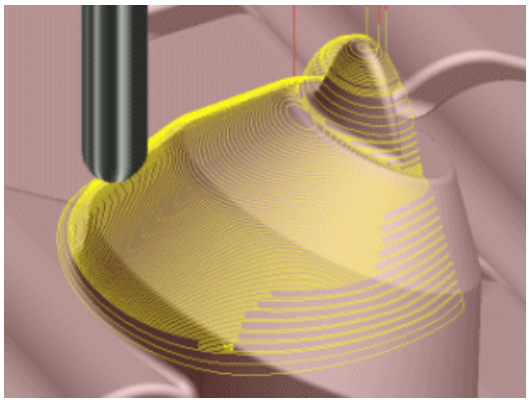
This high speed machining technique inserts blends of a specified radius when sharp interior corner conditions.

This technique is useful to improve machine performance because the machine does not need to decelerate to a full stop to change direction. Wear on inserts is reduced and the machine runs smoother.



Adaptive Step Down

This option inserts additional levels into the program for those areas that require a smaller step down in order to achieve a more consistent cusp height.



Programmable Cut Direction

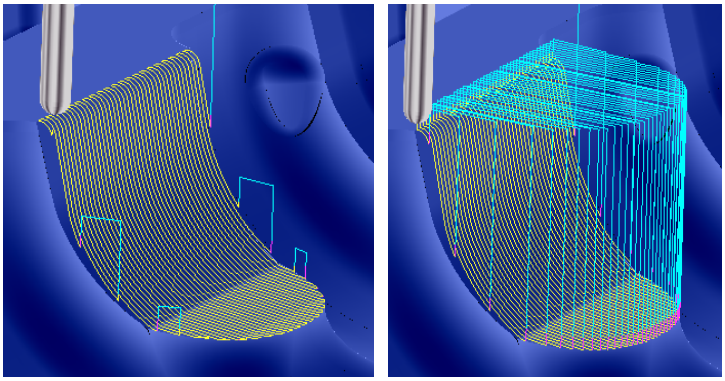
Cut in –Z direction or +Z direction.

3D Lace & Box

Cutting Styles

Lace – straight parallel cuts at a specified angle. Cuts are assembled in a zig-zag fashion such that the tool never lifts unless necessary.

Box – straight parallel cuts assembled in a one-way fashion. At the end of each cut, the cutter lifts and rapids to the start of the next scan.

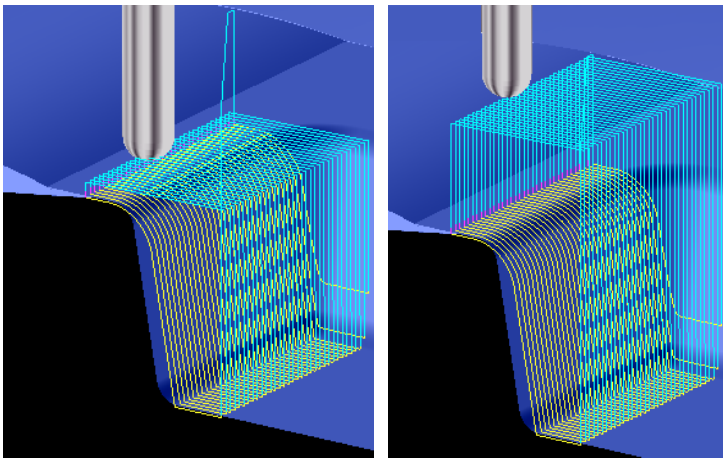


Optimized Clear Plane

Return motion at rapid to the start of the next cut will lift only as high a necessary to avoid collision with part and stock. This minimizes the machine time.

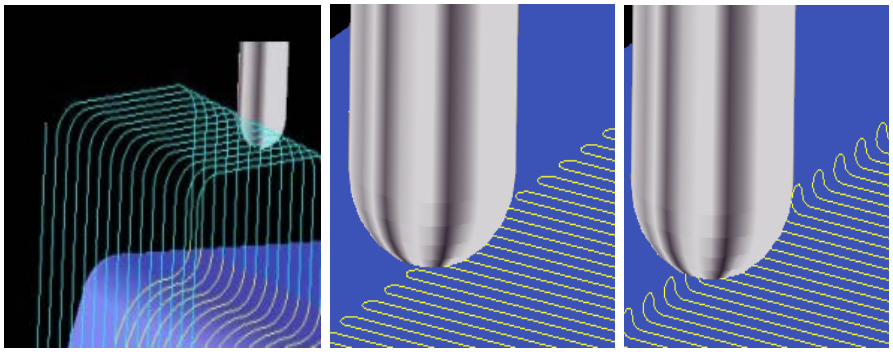
Rapid motion for lace programs are also optimized in the same manner.

A fixed clear plane may be used instead for those wishing to take a more conservative approach at the expense of machine time.

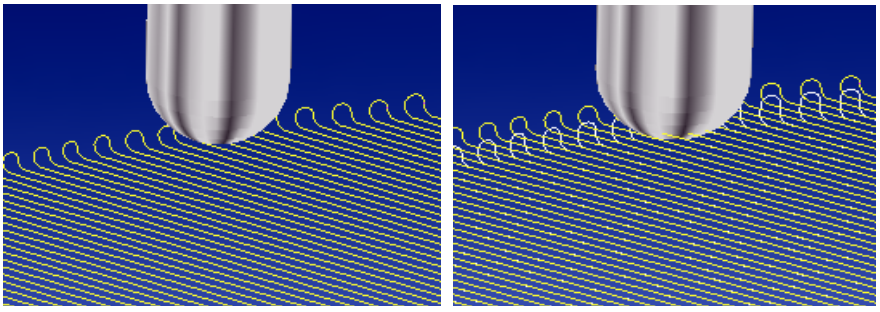


High Speed Machining Options

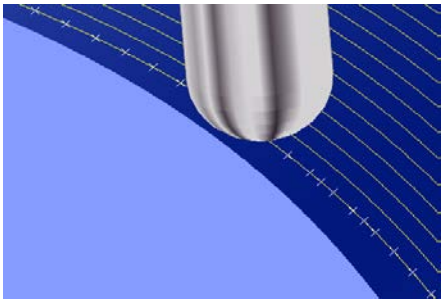
Transition Smoothing – avoiding abrupt changes in direction is a key to high speed machining. Inserting circular links eliminates sharp corners when moving to each successive scan. Circular lead-ins gently ease the tool in and out of the material at the end of each scan improving machine performance and finish. Sharp corners in the return motion for box cycle can also be smoothed.

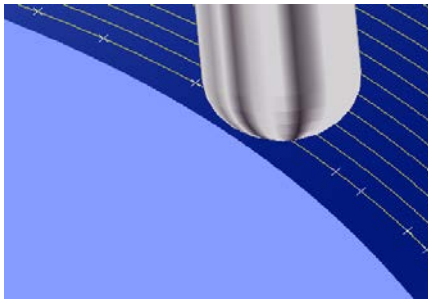


Constant Depth of Cut – constant depth of cut adjusts the height of the cutter path based on the stock condition to ensure a constant chip load is maintained.



Precision Finishing – for high speed machine tools that require additional points in the cutter path to run at maximum performance, the precision finishing option supplies the needed points without having to program at a lower tolerance.

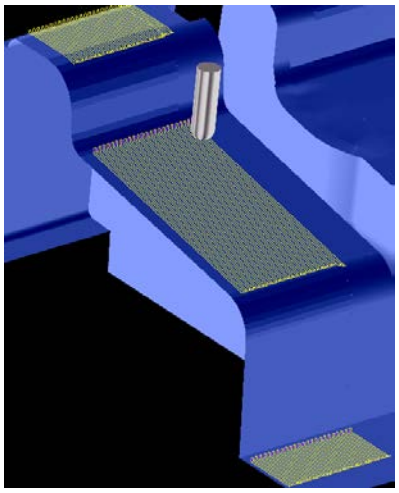


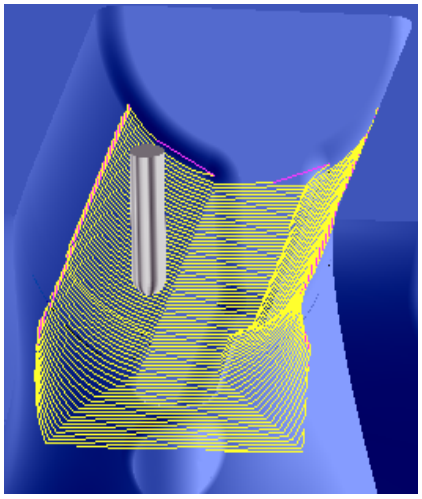


Constrain Cutter Paths

Limit by Angle – when angular change in the direction of the cut or perpendicular to the cut goes beyond a specified angle, that portion of the cut is omitted. This is useful for constraining the path to machine only on relatively flat areas.

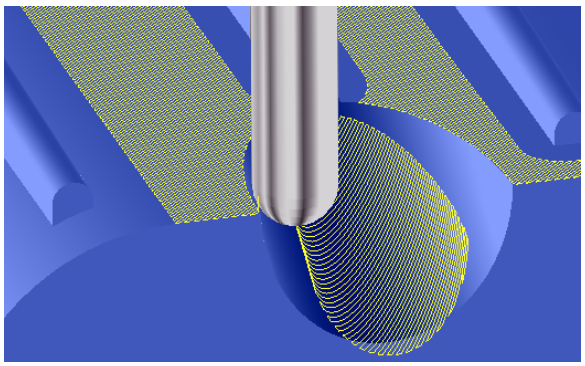
Limit by Z – cuts can be constrained to a minimum and/or maximum Z height. This is useful to prevent the cutter from machining walls or dropping into pocket areas.





Precise Cutter Contact Point Control

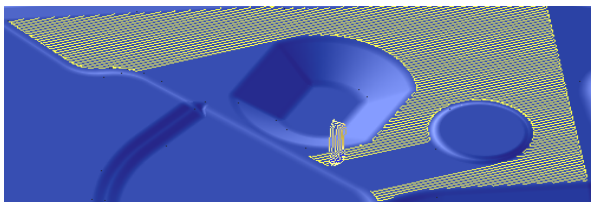
Contact point control constrains the cutter at the end of each scan such that it is exactly tangent to the part as indicated by the containment window. This feature is used in areas of the job where maintaining a sharp is critical.



Efficient Ordering and Machining of Shadow Areas

Ordering of cuts for multiple regions is optimized to save machine.

Start locations for machining shadow areas are biased to avoid full-width cuts.



Features & Options

Cutting angle and start point control.

Separate feed rate control for cutting and plunging.

Configurable approach distance to slow to plunge feed when entering material.

Configurable retract distance to exit material.

Feed or rapid distance filter to control traversal to next scan or shadow area.

3D Flow Machining

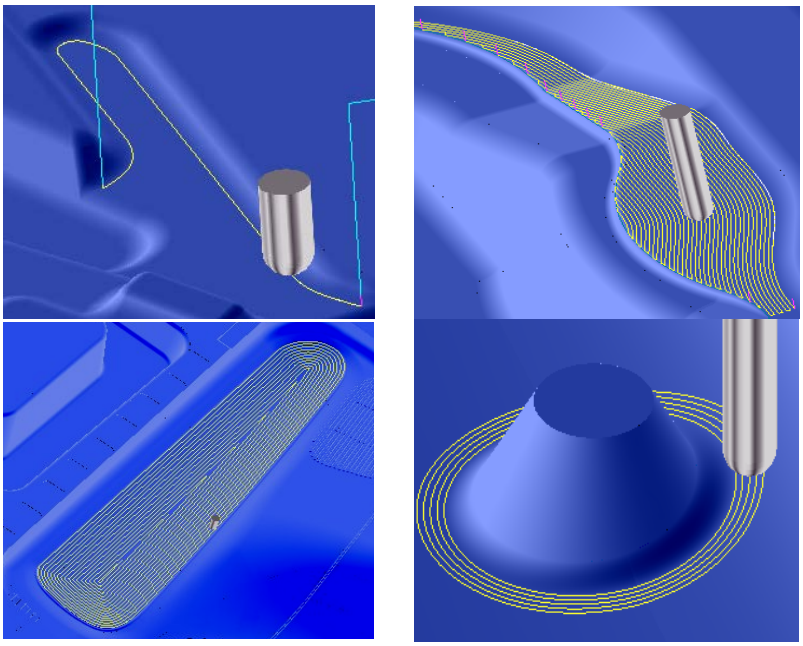
Cutting Styles

Flow machining produces on-surface cuts that follows the shape of one or more designated curves.

Primary Curve - on-surface cut follows the shape and direction of the primary curve.

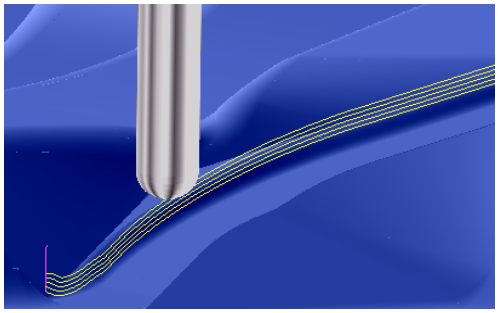
Primary & Secondary Curve – on-surface cut follows the shape and direction of the primary curve. Cuts are trimmed at the intersection with the secondary curve.

Closed Curve – on-surface cuts generated by multiple offsets at a specified step-over.



Stepping the Cutter Down Into Stock

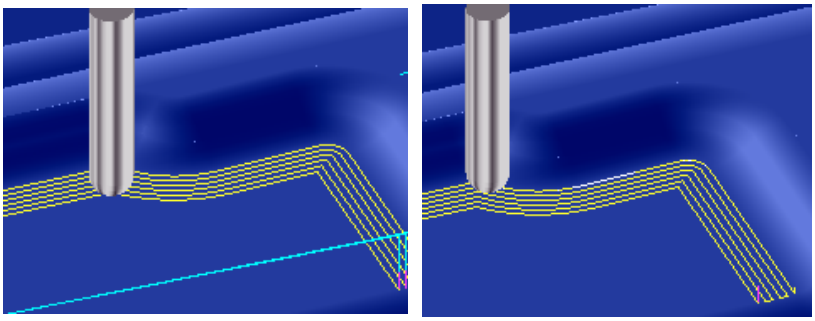
On-surface cutter path can be "ribbed-up" to allow the cutter to take multiple passes along the flow curve to safely machine in areas with a high concentration of stock.



Walking the Cutter Into the Stock

The multiple passes option uses a specified step-over suitable for the tool and stock condition to walk the cutter into areas of heavy stock.

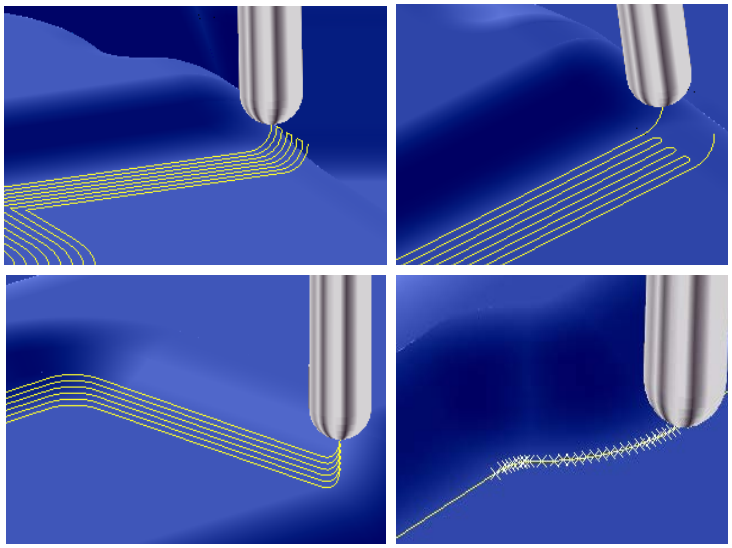
Zig-zag or one-way cutting style.



High Speed Machining Options

Transition Smoothing – avoiding abrupt changes in direction is a key to high speed machining. Circular lead-ins gently ease the tool in and out of the material at the end of each scan improving machine performance and finish. Circular links eliminates sharp corners when moving to each successive scan when using the multiple pass option to walk the cutter into heavy stock. Sharp corners in all rapid motions may be smoothed as well.

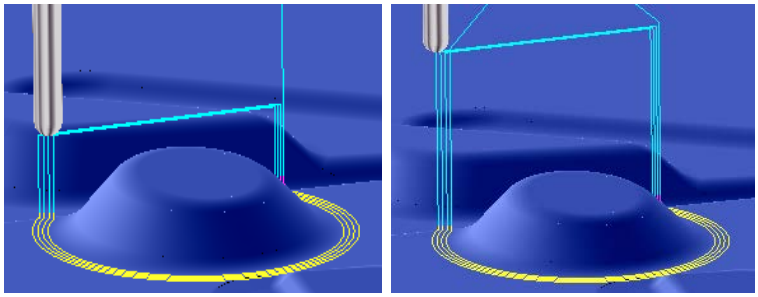
Precision Finishing – for high speed machine tools that require additional points in the cutter path to run at maximum performance, the precision finishing option supplies the needed points without having to program at a lower tolerance.



Optimized Clear Plane

Return motion at rapid to the start of the next cut will lift only as high a necessary to avoid collision with part and stock. This minimizes the machine time.

A fixed clear plane may be used instead for those wishing to take a more conservative approach at the expense of machine time.



Features & Options

Z limits to constrain cutter path from climbing walls or descending into pockets.

Separate feed rate control for cutting and initial entry into material.

Configurable approach distance to slow to plunge feed when entering material.

Configurable retract distance to exit material.

Feed or rapid distance filter to control traversal to next cut.

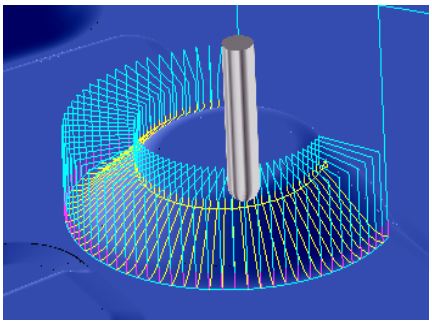
3D Radial Machining

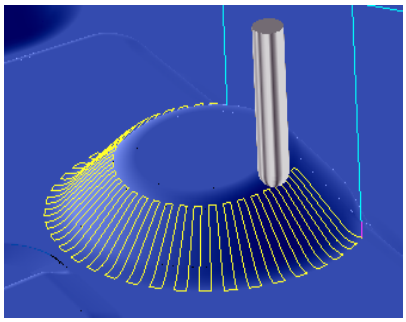
Cutting Styles

Radial machining produces on-surface cuts perpendicular to two curves.

One-Way – unidirectional cutting from the primary to secondary curve or vice-versa. Rapid motion back to the start of each cut.

Zig-Zag – bi-directional cutting. Tool stays down in the material.

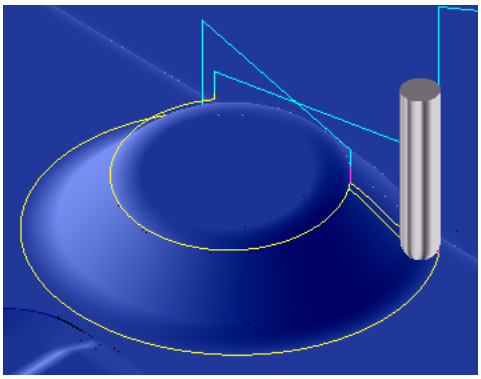




Cut Curves

Cut Curves First – both radial curves are machined first before the perpendicular cuts. This removes the stock at the top and bottom of each to come ensuring that it will not encounter heavy stock conditions at the end points.

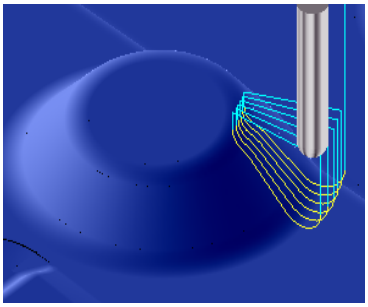
Cut Curves Last – both radial curves are machined after the perpendicular cuts. This removes any cusps at the top and/or bottom that may have formed as a result of the machining.

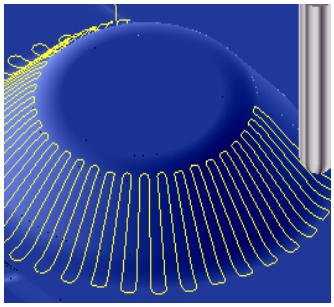


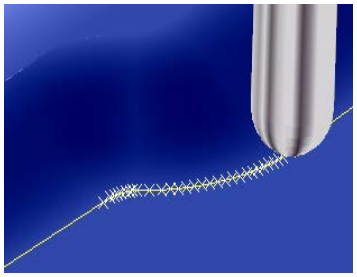
High Speed Machining Options

Transition Smoothing – avoiding abrupt changes in direction is a key to high speed machining. Circular lead-ins gently ease the tool in and out of the material at the end of each scan improving machine performance and finish. Circular links eliminates sharp corners when moving to each successive cut. Sharp corners in all rapid motions may be smoothed as well.

Precision Finishing – for high speed machine tools that require additional points in the cutter path to run at maximum performance, the precision finishing option supplies the needed points without having to program at a lower tolerance.



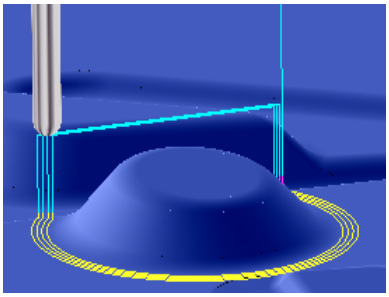


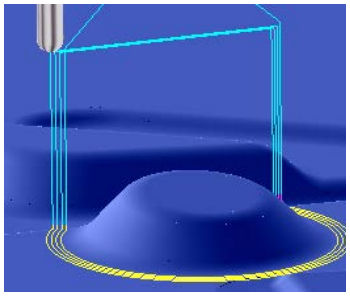


Optimized Clear Plane

Return motion at rapid to the start of the next cut will lift only as high a necessary to avoid collision with part and stock. This minimizes the machine time.

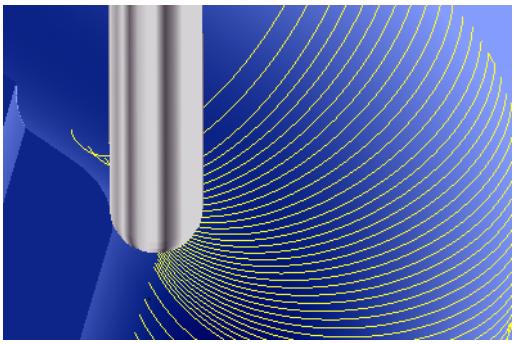
A fixed clear plane may be used instead for those wishing to take a more conservative approach at the expense of machine time.





Precise Cutter Contact Point Control

Contact point control constrains the cutter at the end of each scan such that it is exactly tangent to the part as indicated by the radial curves. This feature is used in areas of the job where maintaining a sharp is critical.



Features & Options

Z limits to constrain cutter path from climbing walls or descending into pockets.

Separate feed rate control for cutting and initial entry into material.

Configurable approach distance to slow to plunge feed when entering material.

Configurable retract distance to exit material.

Feed or rapid distance filter to control traversal to next cut.

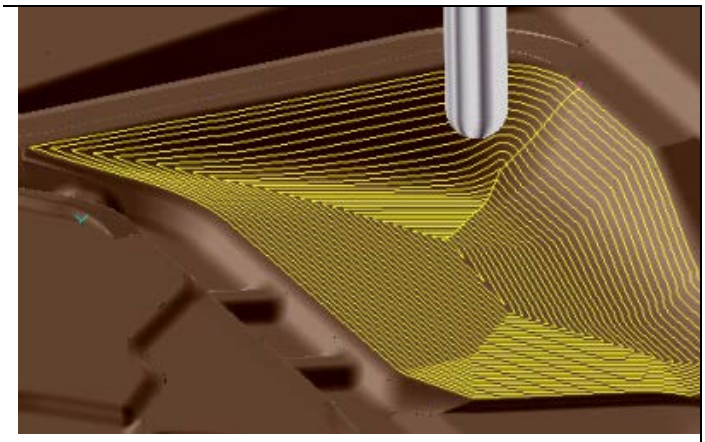
3D Contour Machining

Cutting Style

Contour machining produces on-surface cuts that follow the shape of the containment boundary. The cuts offset from each other by a specified step-over to machine the entire interior of the boundary.

Cuts may be arranged to machine from the outer boundary towards the center or to start in the center and machine outwards.

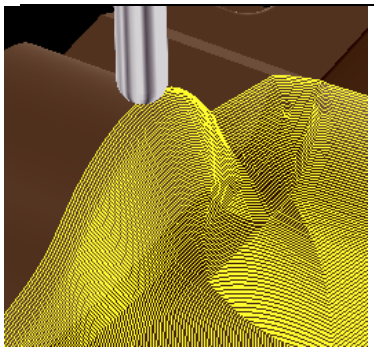
Option to control the direction of the cuts determines climb or conventional machining.

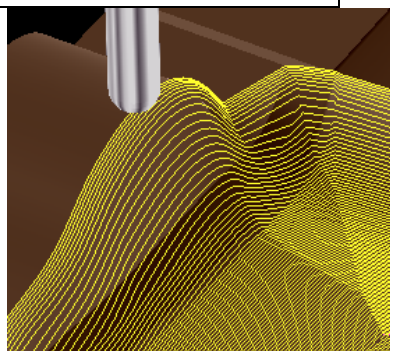


Cusp Height Control

On-Surface – step-over distances are computed on-surface offering better cusp height control to produce an excellent finish.

Constant – constant step-over provides faster cutter path generation for semi-rough and semi-finish operations where finish quality is not an issue.





Features & Options

High Speed Machining Transition Smoothing – avoiding abrupt changes in direction is a key to high speed machining. Circular leads gently ease the tool in and out of the material improving machine performance and finish.

High Speed Machining Precision Finishing – for high speed machine tools that require additional points in the cutter path to run at maximum performance, the precision finishing option supplies the needed points without having to program at a lower tolerance.

Optimized Clear Plane – when necessary to lift and traverse to another area to machine, the cutter will lift only as high a necessary to avoid collision with part and stock. This minimizes the machine time. A fixed clear plane may be used instead for those wishing to take a more conservative approach at the expense of machine time.

Separate feed rate control for cutting and initial entry into material.

Configurable approach distance to slow to plunge feed when entering material.

Configurable retract distance to exit material.

Feed or rapid distance filter to control traversal to next cut.

3D Spiral Machining

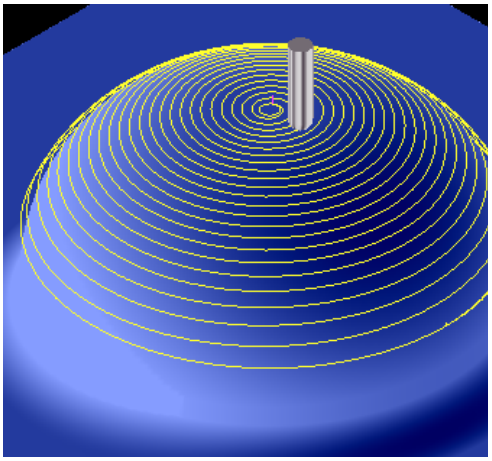
Cutting Style

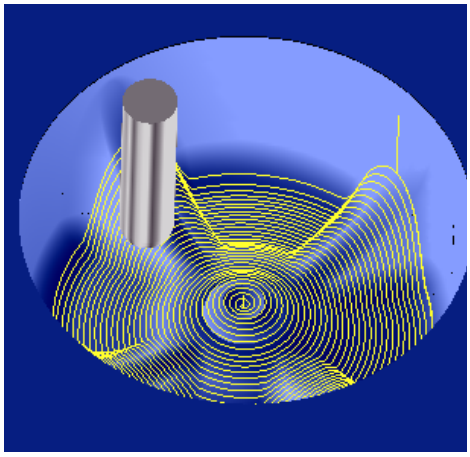
On-surface cuts forming a continuous spiral pattern.

Minimum and maximum radius controls the extents of the machining,

Option to cut from outside-in or inside-out.

Clockwise or counterclockwise cutting direction to enforce climb or conventional machining.





Features & Options

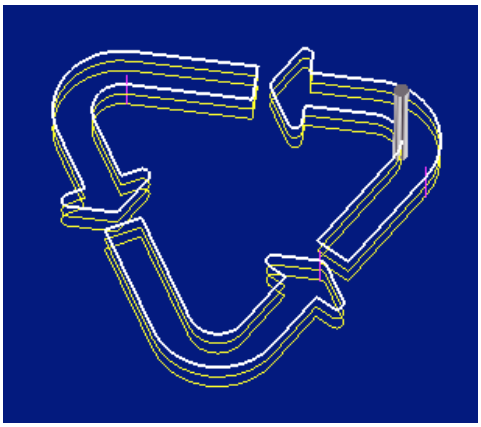
Separate feed rate control for cutting and initial entry into material.

Configurable approach distance to slow to plunge feed when entering material.

Configurable retract distance to exit material.

3D & 2D Scribe Machining

Cutting Style



Cutter centerline follows indicated scribe curves to engrave the design into the material.

Cutter descends to a specified depth. Multiple passes may be specified to machine the feature in levels separated by the indicated step-down.

One-way or zig-zag cutting option.

Cut by level or cut by curve option.

Available as a 2D and 3D strategy.

Features & Options

Separate feed rate control for cutting and initial entry into material.

Configurable approach distance to slow to plunge feed when entering material.

Configurable retract distance to exit material.

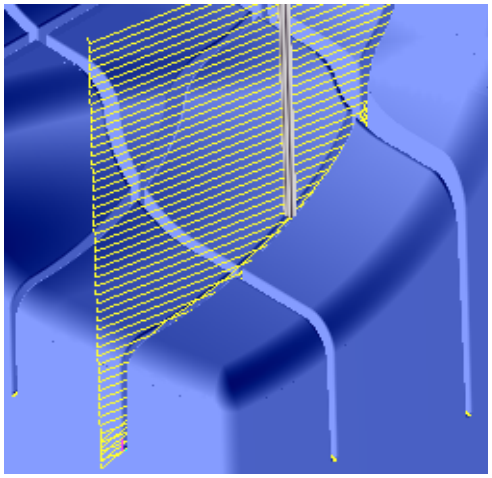
3D Rib Machining

Cutting Style

Rib machining can be a more efficient alternative than EDM methods to machine ribs and slots in a job.

Roughing - Z-level cuts are machined first to rough out rib. A starting Z and ending Z specifies the range of the roughing cuts to be made at a specified step down.

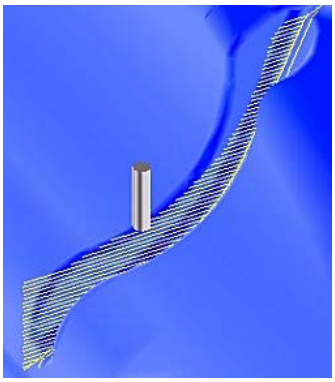
Finishing - The roughing cuts are followed by finishing passes that follow the shape of the rib. The number of finish passes and step down for the finish passes is configurable.

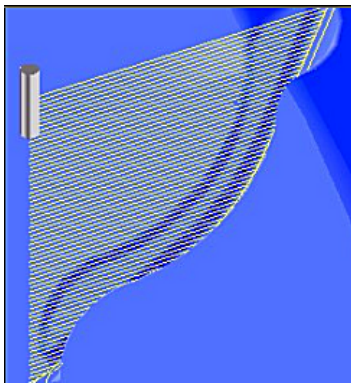


Optimized Z-Levels

Optional optimization of Z-level roughing passes trims back each roughing cut to the extent of the stock along the curve. This form of optimization is usually desirable to save machine time.

Non-optimized Z-level passes follow the length of the curve in its entirety.

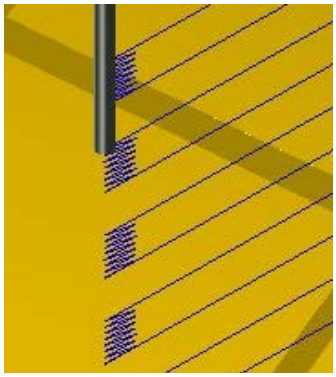




Z-Level Transition

Plunge – tool descends in Z at plunge feed rate to the next level.

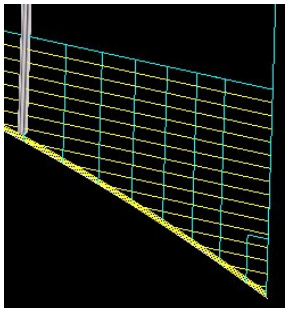
Linear Ramp - zig-zag cuts at a specified ramp angle are made at plunge feed rate to cut down to the next level.

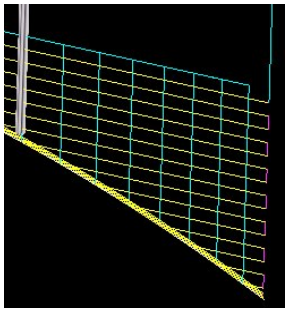


Cutting Techniques

One-Way – Z-level passes and finish passes cut in the direction of the rib curve. Rapid motion back to the start of the next cut may be optimized to lift only high enough to clear the part and stock or set to fixed clear plane for more conservative machining.

Zig-Zag – Z-levels and last passes are cut in both directions. The cutter only lifts when necessary to move to the start of the next cut.





Features & Options

Optional extension of cutter path off the part to ensure a clean cut at break-out areas.

Configurable start point along the curve.

Separate feed rate control for cutting and initial entry into material.

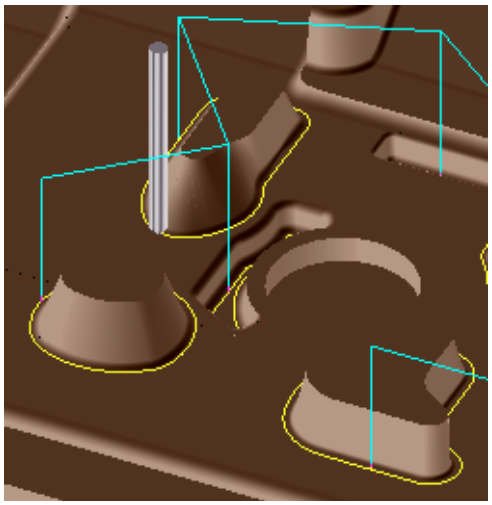
Configurable approach distance to slow to plunge feed when entering material.

Configurable retract distance to exit material.

3D Pencil Trace Machining

Cutting Style

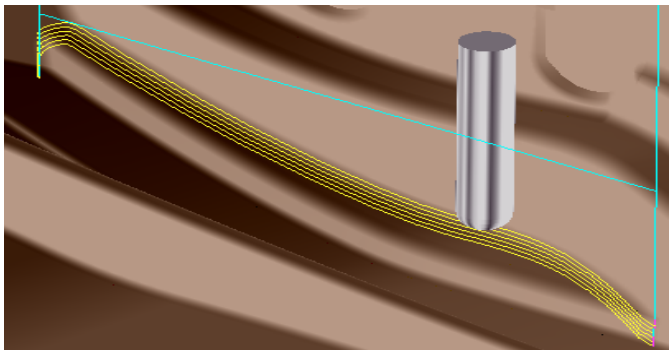
Pencil tracing is a useful machining strategy for removing excess stock in corners and valleys where the prior cutters either wouldn't fit or have left larger radii than desired. Pencil trace programs drive the tool along a path where the tool makes contact with the work on both sides of the cutter. Part conditions where this will happen are typically valleys and fillet areas that contain excess stock.



The paths for pencil trace programs are determined by the system based on tool size and area of the job to machine. Candidate paths are presented graphically for selection to become part of the program. All cuts are oriented to climb cut the part however the curves may be reversed if conventional milling is required. Order of machining each curve is automatically optimized to save machine time.

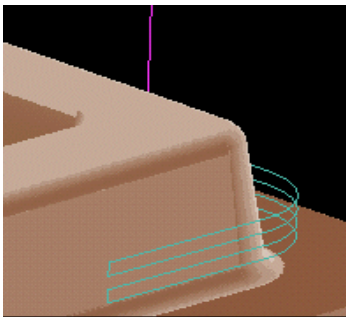
Stepping the Cutter Down Into Stock

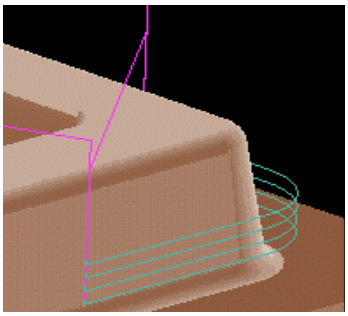
On-surface cutter path can be "ribbed-up" to allow the cutter to take multiple passes along the curves to safely machine in areas with a high concentration of stock.



One-way or zig-zag cutting techniques may be used for multiple passes.

The number of ribs for each cut can be configured separately or as a group.

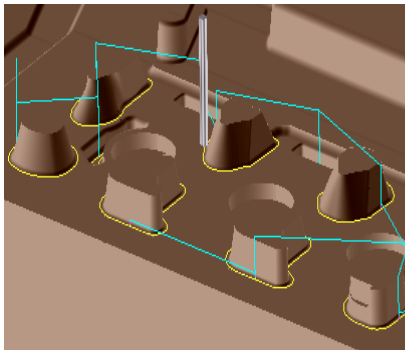


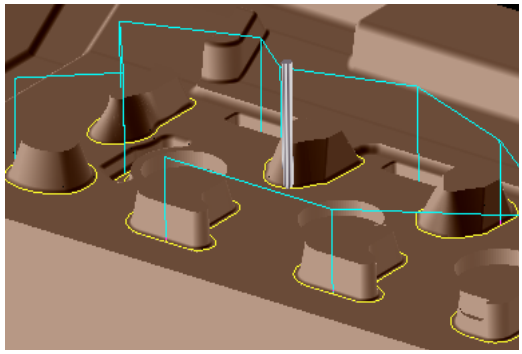


Optimized Clear Plane

Rapid motion from the end of one cut to the next will lift only as high a necessary to avoid collision with part and stock. This minimizes the machine time.

A fixed clear plane may be used for those wishing to take a more conservative approach.





Features & Options

Optimal ordering of the curves minimizes machine time.

Separate feed rate control for cutting and initial entry into material.

Configurable approach distance to slow to plunge feed when entering material.

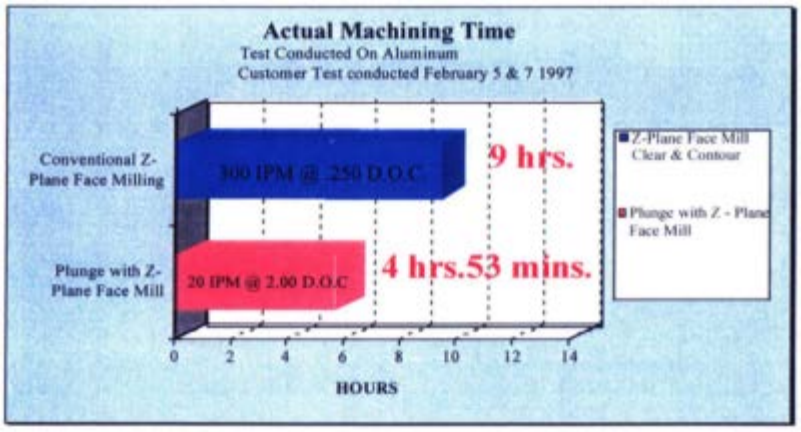
Configurable retract distance to exit material.

3D Plunge Roughing

Machining Strategy

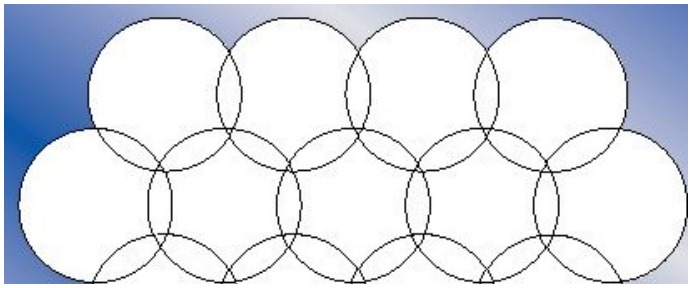
Plunge roughing is drilling-like machining process where the roughing tool is feeding in the Z-axis only then retracted like a drill, indexed to new X-Y coordinates and plunged again.

Significant reductions in machine time for roughing can be achieved over traditional Z-Planar methods. This is particularly true for deep cavities. When plunging, tools are subjected to mainly axial forces along the Z axis of the machine. Because there are minimal side forces, cutting feedrates can be maintained regardless of depth. The deeper the cavity, the more time can be saved.

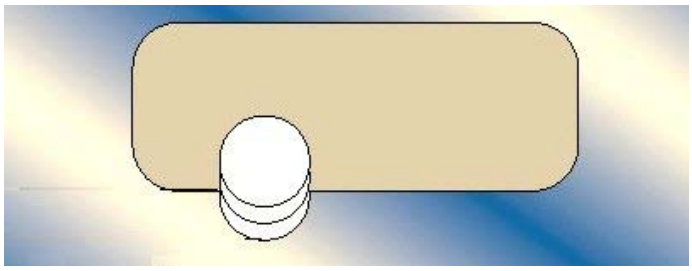


Cutting Styles

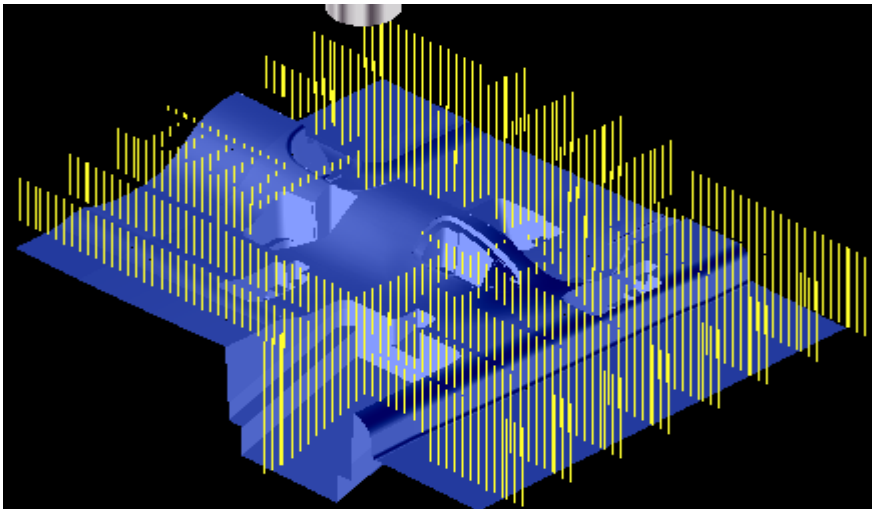
Center Cut – this technique uses a center-cutting end mill creating a hole size equivalent to its own diameter. The overlapping pattern of holes maximizes the material removal for each plunge. High pressure through the tool coolant is recommended to assist with chip evacuation.



Edge Cut – Unlike center-cutting plunge roughing, this technique takes a smaller step-over for each plunge but at a higher feedrate resulting in material removal rates as high as 48 cubic inches per minute in P20 tool steel. The edge-cutting technique does not require as much horsepower as center-cutting method and does not require coolant.



Automated Programming



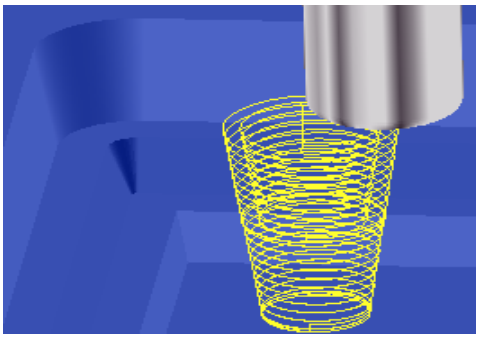
Full automatic mode allows Prospector to choose the best pattern and sequence of plunges to maximize material removal.

Unique OptiPlunge option allows for the addition of plunges to clean up particularly large concentrations of stock that can occur near vertical walls of the job.

Full control of cut direction, coverage and entry points into the part is offered in addition to full automatic mode.

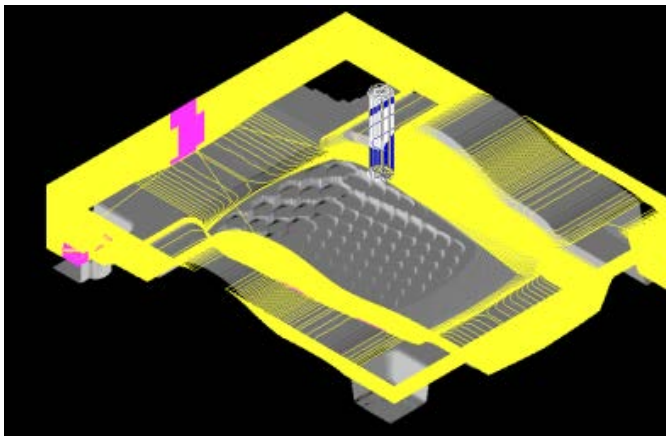
Deeper jobs may be divided up into several levels with a separate program for each level. This allows for shorter tool setups and assists with chip evacuation.

Rouging Cavities



For cavity areas of a job, a conical entry hole is created as a separate program. The location of the entry hole is automatically calculated by Prospector to place it at the deepest point(s). The option is available to indicate specific locations for plunging to commence is available as well. The conical shape of the entry hole facilitates chip evacuation during its creation and when the initial plunging operation begins.

Z-Planar Cusp Removal



The final step in plunge roughing is to remove the cusps that form. The Z-Planar No Clear Continuous ramp program with a tool equal to or larger in diameter than the plunge tool is designed to perform this final step in the process.

Features & Options

Configurable major step-over control (distance between rows of plunges).

Configurable minor step-over control (radial depth of cut into the material).

Configurable approach distance to slow to plunge feed when entering material.

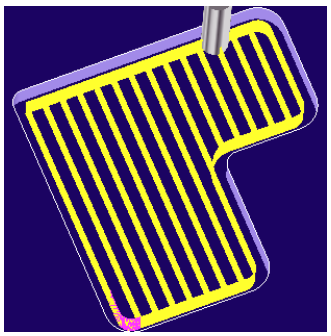
Configurable “step-back” distance to pull the tool away from the material when retracting after a plunge to ensure inserts do not drag against the forward wall during retract.

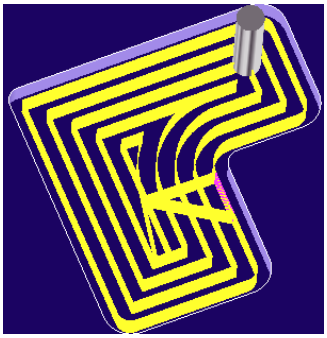
2D Pocketing

Clearing

Zig-Zag Clearing – clears using linear scans at a specified angle. Islands are climb-cut as they are encountered to minimize interrupted cuts. Scans are ordered to minimize machine time.

Spiral Clearing - Inside Out or Outside In – clearing passes follow the natural contours of the part data. Contours are optimally ordered in groups to maximize machine efficiency.

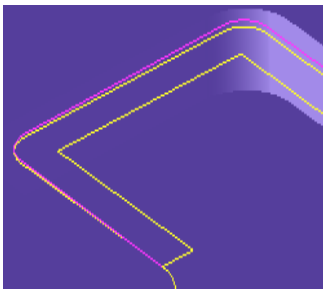


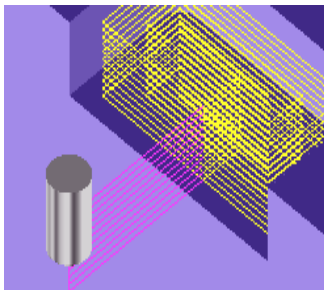


Z-Level Transition

Contour Ramp – remain in the material cutting down to the next level at a designated angle and plunge feed rate. Minimum pocket radius control prevents the possibility of the tool bottoming out in tight pockets.

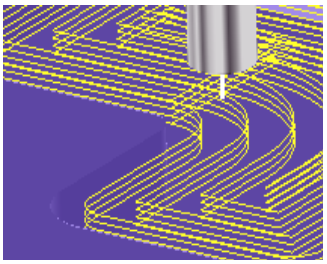
Off-the-block – start at and always return to the closest designated plunge point off the part to descend in Z to the next level.

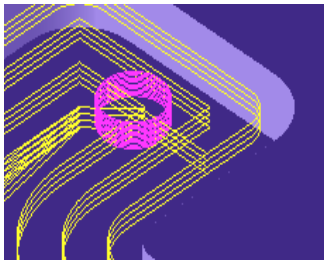




Pre-Drilled Hole – start at and return to the closest designated pre-drilled hole to descend in Z to the next level to machine.

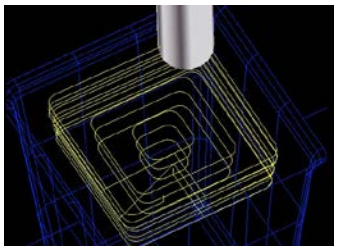
Helical Ramp – follow a helical path at a specified plunge feed to machine down to the next level. Ramps are placed in the most optimal position for machining. Diameter of helix is automatically adjusted to allow cutter to reach tight pockets but will not go below a designated minimum diameter which prevents the tool from bottoming out.





Smooth Interior Corners

This high speed machining technique inserts blends of a specified radius when sharp interior corner conditions are encountered. This is useful to improve machine performance because the machine does not need to decelerate to a full stop to change direction. Wear on inserts is reduced and the machine runs smoother.



Features & Options

Unlimited number of independent islands and sub-pockets each with different draft, height and depth specifications.

Cusp height control or fixed step down.

Separate feed rates for cutting, ramping and retracing.

Optional retract & rapid to start of next level or retrace at the retrace feed rate.

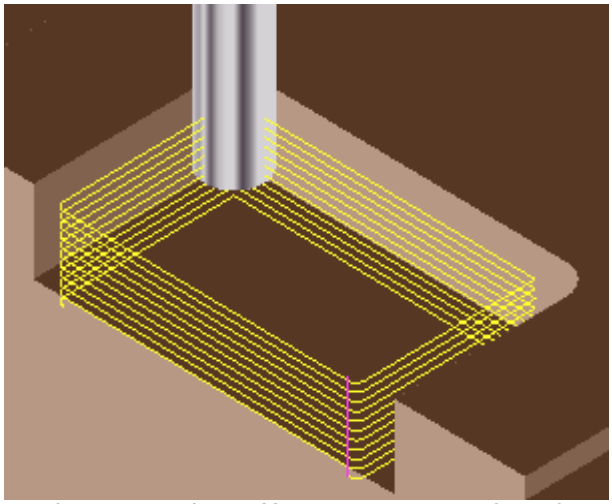
Climb or Conventional cutting.

Minimum pocket size to prevent tool from bottoming out when ramping to lower levels.

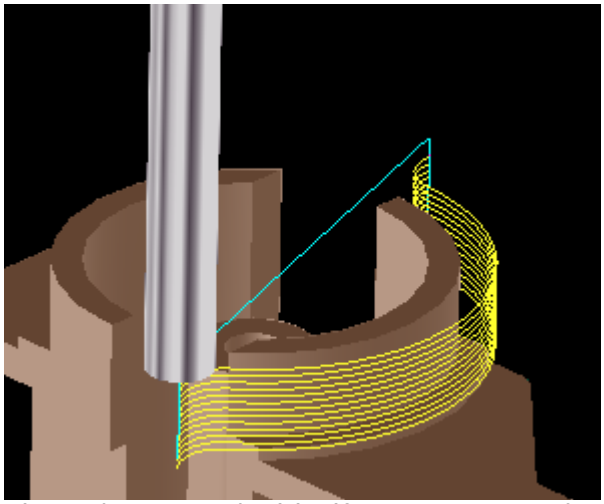
Configurable approach and retract distances to decelerate & accelerate a safe distance from material.

2D Profiling

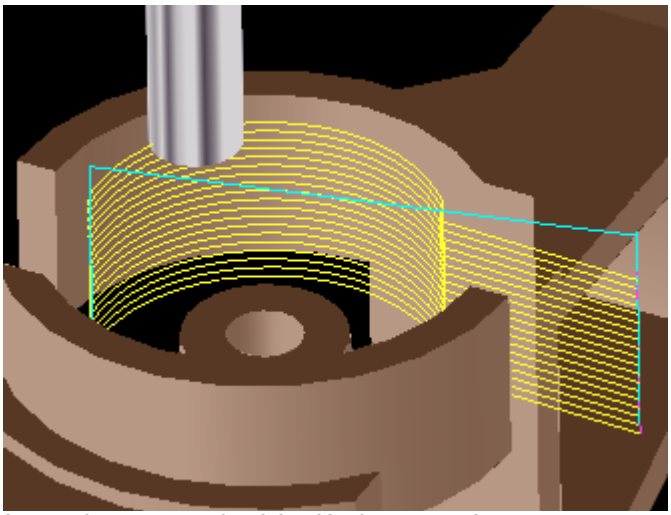
Cutting Styles



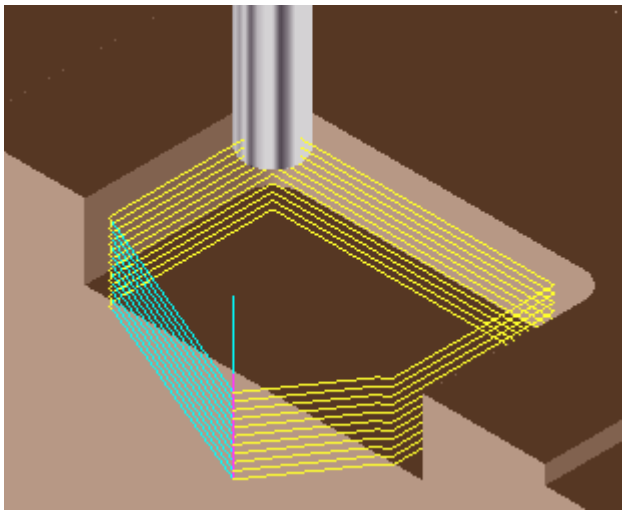
Plunge / One-Way / No Lift - One-way cuts that plunge at the start point of each level. The tool does not lift between levels. This style is used to machine inside corner areas of the job where the tool can safely stay down between levels.



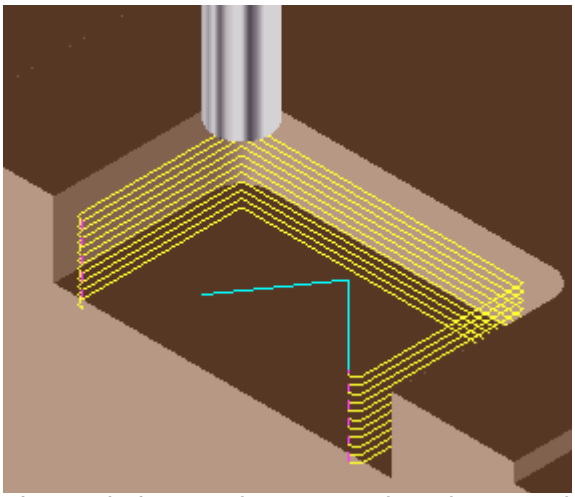
Plunge / One-Way / With Lift - One-way cuts that plunge at the start point of each level. The tool will lift between levels to the clear plane to return to the start of the next cut. This style is used to machine outside corners where the can not safely stay down between levels.



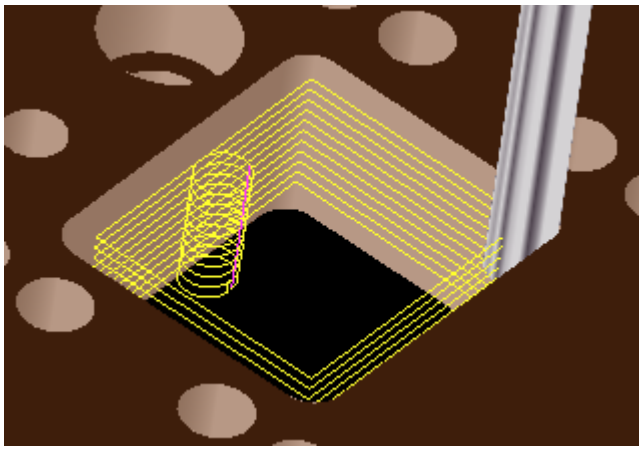
Plunge / One-Way / With Lift / Start Point - One-way cuts that plunge at a specified entry point. The tool will lift at the end of the level to a safe clear plane, return to the start point to descend to the next level. This style is used when the tool cannot safely stay down between levels and it's important to plunge only in a known safe location.



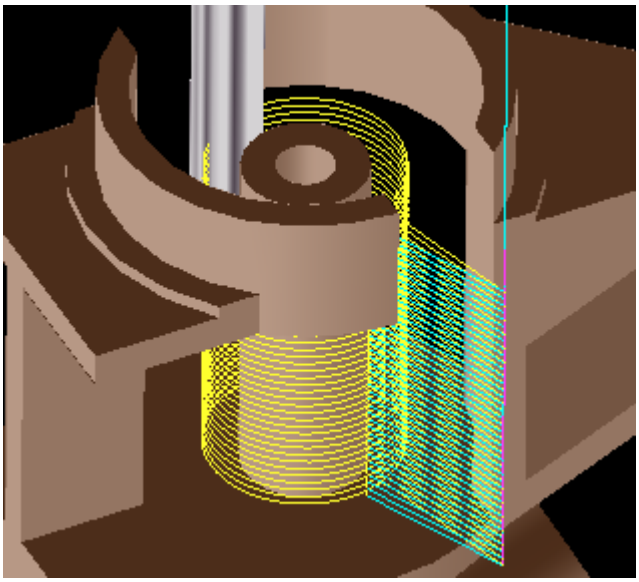
Plunge / One-Way / No Lift / Start Point - One-way cuts that start and descend to lower levels at a specified start point. The tool will not lift between levels. This style is used where the tool can safely stay down between levels however it is necessary to specify a safe and efficient plunge point.



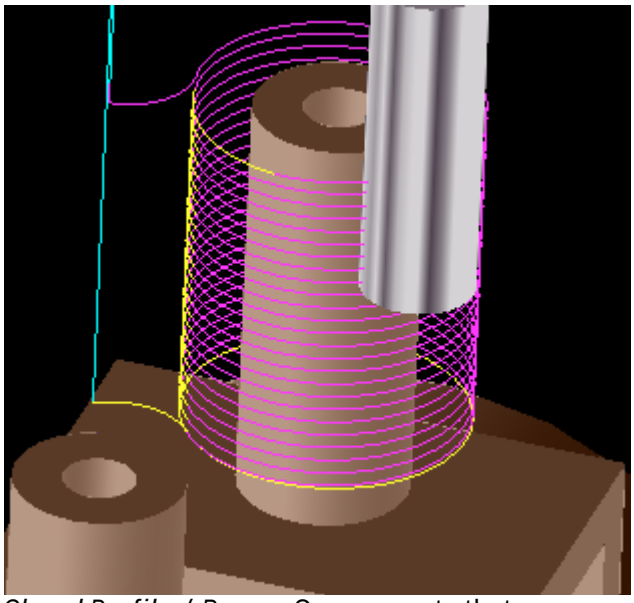
Zig-Zag / Plunge – zig-zag cuts that plunge at the end of each cut to the next level then cut in the opposite direction.



Close Profiling / Plunge - One-way cuts that plunge to descend to the next level. Plunge point is automatically computed to start along the longest edge of the profile. The tool will not lift between levels.

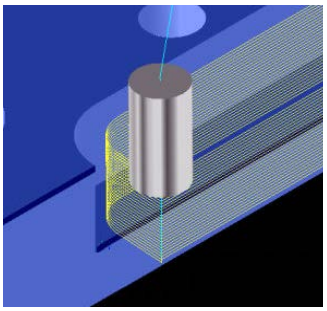


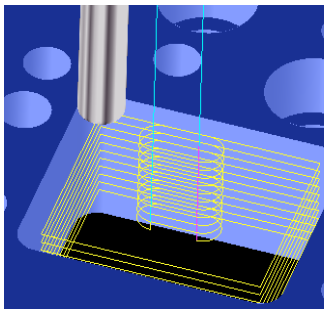
Closed Profile / Plunge / Start Point - One-way cuts that plunge at a specified start point. The tool will not lift between levels. Typically used to finish closed features where the location of the start and plunge point must be carefully controlled.



Closed Profile / Ramp **-** One-way cuts that ramp following the contour of the part to descend to the next level.

Overlapping and Extending Cuts

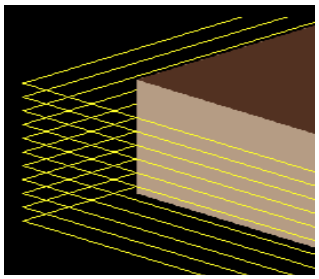


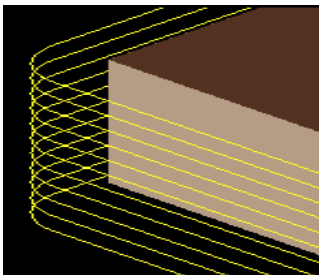


Extend Open – at entry and exit of an open profile, the cut can be extended tangentially to ensure a sharp edge is maintained.

Overlap Closed – for each level of a closed profile, the cutter path may be overlapped to prevent the formation of a cusp.

Corner Options

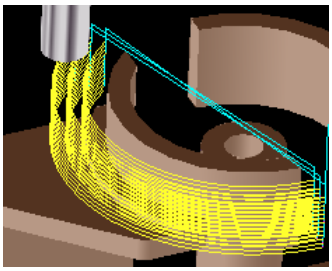


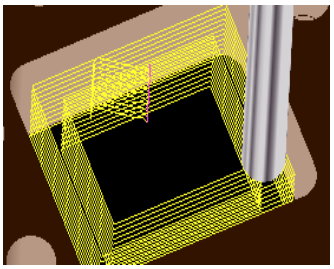


Maintain Sharps – exterior corners are machined such that the sharp corners are maintained.

Roll Corners - cutter path arcs around exterior corners.

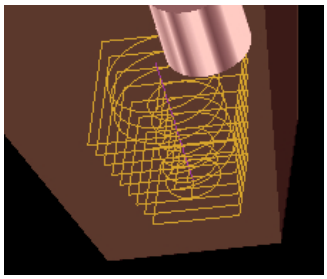
Walking the Cutter Into the Stock





The multiple passes option uses a specified step-over suitable for the tool and stock condition to walk the cutter into areas of heavy stock.

Variable Radius Circular Leads



The circular lead option automatically adjusts the radius to avoid gouging the part when descending into tapered pockets.

Features & Options

Climb or conventional cutting.

On-centerline option to drive centerline of cutter along a profile.

Cusp height control or fixed step down.

Circular lead-in and lead-out.

Separate feed rates for cutting and ramping.

Radial cutter compensation (G41/G42) support.

Optional lead-in distance for cutter compensation activation.

Minimum pocket size to prevent tool from bottoming out when ramping to lower levels.

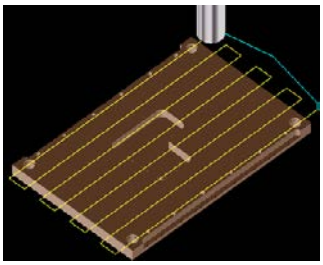
Configurable approach and retract distances to decelerate & accelerate a safe distance from material.

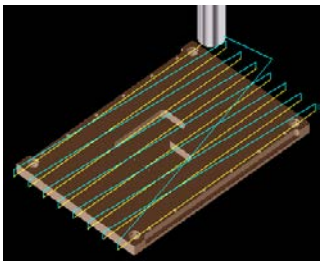
Face Milling

Cutting Styles

Zig-Zag– linear cuts are made in both directions to remove material. Suitable for cutters and material conditions that do not require maintaining cutting convention.

One-Way – unidirectional cuts ensure that the material is always climb or conventional cut.

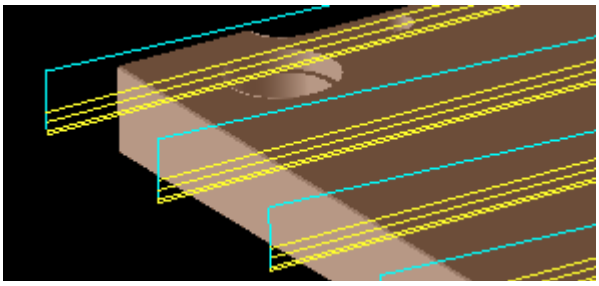




Stepping the Cutter Down into Stock

Optional step down feature allows the cutter to take multiple Z level passes to machine excess stock.

The step down for the final pass is configured separately to produce the best finish possible.



Features & Options

Configurable lead-in and lead-out distances from the part surface.

Cutting direction control arranges cuts along the X or Y axis.

Starting quadrant control.

Programmable feed rate for last pass.

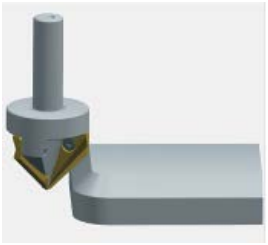
Chamfer Milling

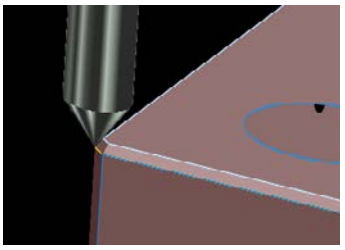
Feature Finder

Prospector can automatically find chamfers in the design data when a solid model is used for part data.

Option to designate curves indicating the top, bottom or edge of a chamfer for cases where the chamfer itself is not modeled.

Designate or override chamfer width and type.





Stepping the Cutter into Stock

Optional multiple pass feature walks the cutter into the stock on each successive pass.

A final pass with a separate step-over is available to produce an exceptionally smooth finish.

Features & Options

Option for sharp corners.

Configurable circular lead-in and lead-out.

Optional user defined starting point for machining.

Programmable tool tip offset to ensure complete machining of the chamfer.

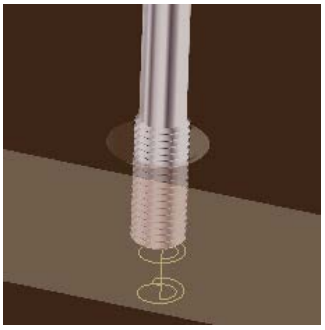
Available left/right cutter compensation (G41/G42).

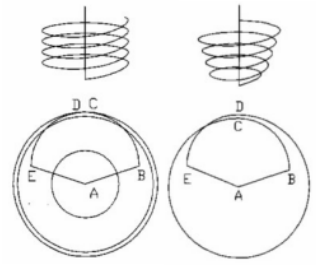
Thread Milling

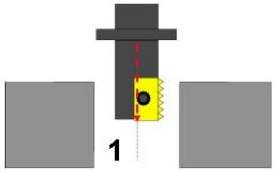
Machining Strategy

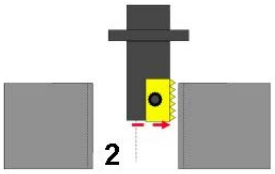
Thread milling is an alternative to tapping for machining threaded holes. It can be particularly useful in cases where larger diameter holes are involved or when working with difficult materials. Other advantages include:

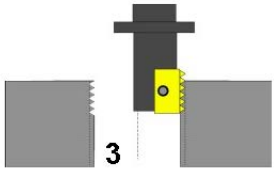
- High cutting Speeds and Feeds
- Produces threads with excellent form, finish, and dimensional accuracy
- Easy machining of difficult materials
- Eliminates the possibilities and consequences of tap breakage
- Full bottom threading
- Precise thread depth control
- Pitch diameter can be controlled by CNC offset
- One tool for through or blind holes
- One thread mill can produce varying thread diameters of the same pitch
- Smaller machines can produce larger threads due to less spindle torque
- No reversal of the spindle required

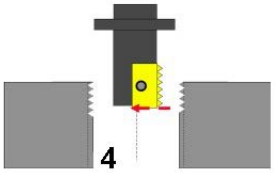












Features & Options

UNC and NPT thread support.

Machine from the bottom to the top or top to bottom.

Configurable helical lead radius and angle.

Optional multiple passes to create proper thread depth in hard materials.

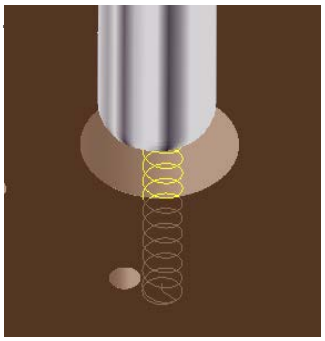
Radial cutter compensation (G41/G42) support.

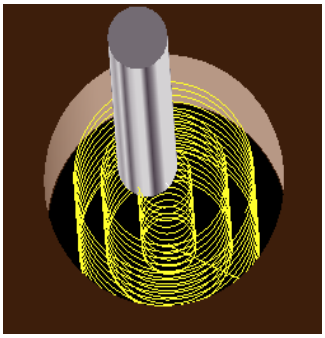
Optimized sorting of holes to minimize machine time.

Helical Drilling

Machining Strategy

Helical drilling is a machining strategy for making holes with milling cutters. Holes are produced by one or more sets of concentric helical cutter paths. This is a useful machining technique for creating larger size holes where the use of large drills may not be appropriate due to the hardness of the materials o because of insufficient machine horsepower.





Because holes of any size can be created by repeated passes of increasing diameter helical paths until the hole is milled to size, it is not necessary to have on hand a large inventory of drills.

Features & Options

Supports straight and drafted holes.

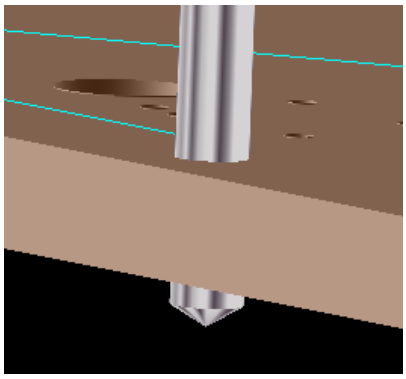
Configurable step down and step over.

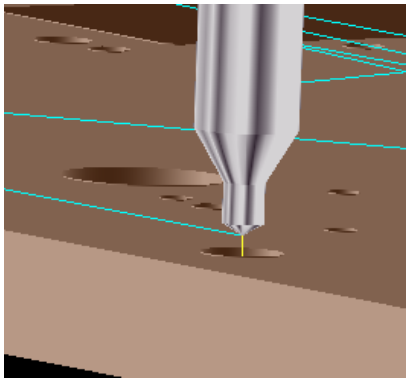
Optimized sorting of holes to minimize machine time.

Hole Making

Comprehensive Suite of Operations

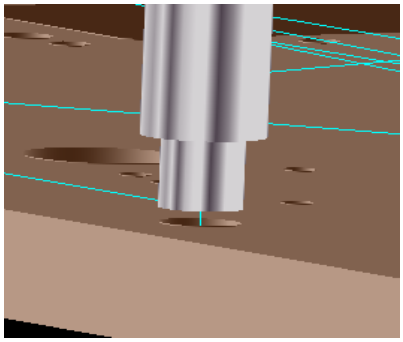
- Drill
- Peck Drill
- Centerdrill
- Counterbore
- Countersink
- Tap
- Thread Milling
- Bore
- Ream

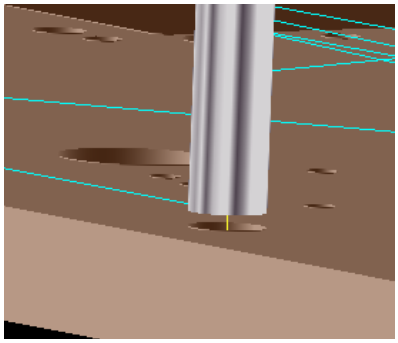




Integrated PowerSource Tooling Database

- Drills
- Center Drills
- Countersinks
- Flat Tip Countersink
- Boring Bars
- Reamers
- Straight & Tapered Thread Mills





Features & Options

Optimized sorting of holes to minimize machine time.

Canned cycle support (G81, G82, G83, G84, G85, G86, G87).

Optional non-canned cycle output.

Fixed or optimized clear plane.

Configurable dwell time.

Full or partial retract option for peck drilling.

Rigid tapping option.

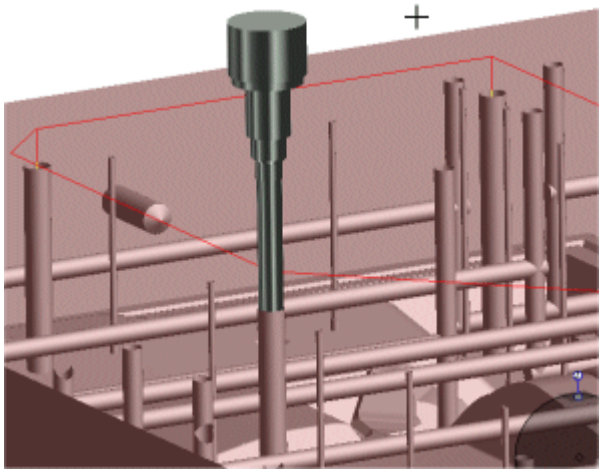
Configurable peck depth with optional peck depth reduction.

Full diameter depth specification option where applicable.

Configurable clear distance to stop short of the part before feeding in.

Gun Drilling

Specialized Drill Program for Waterlines



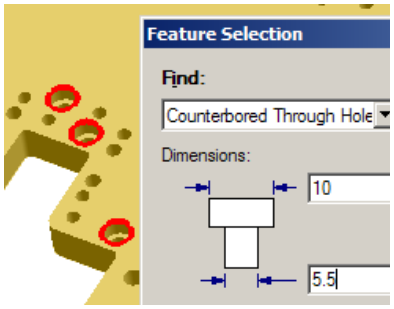
Full control over all phases of the holemaking operation:

- Approach Phase -The approach phase advances the tool into the hole at a specified feedrate by the programmed approach distance you specify. The programmed approach distance can be zero if this phase not required. The spindle may optionally be started during the approach phase. There is a separate spindle speed you set for this phase of the program.
- Engagement Phase - The engagement phase is the initial cutting phase. The coolant is turned on. The spindle is started at a programmed rate for this phase of the operation. By default it is 50% of the programmed spindle speed associated with the tool however you can set this to be a specific speed or program a different rule in PowerSource Insight. The tool feeds into the hole at a separately programmed feed rate. By default the feed rate is 50% of the programmed feed rate for the tool. Like the spindle speed, this feed rate can be modified however you wish. The tool continues to advance into the hole by the initial depth distance set for the program.
- Drilling Phase - Spindle speed and feed rate is increased to the speed and feed programmed on the tool selection page. Tool advances into the hole until the full depth is achieved.
- Disengagement Phase For Blind Holes - The tool is disengaged from the material by retracting a small incremental distance you specify from the bottom of the hole. The coolant is then turned off and the spindle is stopped.
- Disengagement Phase For Through Holes - A breakthrough distance is specified which is added to the depth of the hole so that the tool completely breaks through the workpiece. Once through the workpiece, the coolant is turned off and the spindle is stopped.
- Retract Phase - With the spindle stopped and coolant turned off, the tool retracts at the retract feed rate to the top of the hole. Once there, it will rapid to the drilling retract plane and repeat the drilling process for the next hole.

Feature-Based Hole Making

Automated Hole Making

Feature-based hole making identifies 2D or 3D hole types of the job. The set of programs to fully machine the feature are automatically generated based on a predefined set of rules defined in the PowerSource database.

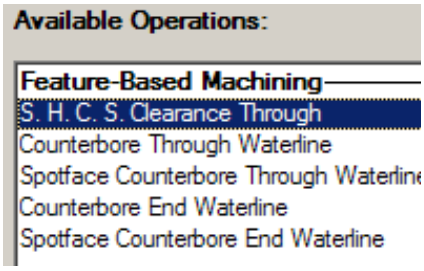


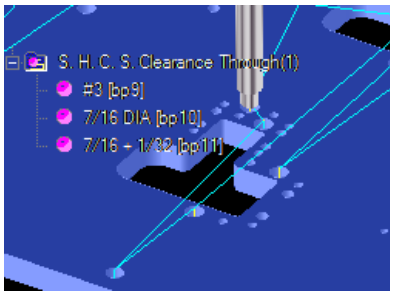
2D Features Recognition

Simple Hole	Counterbore
Tapped Hole	Counterbore Tapped
Contersink	Countersink Tapped

3D Feature Recognition

Through Hole	Blind Hole
Through Counterbore	Blind Counterbore
Through Countersink	Blind Countersink





Features & Options

Automatic depth calculations for 3D features.

Optional layer and color filters assist locating features.

Graphic verification of feature selection.

Tool changer support option when programs are combined.

All features and options for hole making operations available for each program created.

Contacts

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