InventorCAM 2013





Parallel Computing

A major new capability in InventorCAM 2013: Parallel Computing

• User can start calculation of an operation or several operations and, while it is calculating, he can in parallel continue to define and calculate additional operations

• User can start parallel simulation and, while it is simulating in the background, he can in parallel continue to work defining additional operations

• User can start G-Code generation and, while it is generating G-code, he can in parallel continue to work defining additional operations



Parallel Computing – LOCAL or REMOTE

 LOCAL: Parallel computing on <u>User Computer</u>, using the power of multi-threading on multi-core CPUs

REMOTE: Parallel computing on External computer on the Network

	Add Machining Process Holes Recognition + Technology	Calculate All in parallel	b Parallel operations
G01	Calculate All GCode All Turret synchronization Calculate & GCode All Show tool path	GCode All in parallel GCode All in parallel Calculate & GCode All in parallel Simulate in parallel Show parallel operations	 Local computer Network computer Note: If you choose the network option, the logged in user account in the local and network computers must be defined on both computers.
			Do not ask again (Defined in CAM settings) OK Cancel



Parallel Computing – LOCAL or REMOTE

chilology	Operation name	Template	Wizard	
3D Surfacing 👻	i3DSurfacing_target 🗸 🗸		On On	
Geometry Tool Levels Technology Wizard Technology Link Motion Limits Control Misc. parameters	Geometry Geometry CoordSys MAC 1 (1- Position) CoordSys Target Show Working area		Advanced	
	Modify geometry fillet Percentage Value Fillet radius: 20			



Software Licensing

InventorCAM 2013 provides <u>software licensing</u>, in addition to the standard hardware dongle licensing.

Advantages:

• For companies demanding a network software license instead of network hardware dongle

 Used instead of hardware dongle for customers who want a 30-day evaluation of the software



Controller ID

Machine Definition Controller Definition User Defined Parameters			
Controller	Name	Value	
S -12.7358 Probe	Inspection Probe	NONE	
Y 18.2528 All Cycles	All Cycles		
c 29.1170 Cycle Plane X	Cycle Plane X		
Cycle Plane Y	Cycle Plane Y		
Cycle Plane Z	Cycle Plane Z		
Cycle Boss	Cycle Boss		
Cycle Pocket	Cycle Pocket		
Cycle Pocket with Boss	Cycle Pocket with Boss		
	Cycle Hole		
	Cycle Cylinder		
	Cycle Hole with Boss		
Cycle Int. Arc	Cycle Int. Arc		
	Cycle Ext. Arc		
Cycle Int. Corner	Cycle Int. Corner		
Cycle Ext. Corner	Cycle Ext. Corner		
	Cycle Angle X		
	Cycle Angle Y		
	Cycle Angle Z		
Hard Move to Back			
🖶 🔤 Pull out			

- First stage on the way to make machine definition in one file *.VMID
- Probe cycles and MCO cycles are moved to *.VMID already in SC2012SP2



MCO cycles





Machine Setup

	Nam	ne:	Setup_123]			
ame	Home	Fixture		Table	x	Y	Z		
B_ax_MAIN	MAC 1 (1- Position)	📥 dam	ping fixture	- Mains	P 0.000	0.000	150.000	بطر	
B_ax_BACK	MAC 3 (1- Position)	📥 fixtu	re1	Backs	P 0.000	0.000	-150.000	#	
Lower_MAIN	🕘 MAC 2 (1- Position)	📥 dam	ping fixture	- Mains	P 0.000	0.000	150.000	#	
Lower_BACK	MAC 4 (1- Position)	📥 fixtu	re1	Backs	P 0.000	0.000	-150.000	ﷺ	
	1		X						

- Definition of fixture, MACs shiftings in one place
- Conection between fixture, MAC and Sub-Machine



MCO: Movement definition styles

hnology	Operation name:				Tem	nplate			Cycle
General 🔻	MACHINE_CTRL			•	· I	2 🚔			
ion on	Process	Proper	ties						
Machine	🔒 Start Definition	No.	Mode	X (X)	Y (Y)	Z (Z)	Ry (B)	Feed (mm/min)	
Turret	Turret	1	B	100				100	
Table	Device	2	-			100			
Table		3	19		_				
Chuck	Activate Air								
Submachine	🗌 🔷 Coolant Flood								
Misc	Coolant Throu								
	Rotation								
	Synchronizati								
	Spindle Orient								
	🗌 🔷 Message								
	Part Move								
	🗌 🔷 Tool Change								
	 ■ 								
	Simulata CC	ada						Save & Copy	Evit

- Definition of device movements in Part CoordSys
- Definition of device movement by axis value (according to Device CoordSys)



CoordSys: Easier CoordSys Edit



• Partly highlighted Existing Coordinate System



Integration with G-code simulators



Possibility to use for Gcode simulation the following simulators:

- VERICUT
- IMSVerify
- DMG Virtual Machine
 - G-Navi

٠

Send all needed data by one mouse click



Color the CAM-tree

solidCAM Settings	8	 Assign color for each operation group 	
	View Font <u>C</u> olors	Color the operation by tool color	
	Font size: 8	Change font size	
Tool settings Color settings Default geometry names	B/ Cam part definition B/ Sp B/ Fixture B/ Fi	Normal/Coursive/Bold types of fonts	
AutoSave Automatic CAM-Part definition		Too Machining Process	
Tool path simulation Machine simulation	B I Milling operation B I C		
	B / Probe operation	Fixture_setup	
CoordSystem CoordSyst	B / Suppressed operation	MAC 1 (1-Position)	
···· GCode generation ···· Tool search ···· Internal post-processor	B / Operation with error		
···· Template Defaults ···· Probe ···· Miscellaneous		MAC 2 (1- Position)	
Gouge check Spin and Feed Defaults CAM Messages		Fixture_setup2	
iMachining Parallel Operations		ian⊖ MAC 2 (1- Position) ian□ Gm Champher	
	OK Car	B_ax_BACK	



General: New and Edit geometry

Techeology	Operation name	Tamalata			
Pocket	P_contour			٠	
Geometry Tool Levels Contrology Link Motion Limits Control Misc. parameters	Geometry CoordSys MAC 1 (2 Contour Show	E-Position) ▼	IN T		
Save Save & Calcula	te 🔽 Simulate	<u>G</u> Code	Save & Copy E	it	

• No need to delete previous geometry from interface to define new one



General: Associative cell color

SolidCAM Settings	S X				
User directories	3D Connexion	Profile Operation			? ×
Default CNC-Controller	Enable 3D mouse support		Operation name	Template	
	Simulation	Profile			1
Tool settings Color settings	$\boxed{\ensuremath{\mathbb V}}$ Keep current model orientation for SolidVerify simulation	Geometry	Positioning levels		
Default geometry names Interoperational tool movements	Tolerance for CAM-Part definition		Start level 10 Delta:	0	
AutoSave Automatic CAM-Part definition	Facet tolerance: 0.01	Technology	Clearance level 10 Delta: Safety distance: 2	0	
	Recent CAM-Part List Number of recent CAM-Parts: 10	Motion Limits Control	Milling levels		
	Solach undate		Upper level 0 Delta:	0	
	Enable Web update of splash screen		Profile depth 85 Delta:	0	
External program Machining Process Cam tree view interface CoordSys definition GCode generation Tool search Internal post-processor Template Defaults Probe Miscellaneous Gouge check Spin and Feed Defaults CAM Messages MAchining Parallel Operations	Operation Page Switch Hotkey for switching: Ctrl + Tab Associativity field background Background color:	Save Save & Calculat	e Simulate GCode 💽	Save & Copy	įxit
241	OK Cancel				

Customize the color of Associative field in interface (red was confusing)



General: Show tool from all operations

b Drilling Operation			8 🐹 🔥 Too	ol Picture	×
Technology Drilling	Operation name This is with 2 fixtures also	Template	•		
CoordSys	Tool Data Coolant Tool change position Tool Type: Bohrer Number: 7 Turret: Rotary Pos/Subpos: 2A	Tool angle			
Save Save & Calculate	e Simulate GCode 💽	Save &	Copy Exit		

• Show 3D tool in separate window



Template: Keep template name

mplate Manager			? ×	
Current Directory:	C:\Program Files\Templates\Defa	ult	Browse	CAM-Part (4THAXIS_WITH_OFFSET)
plate Folders	Operation Templates			Machine (integrex200-IV)
Templates	Name	Operation Type	Technology	CoordSys Manager
Process Templates	OuterContour	Y HSM	Constant Z machining 🛛	🚳 Stock (stock123333)
	Contour	2.5D Milling	Profile	Target (target 1)
	FlatSurfaceHSMcutting	2.5D Milling	Translated Surface	Settings
	OuterContour	HSM	Constant Z machining	
	PreDrill	2.5D Milling	Drilling	
	PR_depth10	2.5D Milling	Pocket Recognition	Machining Process
	PR_maxDepth20mm	HSM	Horizontal machining	Geometries
				Fixtures
				🚊 💭 📂 Operations
				in fixture
				B_ax_MAIN
				MAC 1 (2- Position)
				B P contour 1
				🗄 * 🤝 OuterContour
	* * *			
	Template name: OuterContour			
	🔽 Use template	name as operation name	Exit	

• Use template name as name of operation created from this template



Transform: 4x transform with offset



• Possibility to add offset along 4th axis during transformation



Impressive graphic interface

New 3D illustrations for every parameter = easier learning and activation of software

ſ	b Pocket Operation		? 🗾 Х	
	Technology	Operation name	Template	
	Pocket	•		
	Geometry	Technology Contour Advanced		-/ \\\\
	W Tool Levels Prechnology WLink Synchron Limits Control	Technology Contour Overlap (i) % of tool diameter	Offsets 0 Island offset: 0 Floor offset: 0	
Pocket Operation Technology Operation name Pocket P profile6	🦾 🖶 Misc. parameters	Value 65	Finish Wall Floor	9
Geometry Technology Advanced Technology Levels Contruer		Rest material\Chamfer	Wall thish On © Geometry Offset	
→ Technology Open Pockets ↓ Link Extension ↓ Motion Limits Control		Use fillet size for last cut Internal: External: 0	Total depth	
Use profile strat		Complete Z-level	Compensation	
Aproach from Descend inter-	Save Save & Calcula	ate Simulate <u>G</u> Code	Save & Copy Exit	
Overlao ● % of tool damet ● Value ↓ Equal ste	65	Compensation e fillet size for last cut		
Rest material/Chamfer	▼ Data	Internal: 0 External: 0		
Save Save & Calculate Simulate	GCode	Save & Cgpy		



2.5D operations: technology on TABs

b Pocket Operation	(1645)	?	locket Operation	And TAXABLE INC.	? ×
Technology Pocket	Operation name	Template	Technology Pocket	Operation name	Template
Geometry Tool Levels Cechnology Link Motion Limits Control Misc. parameters	Technology Advanced Technology Data Open Pockets Data © % of tool diameter 0 © Value 10 Use profile strategy 0 © One way Zigzag Approach from outside Descend in Rapid to Cut level Complete Z-level Min. Overlap © % of tool diameter 65 Value 65 Equal step over Rest material/Chamfer None Data Simulate <u>QCode</u>	Offsets Wall offset: Island offset: Floor offset: Wall finish Wall Floor Wall finish On Geometry Offset Depth Total depth @ Each step down Wall finish only Compensation Use fillet size for last cut Internal: External: Save & Cgpy Exit	Geometry Tool Levels Link Motion Limits Control Misc. parameters	Technology Hatch Open pocket Adva Technology Hatch • Min. Overlap % of tool diameter % Value 65 Value Equal step over Begual step over Use fillet size for last cut Internal: © Complete Z-level Rest material/Chamfer Chamfer Chamfer Simulate <u>GCode</u> 	Anced Offsets Wall offset: 0 Floor offset: 0 Floor offset: 0 Floor Wall finish On © Geometry Offset Depth Total depth @ Each step down Vall finish only Compensation Save & Copy Exit

- Split technology page of 2.5D milling operations to TABs
- More structured parameters placing



Profile geometry: Silhouette

			9 2
Profile Operation			
Technology	Operation name	Template	
Profile	▼	🖬 🖻	
			· ·
Geometry	Geometry		
Tool	CoordSys MAC 1 (1- Position)		
Levels			
lechnology	Show		
Link	SHOW		
→ Misc parameters	Geometry selection		
	General Silhouette		
	·		
9			
20			
Save & Calculate	Simulate <u>G</u> Code	Save & Copy	Exit

• Automatic creation of silhouette around defined model



Profile geometry: Show tool at the end also



- Under Modify geometry we can wee tool radius at the end and at the beginning of geometry
- Useful for complex geometries



Profile geometry: Take depth from 1st selected item of geometry

z	
Operation name F_contour3 Positioning levels Start level 00 Clearance level 00 Safety distance: 2 Miling levels Upper level 0 Profile depth 32	Ceta: 0 Deta:
Sava Sava & Calculate Simulate	Code Save & Cooy Evit



Face milling: Angle of cutting in "One pass"

Face Milling Operation			? <mark>×</mark>
Technology Face Milling	Operation name	Template	•
Geometry Tool Levels Cechnology Link Motion control	Technology One pass Advanced Hatch angle Angle: 30	Extension % of tool diameter 10 Value	
Save Save & Calculate	Simulate <u>G</u> Code	Save & Copy	Exit

• Angle is added to One pass in Face milling



Profile: Ignore geometry self-intersection

Profile Operation		8 ×	ignore geometry self-intersection
Technology	Operation name	Template	
Profile	F_contour 12 🗸		
	Technology Advanced		
Tool	Modify	Offsets	
Levels	Tool side:	Wall offset: 0	
		Floor offrat:	
		Thoronset.	
Hisc. parameters	Compensation	Equal step down	
	Depth type	Rough	
		Step down: 0	
	Constant Pick	· · · · · · · · · · · · · · · · · · ·	
		✓ Finish	
	Depth cutting type	Number of passes: 1	
	One way	Extension/Overlap: 0	
		Step down: 0	Innore geometry set
9	Rest material\Chamfer		ignore geometry set
	None 🔻	Clear offset	
		Offset	
	Use fillet size for last cut	Step over: 0	
	Internal:	One way	
	External: 0	Complete Z-level Sort by chains	
~			
Save Save & Calculat	te 🗙 Simulate GCode 🗸	Save & Conv Evit	

 Possible to use open self-intersecting geometry with compensation without reducing toolpath



Draft wall angle: Bottom to top



• New option – bottom to top in Draft angle in Profile



2.5D Threading: Roughing definition improvement



• Only multi-step Roughing is available

• Enable one step Roughing, in addition to multi-step Roughing (clear offset option)



2.5D Threading: Minimize air cutting

echnology Thread Milling	Operation name	Template	₽
Geometry Tool Levels Geometry Tool Comparison Technology Comparison C	Lead in/out arc		 For large internal threadings – now there is an option not to star
	Start from center		from the cylinder center
		Start from center	Start from center
Save Save & Calculate	Simulate		



Threading: Variable step over (%)

read Milling Operation				75%
echnology Thread Milling	Operation name			50%
 Geometry Tool Levels Technology Link Motion Limits Control Misc. parameters Misc. 	Technology Sequence of thread positions Sort sequence by: Default • • • • Direction Reverse Zigzag (*) One Way Pickline Show sorted Compensation Thread data Type Internal External Major thread diameter: 0 Direction Right hand Left hand Cut from @ Bottom to top Top to bottom	Image: Clear offset: 0 Image: Clear offset: 0 <td< td=""><td>Image: Clear offset: 0 Image: Clear offset: 0 <td< td=""><td>Geometry</td></td<></td></td<>	Image: Clear offset: 0 Image: Clear offset: 0 <td< td=""><td>Geometry</td></td<>	Geometry
Save Save & Calculate	e Simulate <u>G</u> Code 💽	Save & Copy Exit		
Unto	3 different dent	h on different roug	h cutting steps	



Drilling: up to 24 cycles available



Amount of Drill cycles was increased up to 24



Drilling: Sorting options interface improvement

InventorCAM 2012	InventorCAM 2013
Sequence of drill positions	Sorting
Sort sequence by: Default 🔹	O Default
Pick line	Shortest distance
One way Ozigzag	Advance
Reverse	Reverse direction
Show sorted	Show sorted

- Now all sorting options are on the screen
- Only useful options left ("Line" option is converted to Default, and deleted from options)
- Changes appear in 2.5D drill, Threading, 3D Drill, Multi-axes drill, Drill recognition



Toolbox: 4 nubs cycle



• In case of big through holes - If user wants to break out the material, instead of machining it with simple pocket.



Toolbox: 1 side open slot



• For cutting one-side open slots with spiral cuts



Toolbox: Flatten surface on corner



• For big chamfers and corner faces machining



Toolbox: Zig-zag slot operation





Toolbox: Simple boss



• Slot machining with zig-zag ramping



Toolbox: Spiral pocket



• Slot machining with zig-zag ramping


Toolbox: Compensation and Finish

b ToolBox cycles operation		2 ×		
Technology	Operation name	Template		
Simple Multi Bosses	TBX_MBSC_contour	🖬 🖻 🛛 🔍		
Geometry	Technology Advanced			? ×
Tool	Step down	Offsets	peration name	Template
← ↓ Levels ← ↓ Technology	Equal step down	Wall offset: 0	TBX_SPN_contour	E 🖻 🤍
Motion Limits Control	Step down: 5	Floor offset: 0	echnology Advanced	
- Misc. parameters	Clear offset	Finish	Step down	Offsets
	Offset 0	🔽 Wall finish	Equal step down	Wall offset: 0
	Step over: 2.5	Compensation	Step down: 5	Floor offset: 0
			Spine tolerance	Extension
				% of tool diameter
			Tolerance: 2.5	○ Value 10
			Detrect height 0.2	Finish
			Redactheight: 0.2	Vall finish
			1	
				Compensation
Save Save & Calculate	Simulate <u>G</u> Code	Save & Copy		
		Save Save & Calculate	Simulate GCode C	Save & Copy

• Now Compensation and Finish options are almost in all Toolbox operations



Drill Recognition: Champher/Spot





2D/3D Engraving operation

Technology	Operation name	
2D Engraving	•	
2D Engraving 3D Engraving ↓ Levels ↓ Levels ↓ Motion Limits Control ↓ Misc. parameters	Technology Modify Tool side: Right Geometry Side offset: 0 Fill area Hatch Fill area Hatch Geometry 0 Step over: 0	Offsets Wall offset: 0 Floor offset: 0 Semi finish Step down: 0
	Depth outling type	Compensation
	 One way Zigzag 	

- Separation to 2D and 3D Engraving
- Improvement in interface easier to understand the, meaning on parameters



2D/3D Engraving: Middle line toopath

logical Section		ି ଅ	Geometry
Technology 3D Engraving Geometry	Operation name Finish turned off = No offset Technology	Template	A A A - mont
	Modify Tool side: Center	Offsets Wall offset: 0.5 Floor offset: 0	
	Fill area Middle line only Ø Don't go dose to wall Min. distance to wall: 0.25	Semi finish Step down: Cutting type Horizontal passes Parallel to surface	Machining
	Depth cutting type One way O Zigzag Tool path tolerance: 0.01	Ploor finish	
Save Save & Calculate	e) ▼ Simulate <u>G</u> Code	Save & Copy	

• Engraving only center line of multi-line text geometry



HSR: Edit passes by selected operations

echnology	Operation name	Template	— 🕦
Restrougning Geometry Geometry Constraint boundaries Passes Link Motion control Misc. parameters	Passes Smoothing Adaptive step down Edit P Stock definition Overthickness: -0.3 Stock definition style By selected operations	Updated stock based on Updated stock based on Updated stock based on Updated stock based on UT_MS UT_MC 1 (1- Position) UT_MS UT_MS UT_MC 1 (1- Position) UT_MS UT_M	Advanced

3 new options of Updated stock: Automatic, by *.FCT file, by Selected operations



HSR: New operation - Rib machining



- For very thin walls made from exotic materials
- Rough+ semi-finish are combined in one operation, level by level.



HSM: New Operation – Hybrid Constant Z



 New Finishing strategy combining Constant Z operation and 3D pocketing with 3D constant stepover, where needed



HSM/HSR: User-defined cut levels

• Cut ONLY on specified Z levels, instead of cut on every step down

SR Contour roughing operation	n		x
Technology	Operation name	Template	
Contour roughing	HSR_R_Cont_target	• 🔒 🚔	$\mathbf{\Psi}$
Geometry	Passes Smoothing Adaptive step down	Edit Passes	Advanced
Constraint boundaries	Adaptive step down	User-defined cut levels	
Link	Min. step down: 0.2	No. Z	
Misc. parameters	Precision: 0.1	2 -15	
	Profile step-in:	3 -20 4	
	Scallop: 0.19989		
	✓ Optimize Z level		
	Last levels to even: 5		
Save Save & Calcula	ste	Save 8	Copy <u>E</u> xit
192			



HSM/HSR: Stay down within





HSM/HSR: Simple ordering and optimize lead position

 Simple ordering between cutting passes – minimize length of connections between passes

💩 HSM Boundary machining op	peration		
Technology Boundary machining	Operation name HSM_Bound_target	Template	
Geometry Tool Drive boundaries Constraint boundaries Passes Int. Motion Limits Control Misc. parameters	General Ramping Strategy Retracts Leads Direction Image: One way Prefer reverse Bi-directional Down mill Up mill Simple ordering Optimize lead positions	Down/Up Mill Refurbishment Retract	 Advanced 0 ▼ 10 5 74
Save Save & Calculat	te Simulate GCode	Save & Copy	z Exit

• Optimize Lead position— find the point to minimize length of Lead-In movement



HSM/HSR: User-defined Facet tolerance

• Enable the user to define the facet tolerance in any HSM operation – in previous versions this was automatically according to Passes tolerance

Technology Constant Z machining	Operation name HSM_CZ_target	Template
Geometry Tool Constraint boundaries Passes Link Motion Limits Control Misc. parameters Test Parameters	Target geometry CoordSys MAC 1 (1- Position) Define target Show Image: The second sec	Submachine Spindle_MainSpindle
	Apply fillets Advanced Tool Diameter 20 Corner radius 10 Define	



Convert From HSS/HSM: New tilting options

hnology Conversion	Operation name:	Template	i
F Source operation Tool ↓ Levels Link Link Default Lead-In/Out	Gouge 1 Gouge 2 Gouge 3 Gouge 4 Finale/Disable Tool Holder	Geometry	
Tool axis control	Arbor Tool shaft Tool tip Strategy Tilting tool away with max. angle: 3 axis to 5 axis conversion Advanced Smoothing	Check surfaces Use STL file Check surfaces 1 Check surfaces 1 Show Show Stock to leave: 0 Tolerance: 0.01	Collision avoidance by tool tilting
ave Save & Calculate	Simulate <u>G</u> Code	Save & Copy	Image: Weight of tool diameter: 100 Image: Weight of tool diameter: 100 Image: Weight of tool diameter: 0 Image: Weight of tool diameter: 0

 Advanced options of Tilting tool away with max. angle : 3 axis to 5 axis conversion



Advanced button in HSS and 5x sim. operations

chnology	Operation name:	Template				
Parallel cuts : Linear 🔻			•	Hide/Show adv	anced param	eters
CoordSys	Surface quality Sorting		Advanced			
Tool	Surface quality			needed in rare	cases	
Levels	Cut tolerance: 0.01	Chaining tolerance: 1				
	Distance : 0.5	Note: The chaining tolerance is u	sually 1 to			
Default Lead-In/Ou		100 times the cut tolerance. This great impact on the calculation to	value has a ne.			
Gouge check	Maximum step over: 1	Slow and safe path creation	b HSS Parallel cuts: Linear operation	tion		- E - X
Motion Limits Control	Scallop: 0			0 ×		
🕂 Misc. parameters			Technology	Operation name:	lemplate	(i
	Surface edge merge distance	Axial Shift	Parallel cuts : Linear 🔻	-		\ `
4	As value: 0.1	Onstant from each contour	Canad Sup	· · · · · · · · · · · · · · · · · · ·		
	As % of tool diameter:	Gradual for all cuts Fr	Geometry	Surface quality Sorting		Advance
		◯ Gradual for each contour T(Tool	Surface quality		
		Damp	Levels	Cut tolerance: 0.01		
	Apply outer sharp corper(s)	3D Tool Compensation	Tool path parameters			
	Outer inde(s) along pass. 30	Tool Tip		Distance : 0.5		
		Tool Center		Maximum step over: 1		
	Loops' radius; 5		Roughing (Offset)			
			Motion Limits Control	Scallop: 0		
Save Save & Calculat	e Simulate GCode	Save &	Misc. parameters			
				Surface edge merge distance		
				As value: 0.1		
				O As % of tool diameter:		
				Apply outer sharp corner(s)		
				Outer Angle(s) along pass: 30		
				Loops radius; 5		



Swarf Machining – new sim 5x operation



SWARF Machining		
Technology SWARF	Operation name:	Template
CoordSys Geometry Tool ↓ Levels ↓ Levels ↓ Link ↓ Link ↓ Link ↓ Default Lead-In/Out Gouge check ↓ Roughing (Offset) ↓ Motion Limits Control	Strategy Synchronize with tilt lines Compensate to floor surfaces Automatic curve detection	Part definition Upper curve Define Show Lower curve Define Show
Misc. parameters	Offset Swarf offset: 0	Tilt lines
Save Save & Calculate	Si <u>m</u> ulate <u>G</u> Code	Save & Copy

- Easy definition of geometry
- Automatic definition of tool axis control



5x sim: Projection strategies





5x. Sim: Retract plane definition

Technology Parallel cuts	Operation name:	Template	•	
CoordSys	Clearance area	Levels		
Tool	Type: Plane	Retract distance	20	
Tool path parameters	s O In X	Safety distance	1	
Default Lead-In/	Out			
Gouge check	O User-defined direction			
Roughing and More	dX= 0 dY= 0 dZ= 1			
Misc. parameters	Plane height 10			
	Keep initial orientation until distance			
	Distance:			
	Angle step for rapid moves: 5	Rapid retract		
Save Save & Calo	ulate 🔽 Simulate GCode	Save	& Copy Exit	

Plane definition by:

- Normal vector (by 2 points)
- Plane



Tooltable: composite tools





Tooltable: Grooving composite tools



- Internal and External grooving tools
- Square and Round inserts



Tooltable: Threading composite tools





Tooltable: Use only insert

💩 Part Tool Table		🗖 🖻 🕺 🖕 Tool Picture
	🔶 🍠 🔃 🏹 🎆	
Tool Nu▼ Turret▼ Tr 1 UT 1 1 LT 1 2 LT 2 3 UT 1 3 LT 3 4 UT 1	iool pos Number Turret Station/Position IA I4 R LT 6 A I Description Mou Mou I Mou I<	ID number ounting Advanced >>
2 4 01 1 4 LT 4 5 LT 5 6 UT 1 7 UT 1 8 UT 1 10 UT 1 13 UT 1 17 UT 1 18 UT 1	IA IA IA IA IA IA IA IA Ia Insert Shape: Inch Ia Ia Insert Shape: Ia Ia	WAAA 020101
10 01 1 25 07 1 26 07 1 27 07 1 28 07 1 31 07 1	IA Corner radius (R): 01 (0.10mm) ↓ IA Cutting edge formation: E IA Cutting edge direction: R IA ✓	

• Define only cutting part of the tool - tool body can be deined as STL holder



Turning: Work without fixture



- If there is target defined fixture is not needed anymore for turning
- If there is NO target fixture is needed
- Machine without fixture and without traget impossible



Turning: Balanced roughing

lanced Rough operation			2
Technology Balanced Rough	Operation name TBR_turn_on_solid2	Template	
Geometry Tool	General Rough Strategies Break edges	Balanced mode Trailing Distance: 3.5	
Save Save & Calculate	e Simulate <u>G</u> Code	Save & Cgpy	Exit

- Possibility to cut with 2 tools at the same time
- Simultaneous balanced turning
- Option to define trailing distance
- Twice faster machining on machines with 2 turrets



Turning: Manual turning

Manual Turning Operation			? ×		
Technology Manual Turning	Operation name MT_contour17	Template	•	3	
Geometry	Tool Data Origin position Coolant Tool	change position	Show tool •		
Technology	Tool	Tool angle			
- Kink	Type: Ext.Rough				
Misc. parameters	Number: 1				
	Tool orientation: Right				
	Turret: UT			ا <i>م</i> ے	
	Pos/Subpos: 1A			2 1	
	Safety angle: 1	i 🚽 🗖 🗖	n		
	Safety envelope: 0.3				
	Setup angle: 0				
	Position in Multi-tool bolder:				
.	R-apple:	Additional angle: 0			
	brangie.				
	Select				
Ι					
Save & Calculate	Simulate <u>G</u> Code	Save & C	opy <u>E</u> xit		
		-	/		

- Define toolpath by sketch
- Full control on tool movements



Turning: Approach/Retract in drilling



Control approach and retract motions in turning drilling operations



Turning: Reduce toolpath on X axis



InventorCAM

Turning: Adaptive step down



• Add additional passes to clean "flat" areas



Turning: Additional grooving paths



• Grooving tool in turning operation = Additional grooving passes could be optionally added



Turning: Separate Compensation for Rough and Finish

and operation	0	Touriste			
Turping	Operation name				
running	TK_CONOGIJ_2				
Geometry	General Rough Semi-finish/finish Groove param	eters Strategies Break edges			
Tool	Rough type	Rough offset			8
Technology	Stairs	ZX		Operation name	Template
Y Link				TR_contour5_2	🚽 🚔
Misc. parameters	Step down	Distance X: 0.6			
	✓ Equal steps	Distance Z: 0.2		General Rough Semi-finish/finish Groove parame	ters Strategies Break edges
	Value: 2.4				
	Adaptive step down			Semi-finish	Finish
	Retreat distance	Step over: 0		ISO-Turning method 🔻	Down only
	Value: 0.2			Stairs method options	Stairs method options
		Side to side 👻	eters		
	Direction			Stairs angle : 45	Stairs angle : 45
	Zigzag 👻	Compensation		Stairs first O Stairs last	Stairs first O Stairs last
				01	01
	Rough Angle			Semi-finish offset	Einich on
	Value: 0				
)			ZX-ABS	Rest material only
				Distance X: 0	Start extension: 0
	Finish on rough geometry			Distance 7: 0	End extension: 0
			11 I I I		End extension.
ave Save & <u>C</u> alcula	ate 🔽 Si <u>m</u> ulate GCode 💽	Save & Copy Exit		Compensation	Compensation
			H		
		-	-		
		<u>Save</u> Save	e & <u>C</u> alculate	Simulate <u>G</u> Code	Save & Copy Exit

• Separate compensation for Rough and Finish in turning



Turning: Improvement of simulation

Rest Material SolidVerify Machine Simulation Host CAD Turning 3D Show data Projection Show Tool path Show material Check Both Show 3D Stop on next Clear Colors
Host CAD Tuming 3D Show data Projection Show Show material Tool path Show material Material Check Both Show 3D Stop on next Clear Colors Image: Colors Image: Colors Image: Colors
○ Tool path ○ Show material ○ Material ○ Check ○ Both ○ Show 3D Stop on next Clear Colors ○ □ + + + + + + + + + + + + + + + + + + +
Stop on next Clear Colors Image: Ima

- Scroll/Zoom/Pan by mouse
- Colored tools
- Better visualization during actions (Scroll/Zoom/Pan)



Turret Synchronization

ШТ		I T	7
01		LI	_
(13)SIM_Turn_contour3 T8 (UT-1A)	0:01		
(14)mco2 ()	0:01		
(15)F_contour4 T9 (UT-1A)	1:03		
(C) (16)TR_contour11 T10 (UT-1A)	0:01		
(17)F_contour12 T11 (UT-1A)	0:10		
(18)D_drill T12 (UT-1A)	0:15		
(19)D_drill1 T13 (UT-1A)	0:34		
(20)D_drill1_1 T14 (UT-1A)	0:09		
(21)D_drill_1 114 (UI-1A)	0:05		
(22)D_drill1_2 T15 (UT-1A)	0:03		
(23)5X_Proj_taces T16 (UT-TA)	1:43		
(24)5X_Proj_taces1 117 (UI-1A)	2:24		=
	0.20		
		(20) (20) IR_contour15 118 (L1-5A) 0:01	
(28)EM facemill T17 (UT-14)	0.25		-11
(29)i3DSurfacing model T19 (UT-1A)	0.01		
(30)F contour17 T19 (UT-1A)	5:35		
(31)mco4 ()	0:01		
(32)F contour19 T9 (UT-1A)	1:52		
(33)F_contour19_1 T9 (UT-1A)	2:29		
(34)F_contour20 T20 (UT-1A)	6:04		
((b) (35)TR_contour21 T10 (UT-1A)	0:01		
(36)5X_Proj_faces2 T16 (UT-1A)	1:29		
(37)mco5 ()	0:01		
(38)D_drill2 T21 (UT-1A)	0:36		
(39)F_contour22 T22 (UT-1A)	0:32		
2	0:28		
(40)TSlot_contour23 T23 (UT-1A)			

- Easy to use vertical interface
- Color differentiation between tables
- Customizable settings of GUI
- Documentation

Synchronization types:

- Start at the same time
- End at the same time
- Start after previous













The revolution in CNC machining



3D iMachining Operation			? ×	The new, revolutionary Milling technology
Technology	Operation name	Template	Wizard	1 machiaiaa
3D Prismatic ▼ Geometry Tool Levels Technology Wizard Technology Link Link Motion Limits Control Misc. parameters	stepDown Technology Channels Passes Step down: 35 Rest Rough	Offsets	Advanced	
	Cutting angles Cutting angles Angle Step over Min cutting angle: 13.77 Max cutting angle: 24.620001 Tolerance Tool path 0.00254			
Save Save & Calculate] Simulate GCode			

3D iMachining with intelligent step-up





3D iMachining with intelligent step-up





3D iMachining smart positioning









3D iMachining for molds


3D iMachining



3D iMachining for Prismatic parts



3D iMachining





New Product: SolidProbe

	Probe Operation Technology Cycle Pocket	Iperation name Probe	Template			$\mathbf{>}$	Z
	C Start Definition Tool Levels Technologies Misc	Tool Path Parametrs Approach / Retract Distance: 13	Modify geometry			y or the second	Z
PROBE		Levels Reposition height: Z level: 0	Measure along axis: X Shift from center: 0		-		
61	1					9	9
1			Repetitive touches: 1				
- The	Save Save & Calculate	Simulate <u>Q</u> Code	Save & Copy	Exit			
					AF		1
						0 0	00
• Home de	ofinition and	Measureme	nt Probe cycl				-
Tool pres	setter	ivicasurenie	int robe cycl				63 mm -



SolidProbe cycles



- Single point X
- Single point Y
- Single point Z
- Angle X
- Angle Y
- Angle Z
- Boss
- Pocket
- Pocket with boss
- Cylinder
- Hole
- Hole with boss
- External arc
- Internal arc
- External corner
- Internal corner
- Possibility to customize cycle usage in Measurement and Home Definition (inside *.VMID file)



Probe Tool

Choosing to Choosing to Colour	Alfor operation User d♥ Diameter ♥ FACE MILL 40 mm END MILL 15 mm END MILL 15 mm END MILL 30 mm END MILL 30 mm END MILL 36 mm SUTT MILL 8 mm DRILL 8 mm DRILL 8.05 mm DRILL 8.05 mm DRILL 3.65 mm DRILL 5.35 mm DRILL 5.35 mm DRILL 6 mm PROBE 6 mm PROBE 6 mm PROBE 6 mm PROBE 1 0 mm PROBE 1 0 mm FINAL 1 0 mm PROBE 1 0 mm FINAL 1	Number 14 Description Inch Data Data Holder Shape Tool Message Inch Total (f1): 120 Under length Inch Total (f1): 120 Shoulder length (sl): 120 Inch Total (f1): 120 Under length Hength: 130
)] X 1+8 •	Select Cancel

• Support of Probe tool in all simulations

.



SolidProbe: Home definition

Probe Operation					
Technology	Operation name	Template	i		
Start Definition	Action Home Position Measurement Geometry				
	CoordSys MAC 1 (1-Position) MAC 1 (1-Position) Show			A	
Save Save & Calculate	<u>Sim</u> ulate <u>G</u> Code	Save & Copy			
			1		
			K		•

• Probe cycles support home definition



SolidProbe: Measurement





User-defined parameters in MachineID

MACHINE ID EDITOR : table_table_exercise.vmid File Open View Help Pile Pile Pile Pile Reference Pile Pile Pile Pile Pile Pile Pile Pil							
x 26.8582 y 27.2582 x 28.3526 x 29.15791 x 28.40 Cycles 98.40 Cycle Plane X 98.40 Cycle Plane Y 98.40 Cycle P	Name GUI Name GPP Name Type Default Value Activation State	Value My parameter NUMERIC 13.000 ON	Probe Operation Technology Single point X Start Definition Tool Levels Technologies Motion Control Misc	Operation name SX_D1 Tool path Parameters Name Overtravel My parameter My parameter Tolerance Point X Point X Point Y Point Z	Templ Type Numeric Numeric Numeric 0.010 -0.010 -0.010 -0.010 -0.010	Ate	
			Save Save & Calculate	Si <u>m</u> ulate <u>G</u> C	Code	Save & C	opy <u>E</u> xit

- Parameters for each Probe cycle in *.VMID file Controller Definition page
- Separate GUI and GPP name for easier localization
- Possibility to activate/deactivate parameter by checkbox



SolidProbe: Technologies page



- Support for multi-chains(points) geometries
- Several technologies (the same cycle type) in the same operation, if needed
- Sorting of chains(points)
- Preview of several technologies
- Preview of geometries by one click
- Status of geometry with technology compatibility & A !



Machining & Probe operations intermixed

- Machining operations and Probe operations are intermixed in the CAM manger
- Machining operations and Probe operations can use the same geometries
- When the solid model is changed, both the machining and probe operations can be automatically synchronized to the change



