

ALPHACAM 2020.1 MATERIAL AND TOOLING CREATION





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Contents

Copyright	i
Conventions used in this manual	v
Recommended Operating Systems and Hardware for ALPHACAM	vi
Supported Operating Systems	vi
ALPHACAM Minimum Specifications	vi
Hexagon Customer Portal	vii
ALPHACAM esupport	viii
MATERIAL FILE	1
General Overview	1
Modifying Material File	2
Using the Material File	2
Speeds and Feeds calculation	3
ROTATING TOOLS	4
Standard Tools	4
User Defined Tools	4
Tool Definition	5
Starting Tool Definition	5
Define Tool Dialogues	6
Tooling parameters	8
Define Tool Dialogue Options	9
Tool Number	9
Offset Number	9
Length	9
Diameter	9
Corner Radius	9
Cone Angle	9
Special	10
Depth of cut	10
Maximum depth	10



Feeds and Speeds	11
Calculated	11
Fixed	11
Simulation	12
Important notes for tool holder graphical options	16
Tool Notes	17
Units	17
Spindle Rotation	17
Coolant	17
Saving the tool	17
Example of tool naming convention:	18
Tool Definition Tutorials	19
Training Tool Definitions	19
Flat 16mm	19
User Defined Tool Definition	21
2mm Corner Radius Tool Drawing	22
2mm Corner Radius Tool Definition	23
Chamfer Tool Drawing	24
Basic Tool holder	26
Basic Aggregate / Angled Tool holder	32
Programmable C Axis Aggregate / Angled Tool holder	36
Multi Drilling Head (Router Module Only)	37
2D Graphics only	
Reference Point using wireframe	44
Solid Model method	46
Reference Point using solids	51
Populating Multi Drill Units	53



Table of Images

5	
FIGURE 1 - CUSTOMER SUPPORT PORTAL	VII
FIGURE 2 - ESUPPORT PAGE	VIII
FIGURE 3 - OPENING A MATERIAL FILE IN ALPHAEDIT	2
FIGURE 4 - MATERIAL SELECTION ICON WHEN SELECTING A TOOL IN ALPHACAM	2
FIGURE 5 - MILL / ROUTER TOOL CREATION TYPE	5
FIGURE 6 - STONE TOOL CREATION TYPE	5
FIGURE 7 - MAIN TOOL CREATION DIALOGUE	6
FIGURE 8 - SPECIALS DROP DOWN	6
FIGURE 9 - SIMULATION OPTIONS FOR TOOL HOLDERS	7
FIGURE 10 - TOOL NOTES DIALOGUE	7
FIGURE 11 - REQUIRED OPTIONS WHEN CREATING A NEW TOOL	8
FIGURE 12 - SPECIAL OPTION ON FLAT TOOL, TAPER	10
FIGURE 13 - SPECIAL OPTION ON BALL END, LOLLIPOP	10
FIGURE 14 - SPECIAL OPTION ON BULLNOSE, LOLLIPOP	10
FIGURE 15 - SIMPLE TOOL DEFINITION FOR SIMULATION	12
FIGURE 16 - ADVANCED TOOL DEFINITION FOR SIMULATION	12
FIGURE 17 - NO HOLDER REQUIRED FOR SIMULATION	13
FIGURE 18 - SIMPLE HOLDER FOR SIMULATION	13
FIGURE 19 - 2D GEOMETRY PROFILE FOR SIMULATION	14
FIGURE 20 - SOLID MODELS FOR SIMULATION	14
FIGURE 21 - LIBRARY SELECTION FOR SIMULATION	15
FIGURE 22 - CURRENT DEFAULT HOLDER FOR SIMULATION	15
FIGURE 23 - TOOLING OPTIONS USING FIXED FEEDS AND SPEED	19
FIGURE 24 - TOOLING OPTIONS USING CALCULATED FEEDS AND SPEED	19
FIGURE 25 - TOOL HOLDER OPTIONS FOR SIMULATION	19
FIGURE 26 - USER DEFINED TOOLING EXAMPLES	21
FIGURE 27 - SAMPLE FORM TOOL FOR USER DEFINED TOOL CREATION	22
FIGURE 28 - WARNING NOTICE WHEN CREATING USER-DEFINED TOOLING	23
FIGURE 29 - SAMPLE CHAMFER TOOL FOR USER DEFINED TOOL CREATION	24
FIGURE 30 - WARNING NOTICE WHEN CREATING USER-DEFINED TOOLING	25
FIGURE 31 - TOOL HOLDER SELECTION OPTIONS FOR DEFINING NEW HOLDER IN MILL / STONE	26
FIGURE 32 - TOOL HOLDER SELECTION OPTIONS FOR DEFINING NEW HOLDER IN ROUTER ONL'	(27
FIGURE 33 - GEOMETRY FOR HOLDER PROFILE	28
FIGURE 34 - TOOL HOLDER GRAPHICS DEFINITION DIALOGUE	28
FIGURE 35 - SELECTING THE AXIS OF REVOLUTION	29
FIGURE 36 - LOCATION POINT ON ACTIVE DRAWING FOR THE TOP OF THE TOOL	30
FIGURE 37 - LOCATION POINT DIALOGUE FOR THE MACHINE GAUGE LINE REFERENCE POINT	31
FIGURE 38 - GAUGE LINE REFERENCE LOCATION POINT	31
FIGURE 39 - SAMPLE ANGLED HEAD UNIT	32
FIGURE 40 - TOOL LOCATION CIRCLE	32
FIGURE 41 - TOOL HOLDER SELECTION OPTIONS FOR DEFINING NEW HOLDER IN MILL / STONE	33
FIGURE 42 - TOOL HOLDER SELECTION OPTIONS FOR DEFINING NEW HOLDER IN ROUTER ONL'	Y 33
FIGURE 43 - SELECTING THE REFERENCE CIRCLE FOR TOOLING LOCATION	34
FIGURE 44 - SELECTING THE GAUGE LINE REFERENCE POINT	35
FIGURE 45 - TOOL HOLDER SELECTION OPTIONS FOR DEFINING NEW HOLDER IN MILL / STONE	36
FIGURE 46 - TOOL HOLDER SELECTION OPTIONS FOR DEFINING NEW HOLDER IN ROUTER ONL'	Y 36
FIGURE 47 - EXAMPLE MULTI DRILL GEOMETRY INCLUDING SOLID MODELS	37
FIGURE 48 - EXAMPLE MULTI DRILL UNIT USING 2D GEOMETRIES ONLY	38
FIGURE 49 - TOOL HOLDER SELECTION OPTIONS FOR DEFINING NEW HOLDER IN ROUTER ONL'	(39
FIGURE 50 - GEOMETRY SELECTION PROMPT BAR	39
FIGURE 51 - GRAPHICS SELECTOR DIALOGUE OPTIONS	40



FIGURE 52 - TOOL REFERENCE CIRCLE PROMPT FIGURE 53 - OPTIONAL REFERENCE INFORMATION DIALOGUE FIGURE 54 - MAIN BODY SELECTION PROMPT FIGURE 55 - MAIN BODY REFERENCE DIALOGUE	41 41 42 42
FIGURE 56 - GAUGE LINE REFERENCE PROMPT	43
FIGURE 57 - ADDING THE MULTIDRILL UNIT	44
FIGURE 58 - SETTING THE UNIT REFERENCE POINT	44
FIGURE 59 - EXAMPLE REFERENCE POINT	44
FIGURE 60 - UNIT LOCATION PROMPT FOR X & Y	45
FIGURE 61 - UNIT LOCATION PROMPT FOR Z	45 46
FIGURE 62 - EXAMPLE MULTI DRILL GEOMETRY INCLUDING SOLID MODELS FIGURE 63 - TOOL HOLDER SELECTION OPTIONS FOR DEFINING NEW HOLDER IN ROUTER ONLY	-
FIGURE 63 - TOOL HOLDER SELECTION OF HONS FOR DEFINING NEW HOLDER IN ROUTER ONLY FIGURE 64 - GEOMETRY SELECTION PROMPT BAR	47 47
FIGURE 65 - TOOL LOCATION PROMPT	47
FIGURE 66 - SELECT THE CORRECT TOOL LOCATION CIRCLE	48
FIGURE 67 - OPTIONAL REFERENCE INFORMATION DIALOGUE	48
FIGURE 68 - MAIN BODY SELECTION PROMPT	49
FIGURE 69 - MAIN BODY REFERENCE DIALOGUE	49
FIGURE 70 - GAUGE LINE REFERENCE PROMPT	50
FIGURE 71 - ADDING THE MULTIDRILL UNIT	51
FIGURE 72 - SETTING THE UNIT REFERENCE POINT	51
FIGURE 73 - EXAMPLE REFERENCE POINT	51
FIGURE 74 - UNIT LOCATION PROMPT FOR X & Y	52
FIGURE 75 - UNIT LOCATION PROMPT FOR Z	52
FIGURE 76 - MULTI DRILL PROJECT MANAGER PAGE	53
FIGURE 77 - <rclick> MENU FOR MULTI DRILL MAIN UNIT</rclick>	53
FIGURE 78 - <rclick> MENU FOR DRILL LOCATIONS</rclick>	54
FIGURE 79 - FULLY LOADED MULTI DRILL UNIT PROJECT MANAGER PAGE	54
FIGURE 80 - FULLY LOADED MULTI DRILL UNIT	55



Conventions used in this manual

To enable you to use the information in this guide effectively, you need to understand the conventions used in the guide to represent differing types of information.

- Buttons on the screen are represented as the button text in square brackets. For example: Click on [OK].
- Keys on the keyboard are represented as bold lettering in between < > characters.
 For example: Press <Enter>.
- Ribbon Tab options are represented as a path with the Ribbon Tab in UPPER case with sub menus Capitalised and separated with an arrow For example: Select FILE > Open.
- Field names are represented as bold text. And the value to be entered will be represented by Bold Text.
 For example: Enter the value 50 in the Offset field. Or When prompted for the X & Y values type 100,50 <Enter>

Denotes a **<LClick>** or Primary Mouse Button Click.

- Denotes a **<RClick>** or Secondary Mouse Button Click.
- This is a note. It contains useful or additional information.
- + This is a reference. It directs you to another part of the user guide.
 - This is a thought box. It is generally used in exercises and contains a question for you to consider.
 - This is a highlighted note to emphasise information
 - This is a warning; it contains information that you must not ignore.
- This is a tip. It is generally used in exercises and offers further advice.
- 1. This is the first line of a number list item
- 2. This is the second item of the numbered instructions, which you must
- 3. Follow in sequence.
- This is a list

- of items, in which
- The order is not important.



Recommended Operating Systems and Hardware for ALPHACAM

Supported Operating Systems

- Operating System
- 64bit operating systems of the following list are supported,
 - Windows 7 (Professional, Enterprise or Ultimate) SP1 required,
 - Windows 8.1 Professional and Enterprise,
 - Windows 10 Professional and Enterprise.
- Alphacam will install and run on the 'Home' editions of the above operating systems. However, this is
 not recommended, and we cannot guarantee to fix any Alphacam issues specifically related to these
 operating systems.
- Nvidia or ATI Open GL Graphics Card with 1Gb dedicated memory
- \square

We recommend you keep up to date with the with the latest Software Updates for the supported operating systems and drivers for your hardware base.

Any Windows Operating system (OS) prior to and including Vista, is not a supported operating system.

ALPHACAM Minimum Specifications

The latest minimum specification can be found at http://www.alphacam.com/systemrequirements

This minimum specification is to run any **ALPHACAM Essential** module, you will need to considerably increase the specification if you are working with solid models and producing the NC code for 3D machining and 3, 4, or 5 axis simultaneous machining strategies.

Your minimum specifications should be the fastest processor with the most memory and the highest specification video card that your budget will allow.

If using Autodesk Inventor Files, please check the current Inventor View requirements at autodesk inventor view



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- Reference to the Customer Support Charter at any time.
- View the status of your Technical Support cases.
- View all purchased Professional Services like Training and Consultancy.

HEXAGON					Home Licensing S	upport Community Reports Down	hloads Account Details Help Ld
Current User							Support Status: Su
	Home						Site Map Log O
Search	Licensing	Support	Community	Reports	Downloads	Account Details	Help
Recent Items							
	Software Licenses	11 Technical Support Cases	Customer Community Forums	Technical Support Metrics	K Software	🐍 Login Details	∦vn How to guides
	Manual Revocation	Support Charter	🗳 FAQ	Professional Services	Training Materials	Company Details	Customer Notification
		Remote Support	Knowledge Base	Maintenance Schedule			nortal Help Videos
				👻 License History			Cicense Documentation
				💱 Support Status			



For the Hexagon Customer Portal visit customers.ps.hexagonmi.com



ALPHACAM esupport

Another location to gain valuable information about using the software or asking other experienced users for assistance are the esupport forums.

esupport.verosoftware.com/alpha	acam/
	HEXAGON = Q Search
	ALPHACAM Alphacam - Blog Forums Knowledge Base Videos Training Sub-Groups V More
	Forum Rules
	The Alphacam Customer Community Forum membership is formed of knowledgeable Alphacam resellers and users from around the world with diverse backgrounds and experiences. Alphacam's Customer Community Forums is a place to join conversations, collaborate with others, and share valuable information you won't find anywhere else. We ask that you please follow these simple posting guidelines.
	Rules of the eCommunity
	The #1 rule is to discuss Alphacam technology in a constructive way.
	Alphacam's technical support, bugs, development tasks, or reseller support should be taken directly to your Alphacam reseller. Alternately log a support case <u>here</u>
	While debating and discussion is fine, we will not tolerate rudeness, profanity, insulting posts or personal attacks.
	You agree that the administrative staff of the Customer Community Forums reserve the right to remove, edit, move or close any thread, private message, forum, social group, or any other aspect of the site for any reason we see fit. You agree that the administrative staff has the right disable, ban, delete, or modify user accounts for any reason.
Figure 2 - esupport page	

Asking a question of the community, using the knowledge base or other available information links could save you time if you have a problem that someone else may already have supplied a solution for.



MATERIAL FILE

General Overview

The material file is used to store the surface cutting speed for any given cutting condition. Each module has a related **Material File** and these are in the LICOMDAT folder. The different material files are:

- Module File Name
 Cutting Speed Type
- Milling Mmat.dat
 Rotational Surface Speed of Tool
- Router Rmat.dat
 Rotational Surface Speed of Tool
- Lathe Tmat.dat Rotational Surface Speed of Part
- Wire Wmat.dat Linear Feed Rate Value
- Profile Lmat.dat Linear Feed Rate Value
- Stone Smat.dat
 Rotational Surface Speed of Tool

They are all basically the same format and each material definition consists of a minimum of 2 lines.

- 1. \$ Unique Reference
- 2. Cutting Speed and Units

The first line is the unique reference which is displayed in the select a material dialogue.

The reference line needs to start with \$ and can be up to 60 characters long, only the first 48 characters are displayed, and must be unique to the file. It should be descriptive and include those items that influence a change in cutting speed, E.G. Part Material - Tool Material - Work Holding - Cutting Type etc.

In the MMAT, RMAT & SMAT.dat files the cutting speed is the constant surface speed of the cutter expressed in either Ft/Min or M/Min.

In the LMAT.dat file the cutting speed is the constant surface speed of the Part expressed in either Ft/Min or M/Min.

In the LMAT and WMAT.dat files the cutting speed is the value of the linear feed rate, the units are not specified as the units are as in the job where it is being applied.

Time spent on your CNC Machining Centre adjusting speeds and feeds will be minimised if you spend time correcting the m/min values.

If you are hesitant about what values to use, then speak to your tooling representative, they will be able give you advice.



Modifying Material File

You edit the Material file using **Alphaedit**, this is the editor supplied with your system. Alphaedit is a multiwindow editor that has specific functionality for editing and manipulating NC files.

To edit a material file, start Alphaedit and select **FILE > Open Material > [module]**, the material file is a text file and can be changed or modified to suit your requirements. The editor provides cut and paste facilities to duplicate and create new material entries.

Prev Inser Save Save Ope Save Ope Save Save Ope Save Cope			Utils	Comms	Wind
Prev Inser Save Save Ope Save Ope Save Save Ope Save Cope Save Ope	ew pen NC/Text	Ctrl	+0	Find Replace	
Save Save Clos Ope Save The save The save The save Save	eview Drawing Files			Next Search	c
Save Clos Ope Save Save Save Cope Save Cope Save Cope Cope Save Cope Save Cope Save Cope Save Cope Save Save Save Save Save Save Save Sav	sert	Ctrl+	Ins		
Clos Ope Save Save Save Cope Save Save Cope Save Cope Save Save Save Save Cope Save Save Save Save Save Save Save Sav	ve	Ctr	+S		
Ope Save Save Save Cope Save Save Cope 1 F:\	ve As NC/Text				
Save Ope Save Set I Ope Save Save Con 1 F:\	ose				
Ope Save Set I Ope Save Save Con 1 F:\	pen Parametric Macro		•		
Save Set I Ope Save Con 1 F:\	ve As Parametric Macro		•		
Set I Ope Save Print Con 1 F:\	pen Post		•		
Ope Save Print Con 1 F:\	ve As Post		•		
Save Print Cont 1 F:\	t Default Post		•		
Print Cont 1 F:\	pen Material		•		
Con 1 F:\	ve As Material	5	•	Mill	
1 F:\	int	Ctrl	+ P	Router	
	onfigure		•	Turning	
2 (1)	F:\Training\Text Post.arp			Profiling	
2	2 C:\Alphacam\\Turning.anc Wire B				
3 Alp	3 Alphastudy.txt Stone				
4 Ho	Housing Plate with mach	nining.PGN			
🗙 Exit	it				

Figure 3 - Opening a Material File in Alphaedit

Using the Material File

When you select a tool the Speeds and/or Feeds are calculated from the active Material Reference, this is the first entry in the material file when starting a new job; therefore, you **MUST** select a material reference prior to selecting the tool.

The material selection can be made from MACHINE > Select Material \mathscr{B}^* or selecting the material button on the tool selection dialogue.



Figure 4 - Material selection icon when selecting a tool in Alphacam



Speeds and Feeds calculation

When a tool is defined, the feeds and speeds can be chosen to be automatically calculated or to be fixed. For tools where calculated feeds and speeds are used, the speed and feed values are calculated using accepted formulae with numbers taken from the tool and material data files. The calculated values can be adjusted if you feel they are not suitable for the application,

Formulae for rotary tooling:

 $RPM(S) = \frac{(Cutting Speed) \times 1000}{\pi \times Tool Diameter}$

For Metric calculations

For Imperial calculations

 $RPM (S) = \frac{(Cutting Speed) \times 12}{\pi x Tool Diameter}$ $XY Cut feed(F) = RPM \times No. of Teeth \times Feed per Tooth$ $Z Down Feed (F) = RPM \times Feed per Tooth$

Where

+

- Cutting Speed is the value stored in the Material Data file.
- The No of Teeth and Feed per Tooth are stored with the tool definition.

It must be noted at this point that due to the calculation process, feeds and speeds may well be beyond the scope of the machine tool in question.

It is the users' responsibility to ensure that any calculated figures are appropriate for the circumstances.



ROTATING TOOLS

There are two categories of rotating tools;

Standard Tools

These are tools that can be defined within the tool creation dialogue by completing the required form.

- Flat End cutters Straight or Tapered.
- Bull Nose cutters Straight, Tapered or Under Cut
- Ball End cutters
 Straight, Tapered or Lollipop
- Drills
 Twist, Lip & Spur or Core
- Taps.
- Saws/Disc.

User Defined Tools

A user defined tool is any tool that does not conform to the above standard definitions. You must have a complete closed profile of the cross section of the tool visible in the drawing area of Alphacam prior to creating this form of tooling.

If you use differing types of User Defined tooling, it may prove easier to download the tooling cross section from the suppliers' web site rather than draw complex gang or stack tooling yourself.



Tool Definition

The only difference in the definition between standard tools and user defined tools is that for User Defined tools you must select the tool cross section geometry on screen prior to the tool dialogue starting.

If tool holder geometry is to be attached to the tool, it is necessary to have the holder geometry on screen and in the correct orientation prior to starting the tool definition as you will be required to select it as part of the tool definition process.

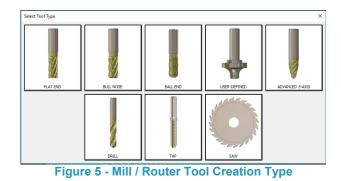
Using Solid representations for the tool holder, these need to be on screen and in the correct orientation prior to the tool definition process commencing.

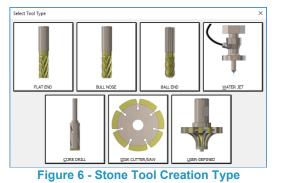
Not all modules of ALPHACAM support the different tool holder creation options.

Starting Tool Definition



The Select Tool Type dialogue box is displayed.





Select the picture of the tool to be defined and the **Define Tool** dialogue box will be displayed.



Define Tool Dialogues

ooling Tool Number Offset Number Length Diameter	1 0 0 0 0	
Special None	×	Units
Shank Diameter	0	Metric Inch
Taper Angle	0	Spindle Rotation
End Diameter	0	⊚ cw ⊖ ccw
ut Depths		Coolant
Depth of Cut	0	None
Maximum Depth	0	⊖ Mist
		OFlood
olour Default	Edit	○ Through Tool
eeds and Speeds		
Calculated		O Fixed Redraw
Feed/Tooth	0	Spindle Speed 0 Simulation
Number of Teeth	1	Fixed Feed 0 Tool Notes
		Fixed Down Feed 0

Figure 7 - Main Tool Creation Dialogue

Special Tape	r ~
Shank Diameter	0
Taper Angle	0
End Diameter	0
Figure 8 - Specials Dro	op Down



Define Tool - FLAT END		×
Tool Simulation Simple Advanced (Solid) Re-select Use profile for simulation		
Holder Simulation None, or default when used Simple Tool Holder Graphics using Profiles Advanced (Solid) Select from Library Current Default Holder Re-select	Tool Holder Length 0 Diameter 0 Default	
Options Tool tip to Gauge Line Length 0		
OK	Cancel	

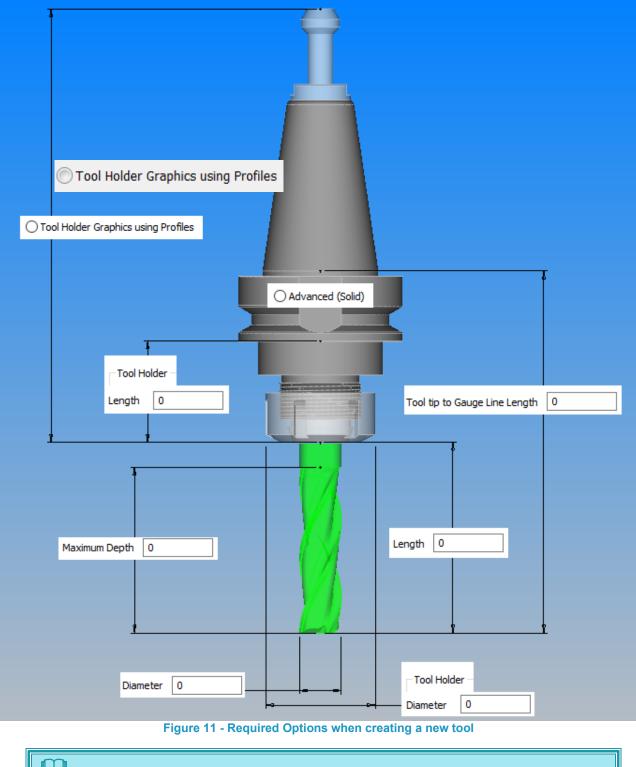
Figure 9 - Simulation Options for Tool Holders

Tool Notes		\times
Note [TNT]		
N Tool Post Data [TPD(N)]		
1		^
3	 	- 1
4		
Edit OK	Cance	I

Figure 10 - Tool Notes Dialogue



Tooling parameters



Your actual tool holders may differ from the example shown; this is just a representation to show the different elements that are controlled via the option boxes within the Tool Definition parameters.

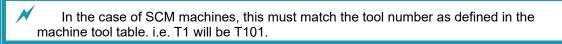


Define Tool Dialogue Options

Tool Number

This is the T number that will be output in the program. If you use standard tooling set-ups where tools have set positions in a carousel, then use the tools' normal position number.

If the tool position is not standard then a number greater than that allowed on the machine should be used, as it will require changing when the operation is processed. This also ensures that an incorrect tool is not selected if you forget to set the correct tool number.



In the case of many Biesse machines, the tool number may not be used on router bits, it is the tool name. Usually the tool name is taken from the Tool Note value [TNT]; this should match that set on the machine.

Offset Number

This is the number of the offset register assigned to the tool. If this field is left at 0 then the default will be the tool number (this is normal).

Length

This option specifies the length of the tool that extends below the tool holder. The tool length is **NOT** used in any automatic checking it is used for visual checking during simulation.

Diameter

This is the nominal cutting diameter of the tool.

Corner Radius

This is the corner radius on the Bull Nose tools.

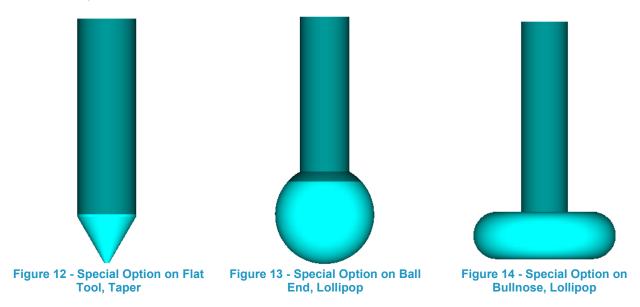
Cone Angle

The Cone Angle is the included angle at the tip of a Drill. le.118° or 120°, for twist drills, 180° for Lip & Spur, Flat ended Drills (C/Bores) and 60° for glass drills.



Special

The Special options allow for the definition of lollipop and taper tools. Lollipop cutters allow re-entrant tool paths to be created.



Depth of cut

This is only used when using Auto Z machining, it is the depth of material that this tool can remove in one pass (full width cut). This determines how many cuts in Z are to be used when applying Auto Z machining strategies.

Maximum depth

This is the working flute length of the tool. This value is used for two purposes;

- 1. To colour the tool cut length differently for visual checking.
- 2. To provide a warning when exceeding this value when machining.

Please note that the simulation shows what happens in ALPHACAM, it is not verification and therefore it is your responsibility to ensure that the tool's length and diameter are set correctly on the machine to ensure successful machining.



Feeds and Speeds

This section allows you to control the feeds and speed values that are output in the program, there are two options **Calculated** and **Fixed**.

Calculated

This calculates the spindle RPM using the cutting rate from the current material setting and tool diameter.

- **Feed/Tooth** This is the amount of material removed by each tooth per revolution of the cutter.
- Number of Teeth -This specifies the number of cutting edges for XY motion it is assumed that there is only one cutting edge in Z (the one that crosses the centre line).

These values are used with the spindle speed to calculate the linear feed rate.

Fixed

These values are directly output on the NC-code

- Spindle Speed is the RPM to be used.
- Fixed Feed is the linear feed rate used when the tool is cutting the material expressed in mm per min.
- Fixed Down Feed is the linear feed rate used when the tool is feeding into the material in Z expressed in mm per min.

If the machine uses Meters per min the post will adjust the values to suit.



tool

Simulation

This option allows the choice between two differing Tool simulation options and six different tool holder options which will give a graphical representation of the tool and holder during any simulation run.

For Tooling options;

Tool Simulation	• Simple uses the dialogue options within the too creation process to generate a basic cylinder to represent the tool in the simulation routine.
Figure 15 - Simple Tool Definition for Simulation	
 ○ Simple ○ Advanced (Solid) ○ Re-select ○ Use profile for simulation 	 Advanced (Solid) allows you to select a solid model of the tool to be used in the simulation process. The dialogue for tool creation still needs to be completed but the graphics from the creation process are replaced by the solid model graphics.
Figure 16 - Advanced Tool Definition for Simulatio	

The I Re-select option allows for the addition of a solid model to an existing tool in a library.

 \cap The solid model representing the tooling must be on screen and in the correct attitude prior to the creation process if • Advanced is to be used.



For Tool Holder Options

⊙ Non or default when used

Sets the tool without a representation of a holder if a default option has not been created or uses the default holder when set.

Tool Simulation			
Simple			
O Advanced (Solid)	l l		
☑ Re-select			5
Use profile for simulation			Ē.
Holder Simulation			
○ None, or default when used	Tool Holder		
Simple		Length	0
◯ Tool Holder Graphics using Profiles			
O Advanced (Solid)		Diameter	0
◯ Select from Library			
○ Current Default Holder		Default	
Re-select			
Options			
Tool tip to Gauge Line Length 0			
ОК	Cancel		

Figure 17 - No holder required for simulation

⊙ Simple Holder

Allows the creation of a simple cylinder to represent the collet nut or lowest section of the holder.

Fool Simulation		
Simple		
Advanced (Solid)		
Re-select		
Use profile for simulation		
Holder Simulation		
○ None, or default when used	Tool Holder	
Simple	Length 40	
○ Tool Holder Graphics using Profiles		
O Advanced (Solid)	Diameter 50	
Select from Library		
Current Default Holder	Default	
Re-select		
Options		
Tool tip to Gauge Line Length 0		
ОК	Cancel	

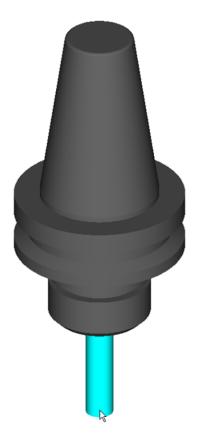


ALPHACAM 2020.1 Material and Tooling Creation

• Tool holder Graphics using Profiles-

This option allows a graphical representation of the tool holder to be selected from the screen; its definition will be associated and displayed with the tool.

Tool Simulation Simple			
Advanced (Solid)			
Re-select			
Use profile for simulation			F
Holder Simulation			
○ None, or default when used	Testustas		
) Simple	Tool Holder	Length	40
Tool Holder Graphics using Profiles		-	
Advanced (Solid)		Diameter	50
◯ Select from Library		D - f - dt	
O Current Default Holder		Default	
Re-select			
Options			
Tool tip to Gauge Line Length 0			
QK	Cancel		



Advanced (Solid) A

Allows the use of tooling and holders created in a solid modelling package to be included in the tool definition.

Tool Simulation		
Simple		
○ Advanced (Solid)		
Use profile for simulation		
Holder Simulation		
○ None, or default when used	Tool Holder	
○ Simple	Lengl	th 40
O Tool Holder Graphics using Profiles	Diamet	er 50
Advanced (Solid)		
Select from Library	Default	
○ Current Default Holder ☑ Re-select		
Options		
Tool tip to Gauge Line Length 0		
ОК	Cancel	

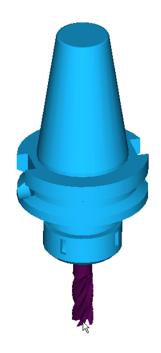


Figure 20 - Solid models for simulation



⊙ Select from Library

Allows for the selection of pre-built or saved tool holders from the current Alphacam tool holder library folder.

Define Tool - FLAT END		×				
Tool Simulation						
Advanced (Solid)		🐫 Open				
Re-select		Look in:	I Holders.alp	•	G 🤌 📂 🛄 🗸	
Use profile for simulation		(And	Name	*	Date modified	Туре 🔺
		S	🏂 HSK 63.a	toolholder	08/09/2014 11:51	Alphac
Holder Simulation		Recent Places	🏂 HSK D7 S	Stubby.atoolholder	08/09/2014 11:51	Alphac
○ None, or default when used			🏂 HSK D10	Stubby Extension.atoolholder	08/09/2014 11:51	Alphac _
Simple	Tool Holder			tapered Extension.atoolholder	08/09/2014 11:51	Alphac
	Length 40	Desktop		Extension.atoolholder	08/09/2014 11:51	Alphac
O Tool Holder Graphics using Profiles		<u> – – – – – – – – – – – – – – – – – – –</u>	🔽 🏂 HSK D10		08/09/2014 11:51	Alphac
O Advanced (Solid)	Diameter 50			Stubby.atoolholder	08/09/2014 11:51	Alphac
Select from Library		Libraries		atoolholder	08/09/2014 11:51	Alphac
	Default			Tapered.atoolholder	08/09/2014 11:51	Alphac
O Current Default Holder		i 🔍	🏂 HSK D16	atoolholder	08/09/2014 11:51	Alphac
Re-select		Computer		Extension.atoolholder	08/09/2014 11:51	Alphac
				Extension.atoolholder	08/09/2014 11:51	Alphac
Options			3 HSK D32	Extension.atoolholder	08/09/2014 11:51	Alphac 👻
Tool tip to Gauge Line Length 0		Network	•			•
Tool up to Gauge Line Length 0			File name:	HSK D10.atoolholder	•	Open
			Files of type:	Alphacam Holder (*.atoolholder)	•	Cancel
ОК	Cancel					

Figure 21 - Library selection for simulation

⊙ Current Default Holder

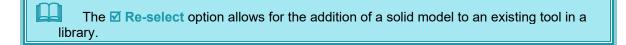
Sets the option for the default holder that will be used when creating tools.

Tool Simulation Simple Advanced (Solid) Re-select Use profile for simulation		
Holder Simulation None, or default when used Simple Tool Holder Graphics using Profiles Advanced (Solid) Select from Library © <u>Current Default Holder</u> Re-select	Tool Holder Length 40 Diameter 50 Default	
Options Tool tip to Gauge Line Length 0		

Figure 22 - Current default holder for simulation



Important notes for tool holder graphical options



The use of Solid Models as representations of tool holders and tooling will be restricted by the solid file type that your Alphacam module can import.

The tool holder cross section or solid model must be on screen prior to starting the tool definition if either the Using Profiles or Using Solids options are required. After selecting [OK] you will be prompted to select the tool holder geometry or solid prior to saving the tool definition.

The tool holder graphics or the Solid Model must be in the correct orientation when on screen to depict the correct look of the tool and holder arrangement.



Tool Notes

This button activates the tool notes dialogue box.

• Note [TNT] -

This is a note that is output in the operations list and as a comment where the tool is loaded in the program. This can be left blank if required.

Some machine post processors require the tool note name in the tool call command for the program, so it may be a requirement to have a value entered in some instances.

• N Tool Post Data [TPD(N)] -

This is data array of 100 variables that can be utilised by the post processor to access specific tooling related variables that are not normally available. Your engineer will inform you if the use of TPD is required and what variables are required.

Units

This specifies the units of the values used in the tool definition.

Metric Drawing, Metric Tooling definition together with a Metric Post Processor = Metric output code.

Imperial Drawing, Imperial Tooling definition together with an Imperial Post Processor = Imperial output code.

Spindle Rotation

This specifies the cutting rotation for the tool. Normal tools cut with the spindle running in a Clockwise direction. Left-handed tools cut with the spindle running in a counter clockwise direct.

The spindle rotation direction is set so that the tool will spin in the correct cutting direction to allow it to function. For example, if an aggregate or angled head is being used, the spindle rotation may be in reverse so that the actual tool rotates correctly.

Coolant

This section allows you to pre-set the coolant to be used with this tool. The option can be altered at the point of use if required.

Saving the tool

When the **[OK]** button is selected, the system will prompt you to select the tool holder geometry if this option has been selected, the Save dialogue box will be displayed.

The save dialogue allows you to save the tool definition file using a filename of your choice, a tool naming and library convention should be established to make the tool selection as simple as possible.



Example of tool naming convention:

Tool	Dia.	Units	Corner	Cut	Overall	No. of	Cutting	Tool	Cut
Туре			Rad.	Depth	length.	Teeth	motion	Mat.	Туре

Tool Type Flat, Bull, Ball Drill, Tap, Saw, User, denotes the tool type,

18mm denotes tool diameter and Units x angle,

3R denotes the corner rad on bull nose tools,

3F is the number of flutes,

Cutting Motion is denoted by EC for End/Plunge Cutting or SC for Side Cutting only,

Tool material is denoted by SCB = Solid Carbide, TCT = Carbide Tipped, HSS, Hsco, TiCN coated tools etc. The cut type is denoted by Rgh, Fin, Profile, and Spot

E.G

Flat 18mm 50CD 75OL EC SCB Saw 250mm x 3 100CD CBN User 10mm x 45 6CD 50OL TCT Chamfer. User EMC4 CD14 OL54 SC TCT

Drill 10mm x 120 60CD 80OL HSS Flat 10mm x 45 6CD 50OL HSS Chamfer Drill 20mm x 90 12CD 50OL SCB Spot.

Along with the tool naming convention, tools should be organised into libraries. Folders could be based on:

Folders could be based on:

Machine type i.e. machine1, machine2

Process type	i.e.	CDM tools, APM tools, Automation Tools, Roughing, Finishing
Tool type	i.e.	Flat, Bull, Ball

There is no limitation as to the setup of your tooling library; it is up to you to choose an appropriate naming convention and storage system that best suits your processing requirements.



Tool Definition Tutorials

Training Tool Definitions

Flat 16mm

Select MACHINE > Define Tool

From the displayed dialogue select the **FLAT END** tool. Set the following values in the Tool definition dialogue.

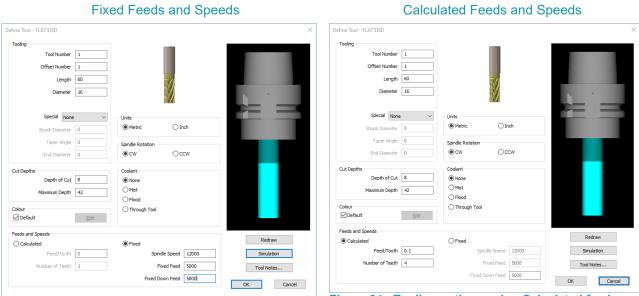


Figure 24 - Tooling options using Calculated feeds and Figure 23 - Tooling options using Fixed feeds and speed speed

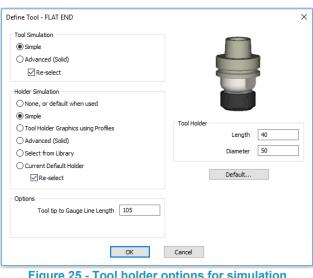


Figure 25 - Tool holder options for simulation



Select **[OK]** from the **Tool holder** dialogue, then **[OK]** from the **Tool Definition** dialogue. Navigate to the training tool library, and save the tool under a suitable name

E.g. 16mm Flat

Also, create the following tools using depths, feeds and speed, and coolant options that are appropriate for your working environment.

Name them with suitable options that will allow you to easily identify them when required.

- 8mm Flat.
- 6mm Twist Drill.
- 15mm x 120° Chamfer Drill.
- 8mm twist Drill.
- 12mm x 30° engraver.
- 10mm x 45° chamfer cutter.
- R2 corner rounding.



User Defined Tool Definition

User Defined tools can be used for engraving though today most users use the tapered flat tool definition for engraving tools as this provides better options.

User Defined tools are for cutting profiled/shaped edges or grooves with profiled sides. The creation of user defined tools is the same as the Standard definition except that the geometry representing the tool **MUST** be visible prior to starting the definition.

The Length and Diameter values will be extracted from the geometry profile selected. The geometry representing the tool must be created vertical, to the correct size and it must be symmetrical.

Rotating tools for profiled edges or for cutting grooves with profiled sides can be complex and the NC programming point (Z0) for these tools is often not the tip, but some easily measured feature such as a shoulder. This will enable the tool length compensation value in the controller to be easily adjusted to suit the tool in use. Also, the effective diameter that is used to apply G41/42 offset at the machine to compensate for tool wear is not necessarily the largest diameter, or even the diameter at the material top, but an easily measured diameter that is the effective diameter when the tool is in use.

These diagrams show some possible tool shapes: -

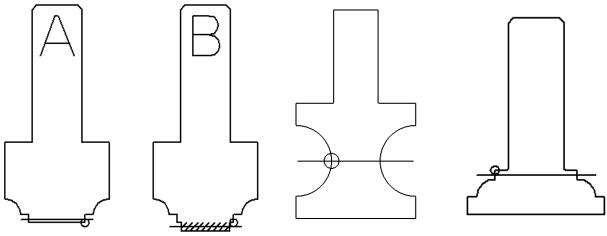


Figure 26 - User Defined tooling examples

When you create the drawing of the shaped tool outline two additional geometries are required.

A circle (of any diameter) with its centre snapped on the tool profile where the tool length will be measured to.

The centre of the circle marks the Z level that will be used as the NC programming Z 0 value.

A single horizontal line (of any length) that intersects the tool outline at the diameter that is to be used as the effective diameter. The diagrams above show various possibilities.

When using a line to define the effective diameter a circle MUST be used to define the driven Z even if it is the tip of the tool. Fig A.

In some cases, a false end, (shown by the shaded area), can be defined on the tool to use a smaller driven diameter than the actual diameter which will produce a standard cut size. The circle defines the actual tool tip for Length setting. Fig B.



2mm Corner Radius Tool Drawing

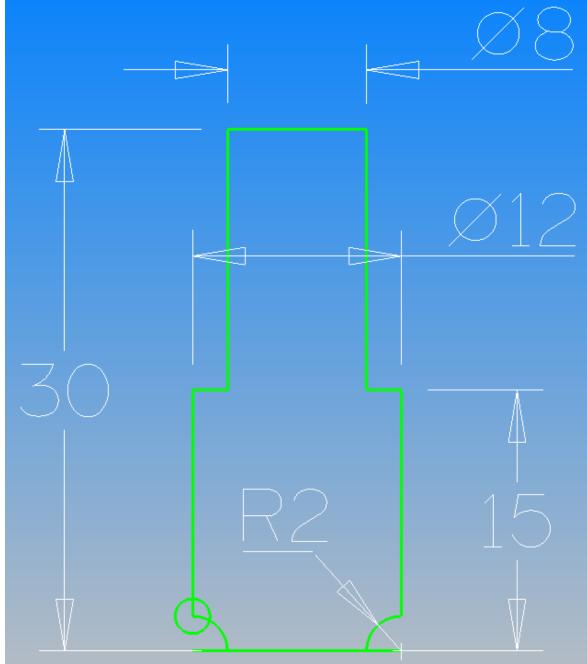


Figure 27 - Sample form tool for User Defined tool creation

Create and Save the drawing as shown. Leave visible on the screen for the tool definition.



2mm Corner Radius Tool Definition



Select MACHINE > Define Tool From the displayed dialogue select the USER-DEFINED tool The system will display the graphics area and be prompting you: Pick Geometry Defining Cross Section, <LClick> on the geometry profile of the tool. The warning dialogue should be displayed:

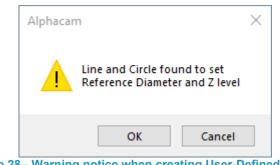


Figure 28 - Warning notice when creating User-Defined tooling

If it does not, then it is usually because the circle is not snapped onto the tool geometry profile.

Set the values in the Tool definition dialogue.

Select [OK].

Navigate to your tool library and save the tool under a suitable name.

E.g. 2mm Corner Rounding Cutter



Chamfer Tool Drawing

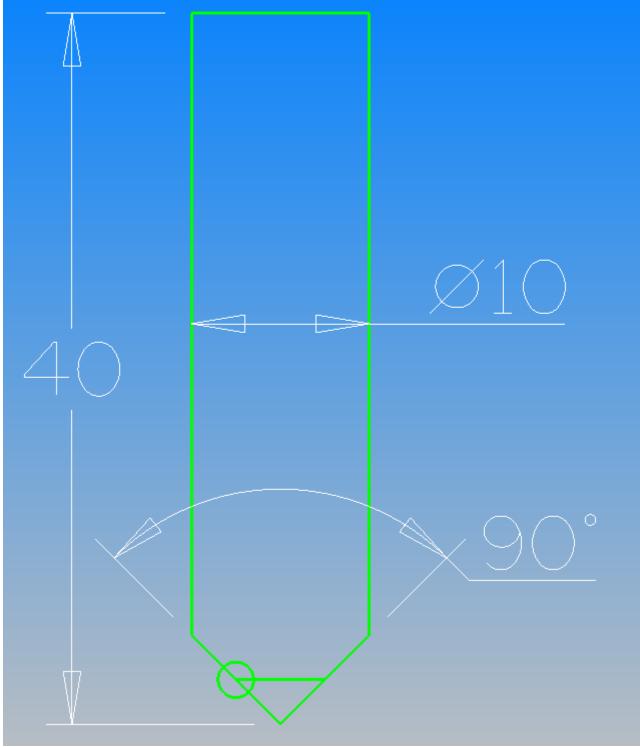


Figure 29 - Sample chamfer tool for User Defined tool creation

Create and Save the drawing as shown. Leave visible on the screen for the tool definition.



Chamfer Tool Definition

Select MACHINE > Define Tool

From the displayed dialogue select the **USER-DEFINED** tool. The system will display the graphics area and be prompting you: **Pick Geometry Defining Cross Section, <LClick>** on the geometry profile of the tool. The warning dialogue should be displayed:

Alphacar	n	\times
	Line and Circle for Reference Diamet	

Figure 30 - Warning notice when creating User-Defined tooling

If it does not, then it is usually because the circle is not snapped onto the tool geometry profile.

Set the values in the Tool definition dialogue.

Select [OK].

Navigate to your tool library and save the tool under a suitable name.

Eg ; 20dia x 45 Chamfer Cutter



Tool Holder Tutorials

The process for creating a tool holder for the simulation is almost identical to the requirements for creating representations of the tools themselves.

There needs to be either of the following items on screen prior to commencing the dialogue;

- A 2D geometric profile of the tool holder, in the correct attitude as it would appear on the actual machine.
- A 3D solid model representation of the tool holder, in the correct attitude as it would appear on the actual machine.

Basic Tool holder

Open the sample drawing ".... ALP TRG 112 2D Machining 2020\Examples\Tooling\Drawings Tool Holders in correct attitude - metric"

Using **MACHINE > Define Holder/Aggregate** you are presented with the options of which type of item you wish to create.

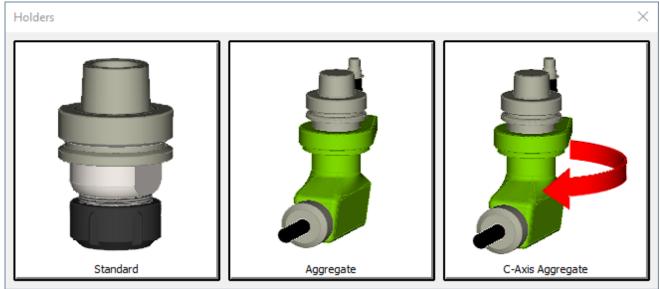


Figure 31 - Tool Holder Selection options for Defining New Holder in Mill / Stone



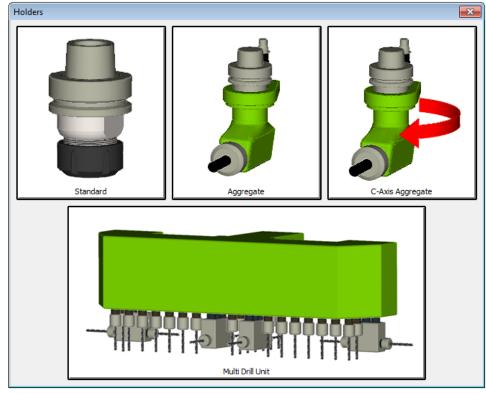


Figure 32 - Tool Holder Selection options for Defining New Holder in Router only

- Standard
- Aggregate
- C-Axis Aggregate
- Multi Drill Unit
- <LClick> the Standard option.

- A tool holder that is directly loaded into the spindle.
- A fixed aggregate or right-angled head style unit.
- As the previous option but can be rotated around the C axis of the main spindle.
- A dedicated unit of fixed position drills for panel manufacture. (Available only in the Router modules).



You are now asked at the bottom of the drawing window to select the required items that represent the tool holder.

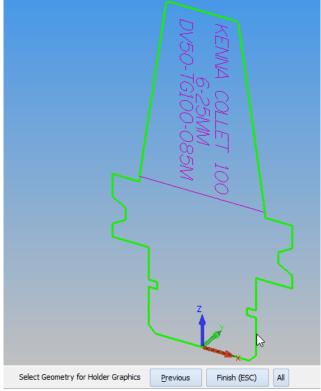


Figure 33 - Geometry for Holder Profile

In this example, select the tool holder cross section that is located on the global X, Y, Z datum. **<LClick>** on the geometry to select it, **<RClick>** to continue.

You are presented with the following dialogue to identify the Name and type of the actual tool holder.

Name	Sample Tool Holder
Solid Type	
Revolved	l
OExtruded	
◯ Solid	
	Top Z 0
	Bottom Z 0
🗹 Indude ir	dash detection checks
_	OK Cancel

Figure 34 - Tool Holder Graphics definition dialogue



The name of the tool holder is only for your reference, so any suitable name will do.

The Solid Type option is to distinguish between;

- Revolved A 2D geometry that is rotated around a specific axis.
- Extruded A 3D solid style representation.

If the representation is from a 2D profile, the Top Z and Bottom Z become available to create the required thickness. If a genuine solid model is used, then these options remain greyed out.

• Solid – A 3D solid model of the chosen tool holder.

✓ Include in Clash Detection allows for a more accurate simulation process where collision detection is critical.

<LClick> [OK] to proceed.

You are now requested for the axis to revolve the profile around, **<LClick>** the blue polyline running through the Z Axis marker.

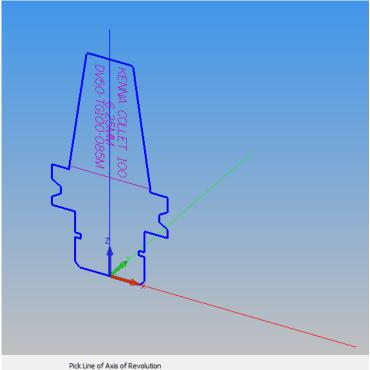


Figure 35 - Selecting the Axis of Revolution

Tool holders of this style should always be positioned with the Z axis passing up through the centre of rotation to give accurate representation of the tool holder.



You are now prompted to select the location point for the top of the tool.

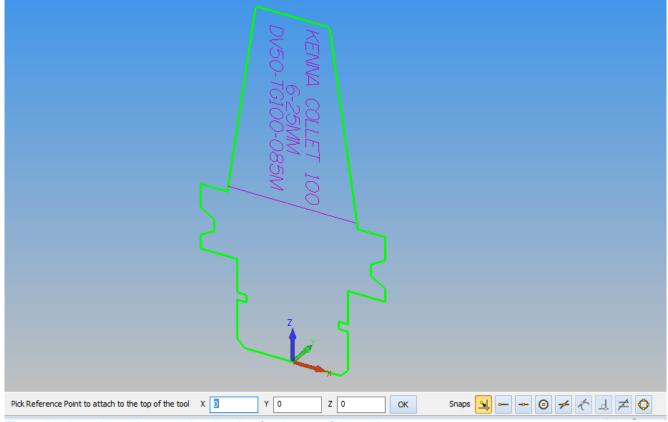


Figure 36 - Location point on active drawing for the top of the tool

In this example, all tooling will be located to the centre of the collet which is the bottom horizontal of this cross section.

The reference point is therefore as shown, X0, Y0, Z0

<LClick> [OK] to continue.



You are now requested to point that represents the Machine Gauge Line.

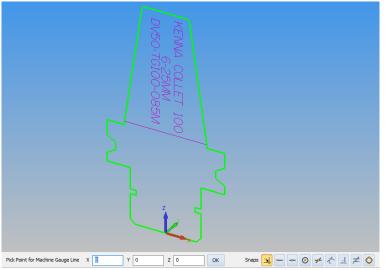


Figure 37 - Location point dialogue for the Machine Gauge Line reference point

This is a specific point that matches to the **Tool Home Position** when creating full machine simulations as detailed in the pdf **ALP TRG 112 Machine and Clamping Creation** which accompanies this pdf.

This point needs to be correctly selected so that the tool holder does not appear too far out of the spindle housing, or too far in.

In this example, the **Gauge Line** of the tool holder is the mid-point of the **Construction** line as shown.

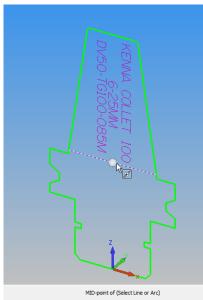


Figure 38 - Gauge Line Reference location point

Once you have selected the Gauge Line reference, you are prompted to save the tool holder with a suitable name in the default **Holders.ALP** folder in **LICOMDAT**.

This folder is non-module specific so any module of Alphacam can access any tool holder created in any module.



Basic Aggregate / Angled Tool holder

Open the sample drawing ".... ALP TRG 112 2D Machining 2020\Examples\Tooling\Drawings\Single Point Aggregate"

For the simulation to work correctly the location of the cutting tool must be defined using a circle of any size located in the correct position on the solid model.

For this we need to first create a work plane to draw the circle on.



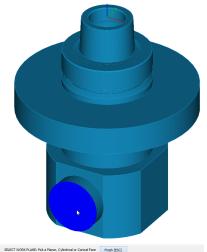


Figure 39 - Sample Angled Head unit

<RClick> to finish.



Select GEOMETRY > Circle > Centre + Diameter

Set the diameter to 10mm, <LClick> [OK] to continue.



CENTRE of (Select Arc) Figure 40 - Tool Location circle

For the location of the circle, use the Centre of **<F8>** snap and select the location shown above.

<RClick> to finish.



Using Machine > Define Holder/Aggregate



you are presented with the options of which type of item you wish to create.

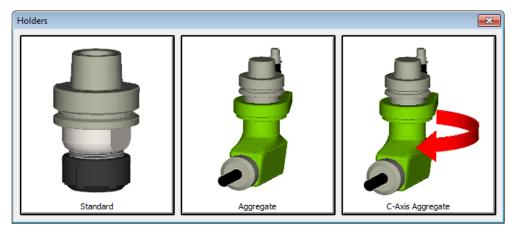


Figure 41 - Tool Holder Selection options for Defining New Holder in Mill / Stone

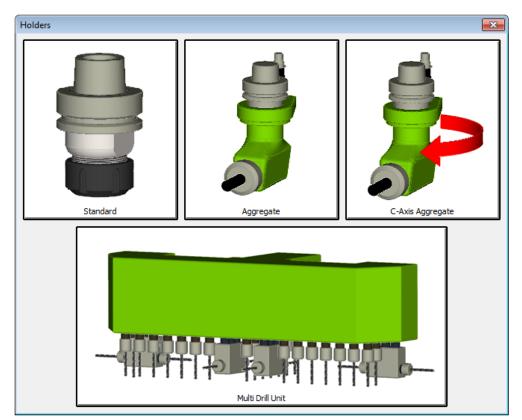


Figure 42 - Tool Holder Selection options for Defining New Holder in Router only



<LClick> the centre Aggregate option.

For the items to represent the aggregate, <LClick> the onscreen model.

You are next requested to identify the location of the tool or drill unit via the **Select Tool Reference Circle** request, **<LClick>** on the circle created on the front face of the unit.

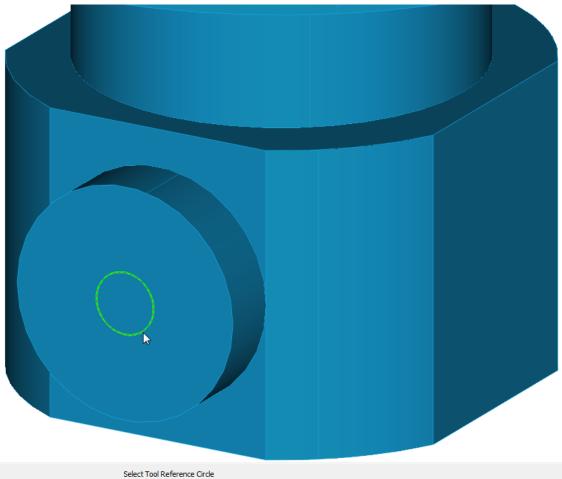


Figure 43 - Selecting the reference circle for tooling location



As soon as you **<LClick>** to choose the circle, you are prompted for the gauge line position for the aggregate unit.

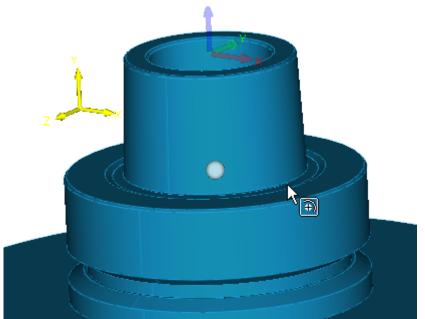


Figure 44 - Selecting the Gauge Line reference point

Using the **Centre of (F8)** snap option, select the position shown above.

You are then prompted to save the tool holder with a suitable name.



Programmable C Axis Aggregate / Angled Tool holder

The process for creating a programmable unit is the same as the previous section but you **MUST** select the C-Axis Aggregate option to allow the simulation to function correctly and to give the correct options for the tool paths once applied.

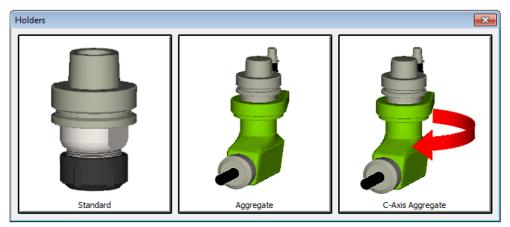


Figure 45 - Tool Holder Selection options for Defining New Holder in Mill / Stone

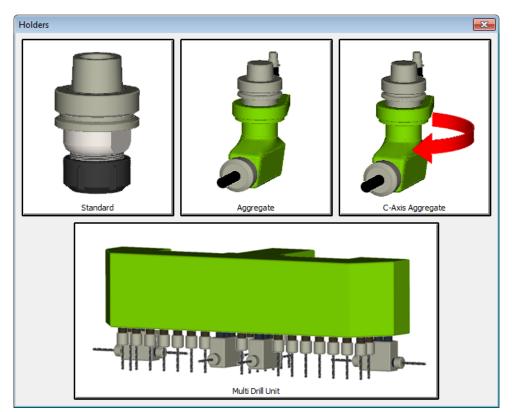


Figure 46 - Tool Holder Selection options for Defining New Holder in Router only



Multi Drilling Head (Router Module Only)

To allow better simulation and programming options you may wish to fully simulate Multi Drill heads during your programming.

To allow correct construction and simulation, the drawing of your own Multi Drill head must include the following items;

- Geometry/Solids to represent the drill spindles.
- Geometry/Solids to represent the actual unit body.
- Reference circles at the correct location of each drill position.
- A 3D Polyline to indicate the stroke length of each individual drill unit.

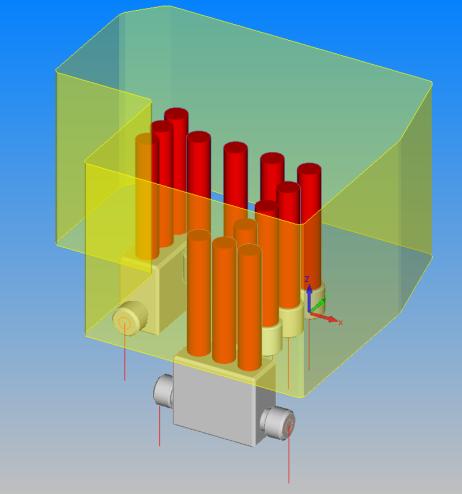


Figure 47 - Example multi drill geometry including Solid models

The image above is an example of Solid models and 2D geometry combined to represent a unit.



2D Graphics only

Open the sample drawing ".... ALP TRG 112 2D Machining 2020\Examples\Tooling\Drawings\2D Multi Drill Unit"

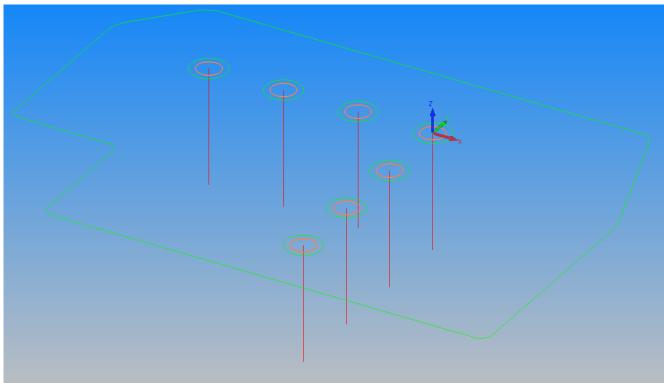
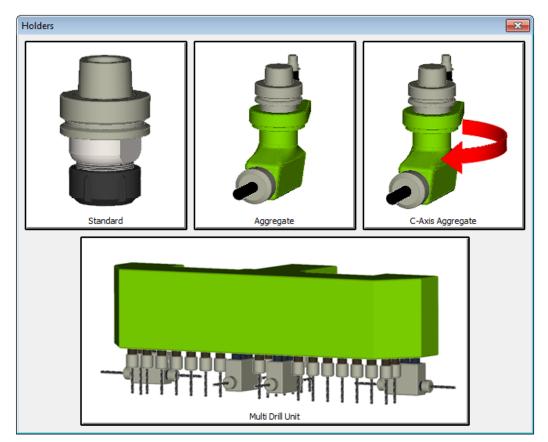


Figure 48 - Example multi drill unit using 2D geometries only

The drawing fulfils the required listing for body definition as follows;

- Geometry/Solids to represent the drill spindles. The green circles.
- Geometry/Solids to represent the actual unit body. The outer green profile.
- Reference circles at the correct location of each drill position. The red circles.
- A 3D Polyline to indicate the stroke length of each individual drill unit. The vertical red lines.





Using Machine > Define Holder/Aggregate and select the Multi Drill Unit option.

Figure 49 - Tool Holder Selection options for Defining New Holder in Router only

Select the Multi Drill Unit option.

The first option choice requires the selection of an item that represents one of the drilling units.

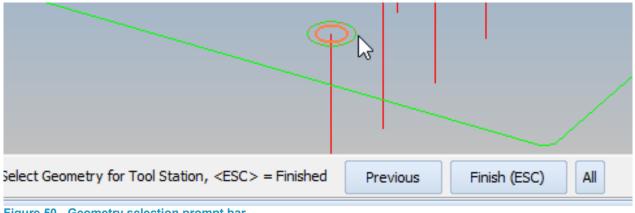


Figure 50 - Geometry selection prompt bar

<LClick> on one of the green circles that represent the diameter and location of the actual drilling units.



You are then requested for the following information in this dialogue box.

Tool Graphics Component	×
Name Unit 1	
Solid Type	
ORevolved	
Extruded	
◯ Solid	
Top Z 100	
Bottom Z 0	
Include in clash detection checks	
OK Cancel	

Figure 51 - Graphics selector dialogue options

Name		Defaults to the Geo number value but can have a suitable name applied.
Solid Type	⊙Revolved	If drawn in a vertical plane, the geometry is revolved around the global Z axis direction. Always by 360°.
	⊙Extruded	If drawn on a horizontal plane, the geometry is extruded in the global Z axis direction.
	⊙Solid	Used if a solid model exists.
Тор Z		Upper limit of the extruded item.
Bottom Z		Lower limit of the extruded item.
☑ Include in Clash Det	ection	Allows for a more accurate simulation process where collision detection is critical.

Enter the values as shown, once complete, <LClick> [OK].



ALPHACAM 2020.1 Material and Tooling Creation

You are then requested to select a circle that represents the actual location point for the drill. In this example, you will also note that there is a single vertical line at the centre of each circle that represents that stroke of the drilling unit.

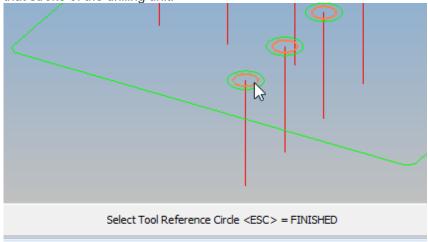


Figure 52 - Tool reference circle prompt

<LClick> on the red circle at the same location as the previous green circle.

Once you have chosen the required reference circle, a dialogue box will request additional information to assign to the unit.

This information is for your benefit only and is not a required item, though it is advisable to allow the ID to be completed automatically.

Tool Location Point	
ID	1
Number	0
Tool Offset	0
Work Offset	0
Group	0
ОК	Cancel

Figure 53 - Optional reference information dialogue

<LClick> [OK] to proceed.

Note that the circle and the polyline will disappear once you have selected the circle. There is no need to separately select the reference circle and then the stroke indicator.

<RClick> to finish selecting the reference circles section.

This will return you to the point where you can select the remaining drill units and complete the remaining circle selection process.

Repeat the above process for the remaining circles.

Once all the tool unit circles and associated reference circles have been selected, **<RClick>** to complete the drill unit selection.



Select Geometry for Holder Graphics Previous Finish (ESC) All Layers
Figure 54 - Main Body selection prompt

You are now asked for the geometry that represents that actual Multi Drill Main Body.

<LClick> on the item that represents that body.

You are requested to complete the process with regards to a name (if required) and Top/Bottom Z Limits (required) in the same manner as the actual drilling units.

Tool Graphics Component X
Name My Multidrill
Solid Type
ORevolved
Extruded
◯ Solid
Top Z 190 Bottom Z 40 ✓ Include in clash detection checks
OK Cancel
Figure 55 - Main body reference dialogue



You are now asked for the Gauge Line point.

This is the point that the multidrill unit you have just created will be located to your machine simulation for correct graphics in the same manner you placed a Gauge Line point on a normal holder.

Pick Point for Machine Gauge Line X 1 Y O Z O OK Snaps 🖳 🛏 🛶 💿 🗲 🏠 🚅 🗘
Figure 56 - Gauge line reference prompt

For this exercise we will use the **X0 Y0 Z0** origin location to then accurately position the physical reference point for the unit once we load it back into Alphacam.

Once you <LClick> [OK] you will be prompted for a name for your multidrill.

After setting the correct values you are prompted for a name for your Multi Drill unit. The save location by default is "...LICOMDAT\Holders.alp\Multi Drill Heads – Generic"



Reference Point using wireframe

Using the Multidrill Project Manager page, add your new multidrill unit to the visible listing us the **Open Multi Drill Unit** command.

ų ×

Figure 57 - Adding the multidrill unit

The unit needs a reference point to allow the simulation to work correctly.

This point in space is directly related to the Global datum position of the machine you are using the Multi Drill unit on in the simulation.

Note that these figures are written from the Multi Drill units' location back to the Global Origin. For example, if the home position of the unit is at the far side of the table from the datum stop and at the far end of the table from the stops, the X and Y values would be both negative.

<RClick> on the listed unit and use the Set Reference Point option to set the correct Home location for the unit.

Multi Drill Unit	4×
≩ + −	
✓ My First MultiDrill Unit □ × (1) □ Save Multi Drill □ × (2) Set Reference Point □ × (3) □ × (4) □ × (5) □ × (6)	
Figure 58 - Setting the Unit Reference Point	

Set Reference Poi	int ×
	x 515
	ү -1952
	z -761
ОК	Cancel
Figure 59 - Exam	ble Reference Poin



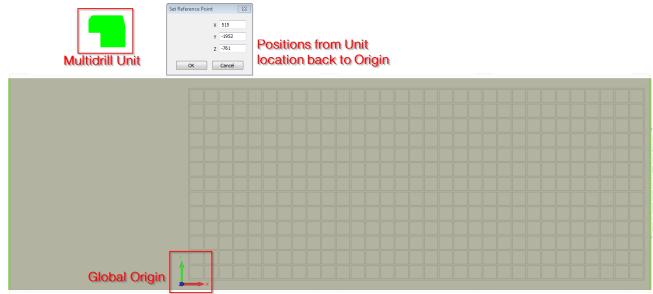


Figure 60 - Unit location prompt for X & Y

I	Set Reference Point			
	Z X			
Ţ	Ţ	Ţ	Ţ	Ļ
Figure 61 - Unit	location prompt for Z			



Solid Model method

Open the sample drawing ".... ALP TRG 112 2D Machining 2020\Examples\Tooling\Drawings\Multi Drill Unit"

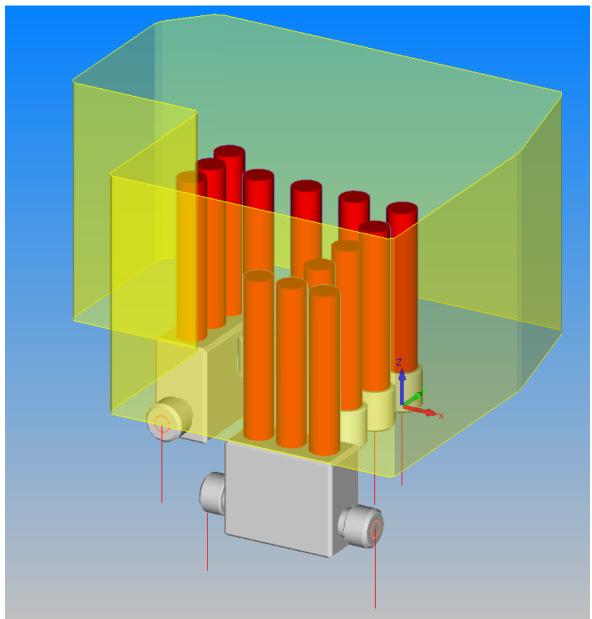


Figure 62 - Example multi drill geometry including Solid models

The drawing fulfils the required listing for body definition as follows;

- Geometry/Solids to represent the drill spindles. The silver and red solid bodies.
- Geometry/Solids to represent the actual unit body. The outer green profile with Z levels assigned.
- Reference circles at the correct location of each drill position. The red circles.
- A 3D Polyline to indicate the stroke length of each individual drill unit. The vertical red lines.



Using **MACHINE > Define Holder/Aggregate** you are presented with the options of which type of item you wish to create.

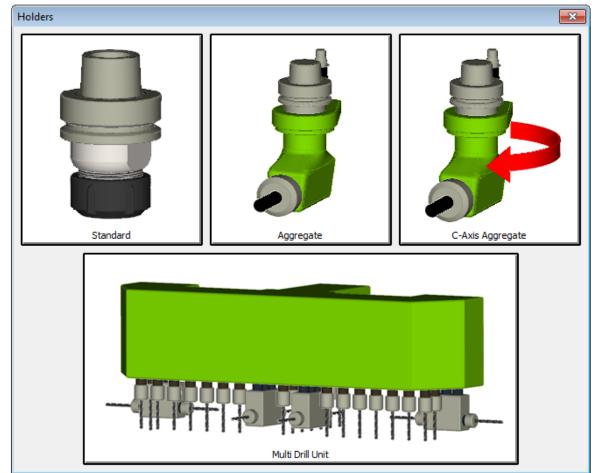


Figure 63 - Tool Holder Selection options for Defining New Holder in Router only

Select the Multi Drill Unit option.

The first option choice requires the selection of an item that represents one of the drilling units.

Select Geometry for Tool Station, <esc> = Finished</esc>	Previous	Finish (ESC)	All
Figure 64 - Geometry selection prompt bar			

<LClick> on one of the solid bodies in the example coloured red. This will select the entire drill unit at that location.



You are then requested to select a circle that represents the actual location point for the drill.

Select Tool Reference Circle <ESC> = FINISHED Figure 65 - Tool location prompt

<LClick> on the circle that is showing now that the solid has been removed after it has been selected.

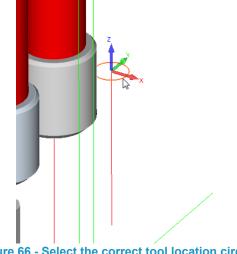


Figure 66 - Select the correct tool location circle

Once you have chosen the required reference circle, a dialogue box will request additional information to assign to the unit.

This information is for your benefit only and is not a required item, though it is advisable to allow the ID to be completed automatically.

Tool Location Point	—
ID	1
Number	0
Tool Offset	0
Work Offset	0
Group	0
ОК	Cancel

Figure 67 - Optional reference information dialogue

<LClick> [OK] to proceed.

Note that the circle and the polyline will disappear once you have selected the circle. There is no need to separately select the reference circle and then the stroke indicator.

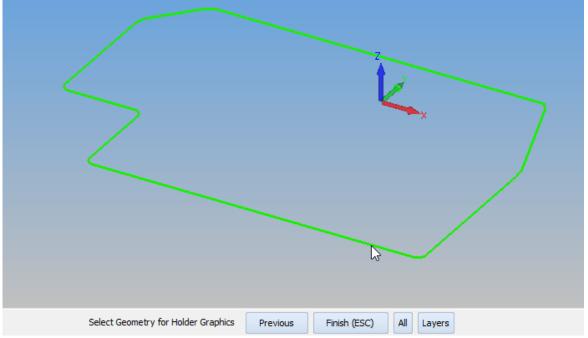


Once you have chosen all the circles that apply to the drilling unit you have selected, **<RClick>** to finish this section of the process.

You can now continue to select a different drilling unit within the Multi Drill body and repeat the previous processes until the entire set of drilling units have been defined.

Once all the drilling units have been selected and defined or no more are required, **<RClick>** to complete this section of the process.

You are now asked for the geometry that represents that actual Multi Drill Main Body.





<LClick> on the item that represents that body.

You are requested to complete the process with regards to a name (if required) and Top/Bottom Z Limits (required) in the same manner as the actual drilling units.

Tool Graphics Component	<
Name My Multidrill	
Solid Type	
ORevolved	
Extruded	
◯ Solid	
Top Z 190	
Bottom Z 40	
Include in clash detection checks	
OK Cancel	

Figure 69 - Main body reference dialogue



You are now asked for the Gauge Line point.

This is the point that the multidrill unit you have just created will be located to your machine simulation for correct graphics in the same manner you placed a Gauge Line point on a normal holder.

Pick Point for Machine Gauge Line X 7 0 Z 0 OK Snaps 🖳 🛏 🛶 🕢 📈 🔔 🚄 🗘 Figure 70 - Gauge line reference prompt	

For this exercise we will use the **X0 Y0 Z0** origin location to then accurately position the physical reference point for the unit once we load it back into Alphacam.

Once you <LClick> [OK] you will be prompted for a name for your multidrill.

After setting the correct values you are prompted for a name for your Multi Drill unit. The save location by default is "...LICOMDAT\Holders.alp\Multi Drill Heads – Generic"



Reference Point using solids

Using the Multidrill Project Manager page, add your new multidrill unit to the visible listing us the **Open Multi Drill Unit** command.

Multi Drill Unit	џ×
द + ─	
Open Multi Drill Unit	

Figure 71 - Adding the multidrill unit

The unit needs a reference point to allow the simulation to work correctly.

This point in space is directly related to the Global datum position of the machine you are using the Multi Drill unit on in the simulation.

Note that these figures are written from the Multi Drill units' location back to the Global Origin. For example, if the home position of the unit is at the far side of the table from the datum stop and at the far end of the table from the stops, the X and Y values would be both negative.

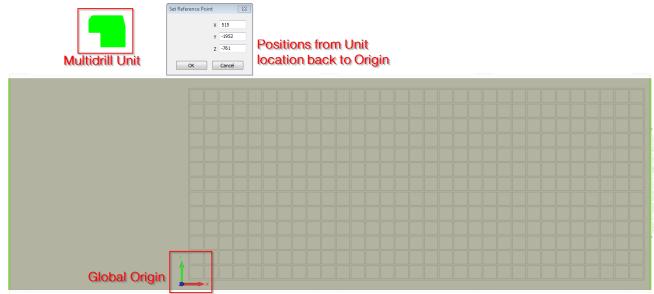
<RClick> on the listed unit and use the Set Reference Point option to set the correct Home location for the unit.

Multi Drill Unit	ų×
≩ + −	
✓ My First MultiDrill Unit □ × (1) Save Multi Drill □ × (2) Set Reference Point □ × (3) ≤ □ × (4) ≤ □ × (5) ≤ ○ × (6)	
Figure 72 - Setting the Unit Reference Point	l

Set Reference Po	int \times
	x 515
	z -761
ОК	Cancel

Figure 73 - Example Reference Point







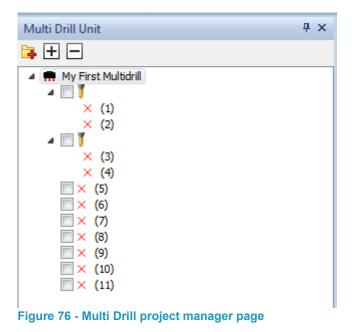
	Set Reference Point		
Ţ	Ţ	Ţ	Ļ

Figure 75 - Unit location prompt for Z

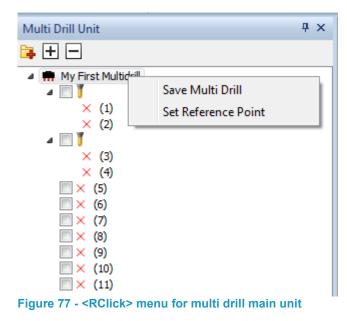


Populating Multi Drill Units

Making use of the Multi Drill tab in the Project Manager, it is possible to edit any previous settings on the unit as well as populate the unit with the required drill bits for a job,



<RClick> on the actual Multi Drill unit will allow you to alter the Reference Point or allow you to Save an empty or populated unit.





Multi Drill Unit		Ψ×
泽 🛨 🗖		
 ▲ My First Multidri ▲ ↓ ★ (1) ★ (2) ★ (3) ★ (4) ★ (5) ★ (6) ★ (7) ★ (8) ★ (9) ★ (10) ★ (11) 	Load Tool Select as Master Tool Properties	

Figure 78 - <RClick> menu for drill locations

<RClick> on any of the defined positions within the unit will allow you to;

Load Tool	Opens the Alphacam Tool selection process to populate the drill position.
Select as Master Tool	Sets this as the programming tool when drilling standard pitch holes in a panel.
Properties	Allows you to alter any of the options in the dialogue box associated with the Location Circle.

Setting up multiple versions of the unit can save time in future production processes if similar parts are machined.

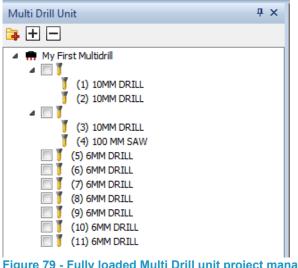


Figure 79 - Fully loaded Multi Drill unit project manager page



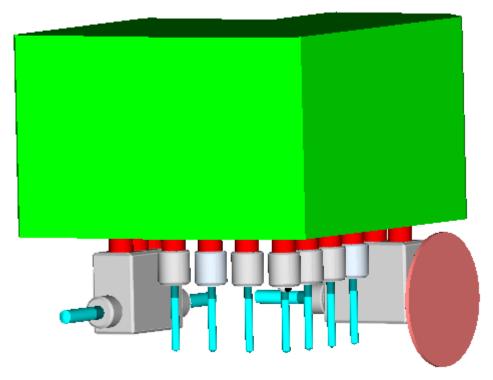


Figure 80 - Fully loaded Multi Drill unit

The image above shows a Multi Drill Unit populated with vertical and horizontal drill bits as well as a vertical saw on one location.



ALPHACAM 2020.1 Material and Tooling Creation

Version amendments

V	Amendment Description	А	Software Version	Amended Date
12	Minor text formatting alterations	1	2020.1	05/11/2019
12	Template altered to Hexagon branding	0	2020.0	15/03/2019





ALPHACAM

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