

ZW3D From Entry to Master

Electrode Design

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Electrode Design

For the plastic mold design electrode design always is an inevitable topic. ZW3D provides the corresponding module with full function for it.

Key Points:

- ♦ Insert parent core or cavity part
- ♦ Automatic way to create electrode
- ♦ Manual way to create electrode

1.1 Insert parent core or cavity part

1.1.1 Electrode Ribbon Toolbar

Following is the independent tool bar for the electrode module:

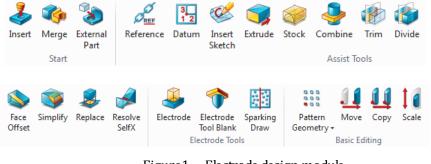
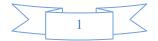


Figure1 Electrode design module

Actually, most of the commands in this module come from other modules like the "Shape" module. But since those commands are frequently used when designing electrode so that intergrate them together into the eletrode design module and provide an integrated interface for users to apply more efficiently.

1.1.2 Various Methods for Inserting Parent Part

Normally the electrode needs to reference to the parent core or cavity part. As we can see in the start column of this ribbon tool bar, there are different tools used for inserting the parent part.



Next let's firstly take a look at these tools in the Start column.

Insert: It is same as the command insert in assembly. It is used to insert the parent core or cavity part into current file. The inserted parent part will become a component of current file.

Merge: It is same as the merge command in assembly. It is used convert the component or subassembly as a local shape or component. After merging it will create an associative relationship with the parent file which means the current file has referenced the original file and will be recorded into history tree. As follows:

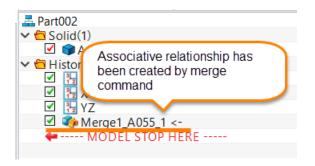


Figure2 Merge command

External part: This command allows to create various associative copy from the external part as follows:

🏷 Exter	nal Part	t	23							
🗸 🗙	3		0							
🔻 Requi	red									
File/Pa	rt									
Core_	Core_back cover.Z3									
Core_	cover									
Previe	w	Off	•							
Location	ı		* 👲 -							
▼ Settin	gs									
Frame										
🔽 Flip o	lirection	n								
🗌 Сору	wirefra	ime								
🗌 Сору	dimen	sions								
History	Associ	ative Copy in this P	art 🔻							
	History Associative Copy in this Part Sub-Part with Associative Copy Sub-Part with History History copied into this Part Associative Copy in this Part									

Figure 3 Selectively choose relationship with external part





The explanation for these types:

Sub-part with associative copy - (Default) it creates a sub-part with a copy of the geometry of the external part. The history of the sub-part has an "Associative Copy" operation that imports the external part geometry. When the parent part is regenerated, the sub-part does not re-import unless you activate it and regenerate its history or right-click it and select the "sub-part regeneration" command to set the "Auto Regen" Flag. When "Auto-Regen" is enabled for the sub-part, its history will be regenerated every time its parent part is regenerated. By default, "Auto-Regen" is disabled for a new sub-part.

Sub-part with history - It creates a sub-part with a copy of the full history of the external part. It means the user has a local copy of the external part's history to edit, but that history is still isolated from the parent part's history.

History copied into this part - It copies the history of the external part into the active part and appends the external part's history to the end of the active part's history. Imported history operations are renamed as needed so they do not conflict with pre-existing operations in the active part. This option can be used in place of "sub-part with history" if you do not want the imported part separated as a sub-part.

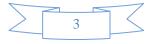
Associative copy in this part - It adds an "Associative Copy" operation to the history of the active part that imports the geometry of the external part. Each time the active part is regenerated, a new copy of the external part will be imported into the active part. If the external part cannot be found, the "Associative Copy" operation will fail.

Next let's start from an empty file as follows:

STEP 01 Create a new empty file and name it as "Electrode for back cover"

💯 Create New File				$\overline{\nabla}$	23
Туре					
Datt (Assembly)		Drawing Short	المعنى Standalone Sket	ch	
Part/Assembly	Drawing Packet	Drawing Sheet	Standalone Sket	cn	
CAM Plan	Equation Set	Multi-Object			
Template	Informa	ition			
[Default]	Unique I	Name			
PartTemplate(MM)	Electro	de_back cover			_
	Descript	ion			
			ОК	Cance	

Figure4 Create new empty file for electrode design





STEP 02 Then insert the parent part "**Core_back cover.z3**" as follows:

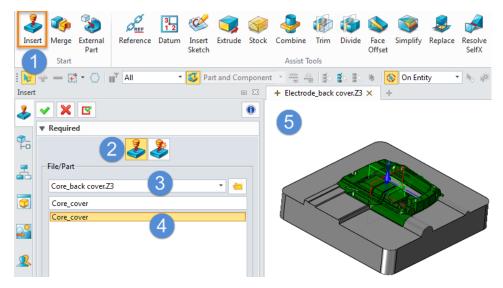


Figure 5 Insert Z3 file as electrode design parent part

STEP 03 Merge the inserted parent part

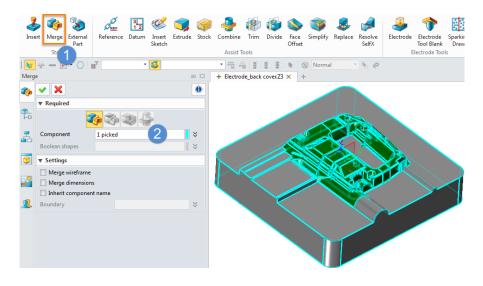


Figure6 Merge the inserted part

By the 2 steps we have created the associated relationship between the electrode file and the inserted part. That means any change happen in the parent part also will affect the electrode side.

STEP 04 Analyze the inserted part we can find there are a lot of slots and open pocket need to create an electrode. Following is the indicator for the positions where need to add electrode:





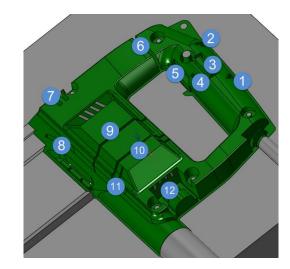


Figure 7 Electrode position indicator

Because most of the electrodes can use the same way to finish so here let's take position 1, 7, 12 as example to explain how to use the electrode tool to finish them.

1.2 Automatic Way to Create Electrode

1.2.1 Create Electrode at Position1

STEP 01 Zoom in the position 1 and then choose the "Electrode" command to create electrode shape as follows:

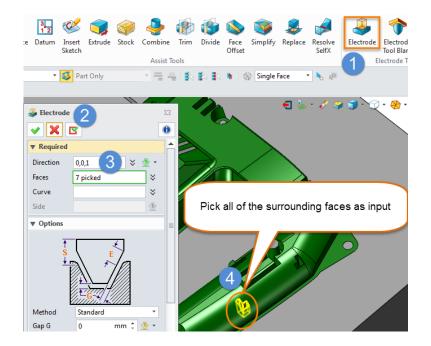


Figure8 Create electrode shape at position 1





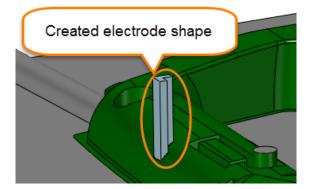


Figure9 Created electrode at position 1

STEP 02 Add blank for the new electrode shape as follows:

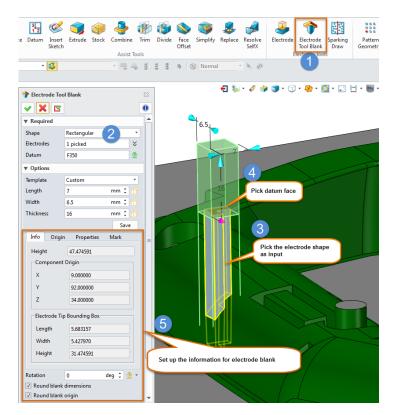


Figure10 Add blank

Details for the information:



Electrode design



Info Orig	jin Properties Mark	Info Origin	Properties	Mark	Info Ori	gin Proper	ties Mark		Info Origi	n Propert	ies Mark	
Height	47.474591	Height			Material	Gr	aphite-Med	•	Position			
Componen	nt Origin				Orbit	G	rcle					
x	12.000000	1	-	1	Orbit radius	0.	0	:	0	05		
¥.	95.000000									-		
z	34.000000	Position			CAM Open	tion O Finish	O Seni () I	lougi		RI		
Electrode	Tip Bounding Box									-		
Length	5.683157				Supplier				Cuttock	1		
Width	5.427970		·		Model ID				Roetback	0		
Height	31.474591	Reverse Z	No		Quantity	0			Center Diame			;
otation	0 deg : 한 -	Rotation	0	deg 🕻 🌰	- Rotation	0	deg :	2.	Rotation	0	deg 1	4
Round blan	k dimensions	[2] Round blank	dimensions		(2) Round bla	nk dimensions			2 Round blank	dimensions		
E Round blan	k origin	2 Round blank	origin		2 Round bla	nk origin			😥 Round blank	origin		
Use local co	oordinate frame	(2) Use local coo	rdinate frame		(2) Use local o	oordinate fram	e .		2 Use local con	ordinate fram	e	
Align blank	with model space axis	[2] Align blank w	ith model space	or axis	2 Align blan	k with model a	pace axis		[?] Align blank s	with model up	ace and	
art name	sde_bac_Blank_Electrode_1 🔮	Part name	ode_bac_Blank	Electrode 1	Part name	sde_bac_Bla	ink_Electrode	1 1	Part name	sde_bac_Bla	nk_Electrode.1	1
New layer	Hickor, Bask, Dectords1	New layer	nde bar Blank	Electrode 7 11	New layer	The Rev Bla	nk Electrode	1.00	New layer	the hor line	sk Electroile.1	

Figure11 Information for electrode blank

Info:

Component Origin, X, Y, Z

The current X, Y and Z coordinates of the origin of the blank (refer to the figure above).

Electrode Tip Bounding Box, Length, Width, Height

The Length, Width and Height of the bounding box surrounding the electrode tip (relative to current datum and rotation).

Rotation

this is used only when **Shape** is set to **Rectangular** (see **Required Inputs** above). This allows you to rotate the blank about the Z axis of the datum.

Round blank dimensions

checking this option will force the blank dimensions to round up to the nearest 1/8 if the units are set to inches. For mm units, it will round up to the nearest 0.5mm + 1mm.

Round blank origin

Check this box, the blank is adjusted such that the origin's x, y coordinates are rounded to the nearest millimeter, or to the nearest 0.05 inch when using inch units. Rounding the blank's origin does not change the electrode's position with respect to the coordinate system.

Use local coordinate frame

Check this box, the blank's component origin and center coordinates are defined with respect to the local coordinate frame that is active when the electrode blank feature is created or regenerated. When this option is unchecked, or if there is no local coordinate frame, the component origin and center coordinates is defined with respect to the electrode's global coordinate system.

Align blank with model space axis

Check this box, it will re-align blank with model space axis.





Part Name

this allows you to specify a name for the new component that will be created (default = Part name + electrode name + "blank"). Automatic name checking and correction is used so you do not need to keep modifying this field for a part with multiple electrodes.

New layer

Check this box to input the electrode tool blank created into the right specified layer. If this layer is not in the current part, it will use the same name to create a new layer.

STEP 03 Change the basic dimension of the blank, origin type and mark size as follows:

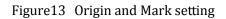
✓ X			0	
▼ Required				10 1
Shape	Rectangular		-	
Electrodes	1 picked		\approx	
Datum	F350		₫	
▼ Options				10
Template	Custom		-	
Length	10	mm ‡	۵	
Width	10	mm ‡	۵	
Thickness	15	mm ‡	۵	
		Sav	2	
Info Origin	Properties	Mark		
Height				

i. Set up dimension as follows:

Figure12 Dimension for electrode blank at position 1

ii. Set up the electrode blank 's origin and mark as follows:

Info Origin Properties Mark	Info Origin Properties Mark
Height	Position
	0000
Position	
	C setback 4
	R setback 0 🌲
Reverse Z And Length 🔻	Center Diameter 4







STEP 04 Set up the shape's color as brown and then we can get the following result:

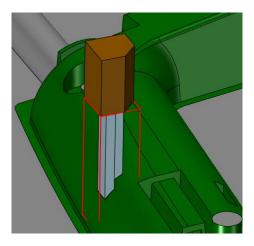


Figure14 Finished Electrode blank

Note: After adding the blank, the electrode part will be turned into a component of this file as follows:

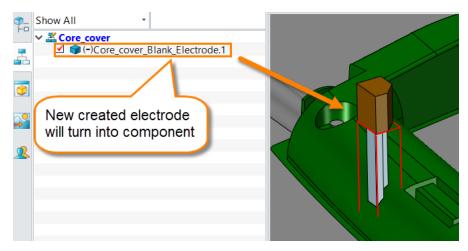


Figure15 New electrode component

Meanwhile it will be listed in the object manager list as follows:

			23					
Previe	ew	Graphic						
in		Name						
		Туре	Modifi					
	As	sembly						
de.1	Pa	rt	YES					
$\overline{\mathcal{A}}$								
New added part in object								
	in de.1	in As de.1 Pa	Assembly de.1 Part	Preview Graphic in Name Type Modifi Assembly de.1 Part YES				

Figure16 New created file for electrode





1.2.2 Create Electrode at Position7

STEP 01 Zoom in position 7 and check the region. It is not a closed region but an open region. So we need some auxiliary curves. Create curves at the bottom as follows:

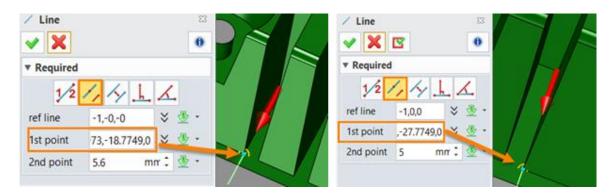


Figure17 Create auxiliary curves

STEP 02 Trim the curves and connect them

i. Trim the curve

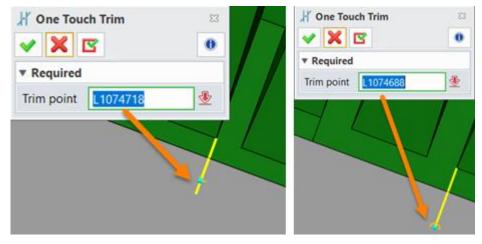


Figure18 Trim the curves

ii. Connect the curve



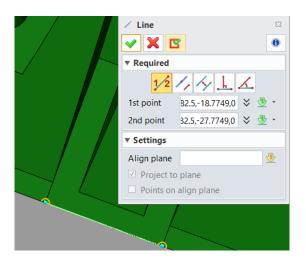


Figure19 Connect the curves

STEP 03 Create the corresponding electrode as follows:

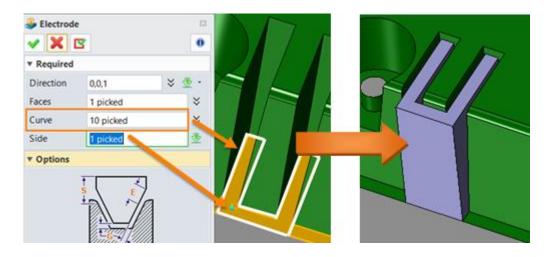


Figure20 Create electrode at position 7

STEP 04 Replace electrode face as follows:

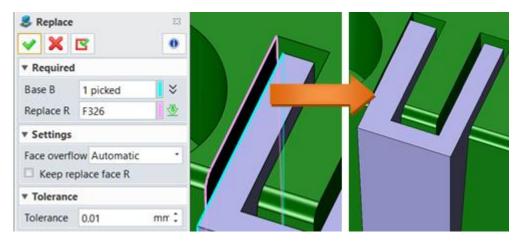


Figure21 Replace electrode face

Repeat the same command to replace other related face to the shape as follows:





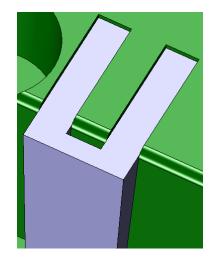


Figure22 Replace electrode face to shape face

STEP 05 Offset electrode face

i. Offset top face

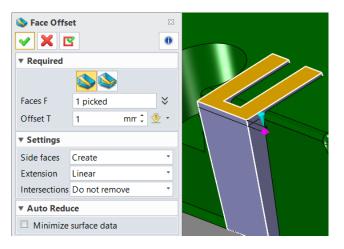


Figure23 Offset top face

ii. Offset side face

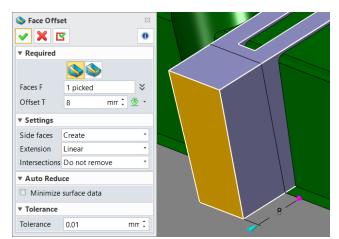
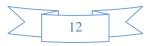


Figure24 Offset side face





iii.Offset slot face for fillet space

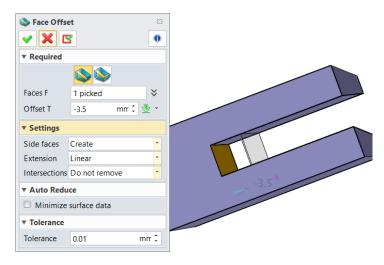


Figure25 Offset slot face

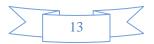
iv. Fillet at the slot bottom edge

🌍 Fillet	23	
✓ X	0	
Required		
Edges E	2 picked 🗧	
Radius R	1.75 mm 🗘 🖑 🝷	
Shape of	Fillet	
▼ Variable ra	adius	
Hold line	*	
Variable ra	dius	
Add	Modify Delete	
Vertex		
Exception	₹	

Figure26 Fillet slot edges

STEP 06 Add the blank for the electrode as follows:

i. Dimension of blank







Telectrode Te		XX 0	
Required			26
Shape	Rectangular	•	
Electrodes	1 picked	\approx	
Datum	F799		
Options			
Template	Custom	•	
Length	20	mr 🗘 📩	
Width	26	mr 🗘 📩	
Thickness	8	mr 🗘 📩	
		Save	

Figure27 Dimension for electrode blank at position 7

ii. Origin and Mark

Info Origin Properties Mark	Info Origin Properties Mark
Height	Position
	0000
Position	
	C setback 4
	R setback 0
Reverse Z And Length 🔻	Center Diameter 4
Rotation 0 deg 🗘 👻 👻	Rotation 0 deg 🗘 👻 🔹
Round blank dimensions	🗵 Round blank dimensions
Round blank origin	Round blank origin
Use local coordinate frame	Use local coordinate frame
Align blank with model space axis	Align blank with model space axis

Figure28 Origin and Mark for electrode blank at position 7





STEP 07 Confirm it and set up the color for it, then we can get the following result:

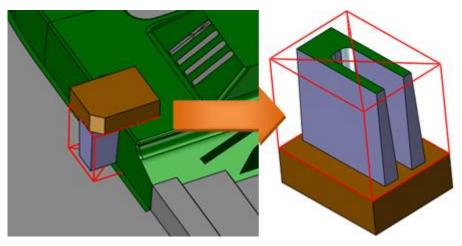


Figure29 Electrode at position 7

1.2.3 Create Electrode at Position8

STEP 01 Also this region is an open pocket so that we need to create some auxiliary curves as follows:

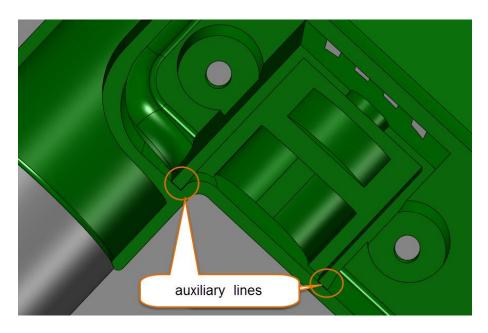
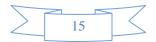


Figure30 Auxiliary lines at position 8

STEP 02 Pick the curves as follows:





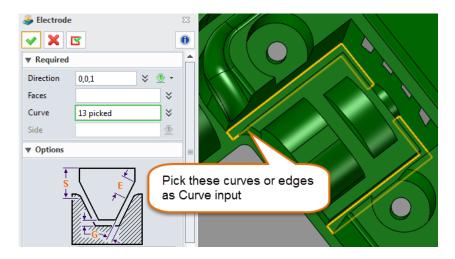


Figure31 Pick curve

STEP 03 Choose the bottom face:

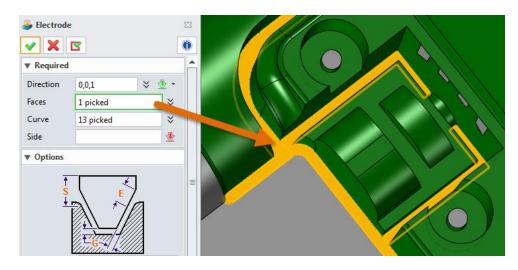
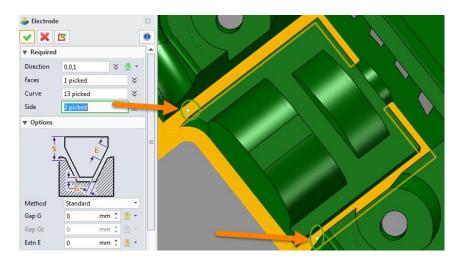
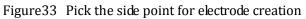


Figure32 Pick face

STEP 04 Determine sides to keep:









Created electrode

STEP 05 Confirm the command and then we can get the following result:

Figure34 Electrode at position 12

Since the side wall of the pocket has draft angle, here the shape we got is vertical

Therefore, we can use "Replace Face" command to make the electrode shape match to the side wall's draft angle.

STEP 06 Replace the side face of electrode to side wall of the core part

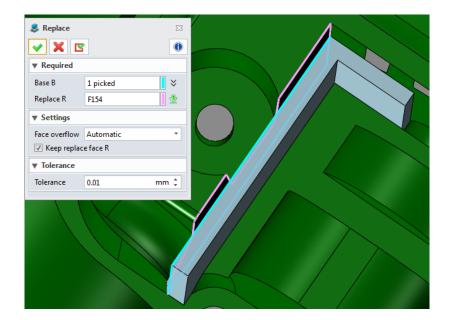


Figure35 Replace face to side wall

STEP 07 Confirm it and we can get a new shape with draft angle on its side face







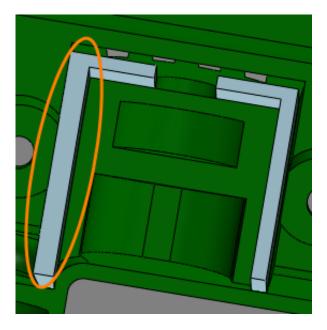


Figure36 New shape with side draft angle

STEP 08 Repeat the "Replace face" to other side faces of the electrode shape, then we can get a new electrode shape as follows:

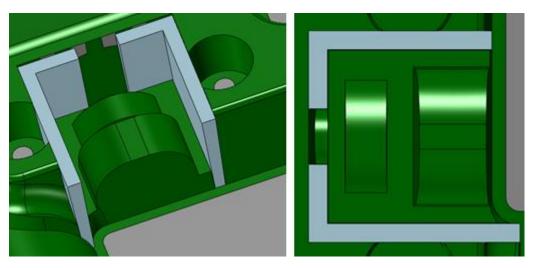


Figure 37 New electrode shape with draft angle

STEP 09 Offset the top face of electrode as follows:







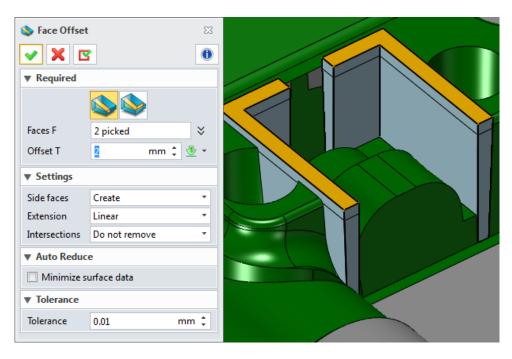


Figure38 Offset top face of electrode

STEP 10 Add blank for electrode by a suitable size and the same mark as form blank then we can get the following result, and then save the finished file.

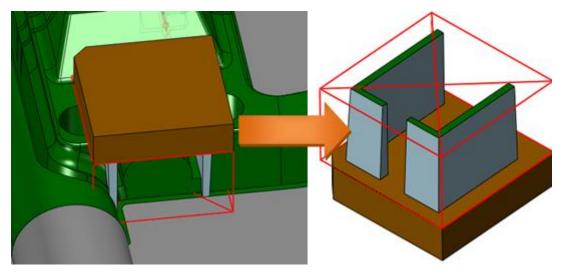


Figure 39 Add blank for electrode at position 12





1.2.4 Create Sparking Drawing for the Electrodes

After completed the electrode design, then we can go to create the sparking drawing for them

STEP 01 Choose the sparking drawning command in the ribbon tool bar as follows:



Figure 40 Sparking Drawing command

STEP 02 Choose workpiece and electrode to create sparking drawing as follows:

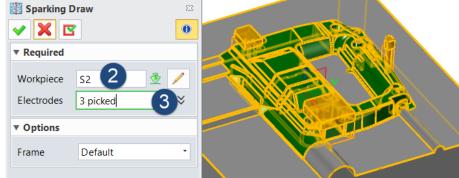
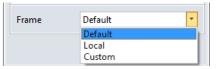


Figure41 Create sparking drawing



Default: using the assembly's default frame as the original reference, in other words the electrode's origin will be calculated based on the world coordinate system

Local: using the local created frame as the original reference

Custom: it requires input a point as the original reference and the X Y will be in accordance with the default frames.

STEP 03 Here let's use the default frame in the middle of the part and we can get the following sparking drawing:

i. General drawing of all the electrodes



Information for Frame



_	1			2			3		4			5			6	
														_		
	D			N	ame				X-origi	- Y -	origin	Z-o	rigir	1		
	1	Elect	rode_b	ac-	Blar	nk_∣	Electro	de.1	9.00	9	2.00	34	.00			
	2	Elect	rode_b	ac_	Blan	nk_E	Electro	de.3	-74.00	- 2	23.00	40	.00			
	3	Elect	rode_b	ac_	Blan	nk_E	Electro	de.4	69.00	-	14.00	22	.00			
													\mathbf{D}	_		
	_										2)-{				3	
	Electr	odeNo							File Path		\uin7\Desktop			.23 - Ele	ctrode_b	ock co
	B orkp	ieceNo				R	esponsible dept.	Technic	col reference	Created by	·	Approver	d by			
	Nu	mber	RoughNum:	_		_				Document	type		Document	status		
\vdash			FinishNum: RoughGap:	_		_	www.z	wso	FT.COM	Title, Supp	lementary title		Created a	Sote		
	Ga	ip -	FinishGap:			-							Rev. Date	of issue	Lang.	Sheet 1/4
_	_					_		_			-		<u> </u>			

Figure 42 Create sparking drawing

ii. Besides the general drawing each electrode also has the corresponding detailed drawing as follows:(Switch by the sheet icon in the bottom)

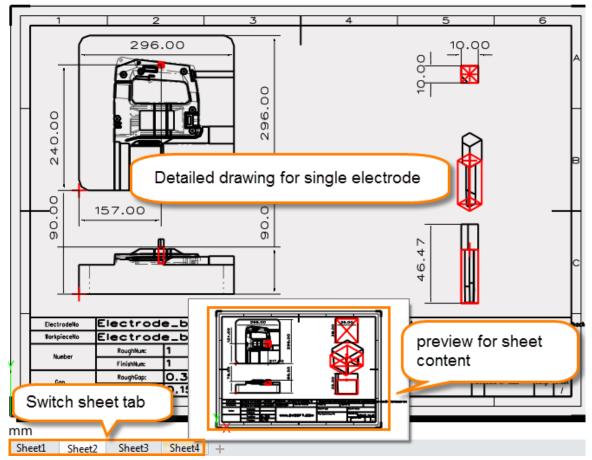


Figure 43 Individual sparking drawing of each electrode

After finishing the drawing we can export it as DXF/DWG or PDF for the workshop.

Finally save the file.





1.3 Manual Way to Create Electrode

Besides the automatic tool for electrode creation we also can find different tools in electrode module for creating electrode. All these tools are using the basic modeling command to help create electrode shape under some cases. For differentiating the manual tool, we can name them as manual tools. As follows:

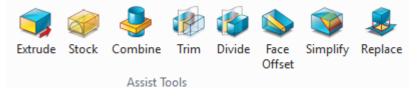


Figure44 Manual tools for electrode

Among these tools the Trim and Replace commands are used frequently very much, they can almost be used in every case. Therefore, in this chapter it is very necessary to take a real example to explain how to use these 2 manual tools in details.

Next let's create an empty file and name it. And then insert the example file "**Manualway_1**" into the newly created empty file. As mentioned in above chapter we can merge the part into the file. The file is as follows:

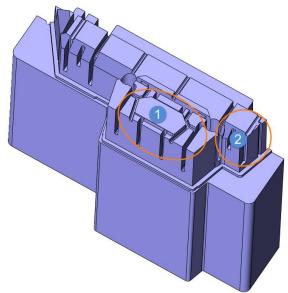


Figure45 Example part "ManualWay_1"

After analyzing the part, we can find there are a lot of narrow and tiny slots and opened deep pockets. Those features need to use electrodes for machining since normal tool is hard to cut. So we will create the electrodes for these features. However, most of the features are similar thus we can take some of them as examples to show how to create it by the manual tools.

Here let's take the following 2 group of features as example to explain in detail.



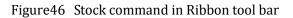


1.3.1 Create Electrode for Feature Group1

STEP 01 Create a stock as follows:

i. Choose stock command

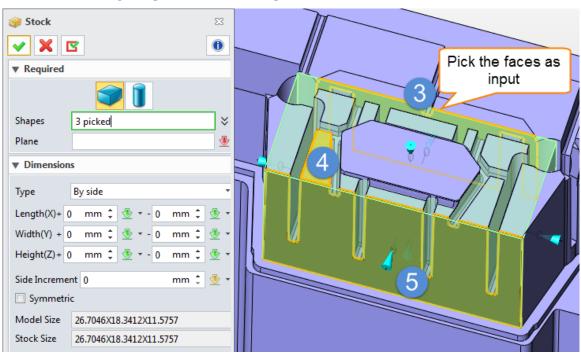
3 1 2	Ø			4		1	\$
Datum	Insert Sketch	Extrude	Stock	Combine	Trim	Divide	Face Offset
			1	Assist T	ools		

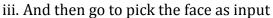


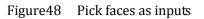
ii. Set up the "Filter" as "Face"



Figure47 Set up filter as "Face"







iv. After we can get a stock as follows:





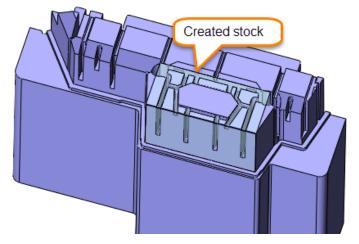


Figure49 New created stock

STEP 02 Modify the stock by "Replace" and "Trim" command as follows:

i. Replace the back face as follows:

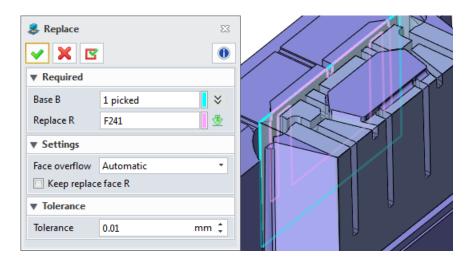


Figure 50 Replace the back face

ii. Trim the front face as follows:

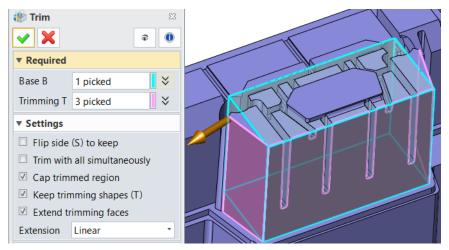


Figure 51 Trim the front face





STEP 03 Combine the stock with the part to create the electrode working shape

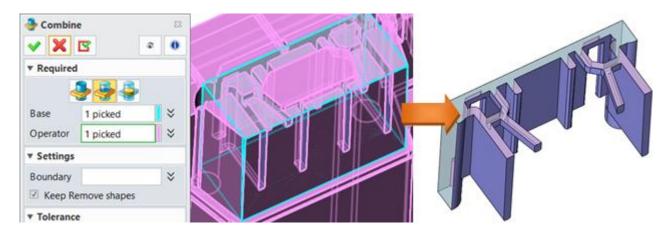


Figure 52 Electrode working shape by combine

STEP 04 Trim away the unnecessary part as follows:

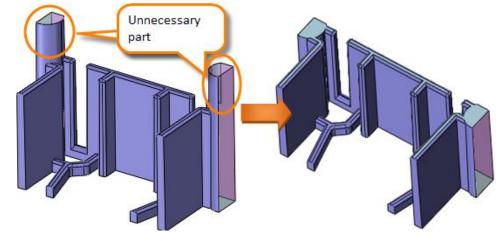


Figure 53 Trim away the unnecessary part

STEP 05 In order to let the eletrode machine easier we can modify it as follows:

- 🌭 Face Offset 0 X Required $\stackrel{\scriptstyle \sim}{}$ Faces F 3 picked mr 🗘 🤳 🔹 Offset T 0.70341 Settings offset up to this face * Side faces Create Extension Linear ÷ Intersections Do not remove *
- i. Extend the top face of electrode shapes

Figure 54 Extend the top face of electrode shape





ii. Extend the side face by 2 mm

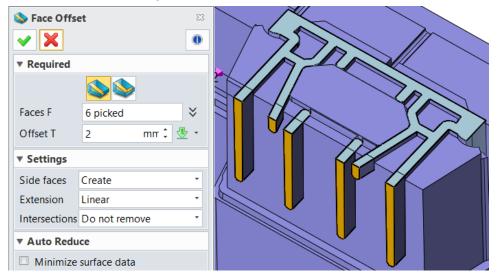


Figure 55 Extend side face of electrode shape

iii. Divide the whole electrode shape as several simple ones

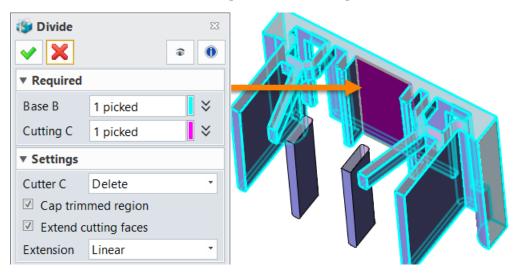


Figure 56 Divide the electrode shape

iv. Then we can get the divided shapes as follows:

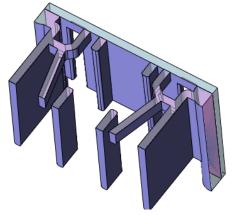


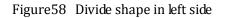
Figure 57 Divided the electrode shape





23 🎁 Divide XI 3 0 ÷ \checkmark 2 Required $\stackrel{\scriptstyle \sim}{}$ Base B 1 picked $\stackrel{\scriptstyle \sim}{}$ Cutting C 2 picked Settings * Cutter C Delete Cap trimmed region Extend cutting faces -Extension Linear Tolerance Divide the shape in left side Tolerance 0.01 mm ‡

v. Continue to divide the shapes into left and right side



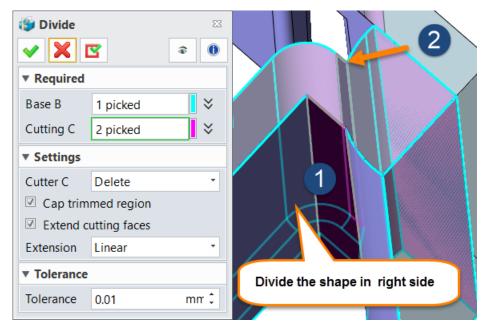
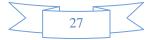


Figure 59 Divide shape in right side

vi. Then erase the unnecessary shapes as follows:





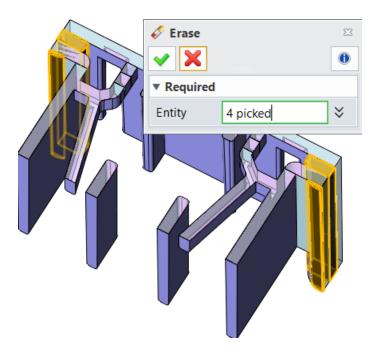


Figure60 Erase the unnecessary shapes

- vii. Modify the specified shape
 - 1) Step 1:Highlight the target

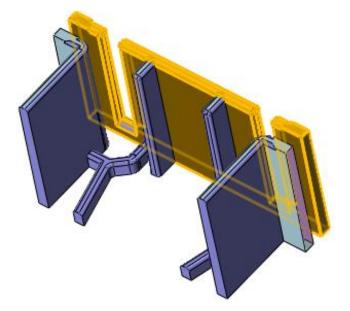


Figure61 Highlight target shape

2) Step 2 : Replace the corner as follows





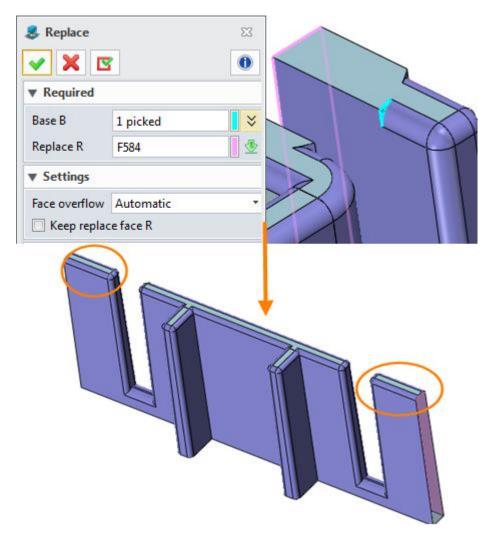


Figure62 Replace corner face

viii. Continue to remove some unnecessary parts from the shape

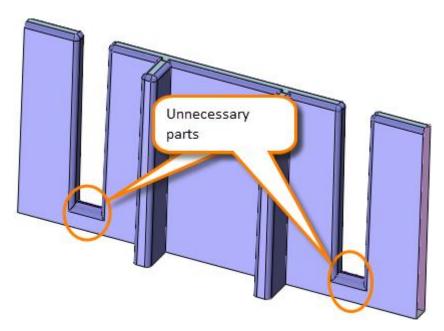


Figure63 Unnecessary parts





1) Divide by faces as follows:					
🌍 Divide		23			
🖌 🗙		•			
▼ Required					
Base B	1 picked	. ≈			
Cutting C	4 picked	×			
▼ Settings					
Cutter C	Delete	-			
Cap trimmed region					
Extend cutt	ing faces				
Extension	Linear	•			
▼ Tolerance					
Tolerance	0.01	mm 💲			

Figure64 Divide by faces

2) Then delete the middle shapes as follows:

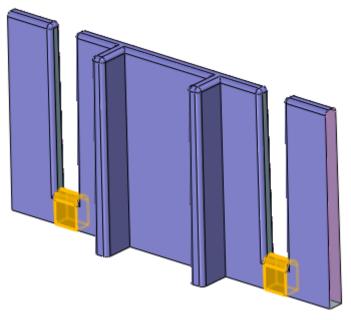


Figure65 Delete the middle parts

3) Trim the corner on bottom as follows



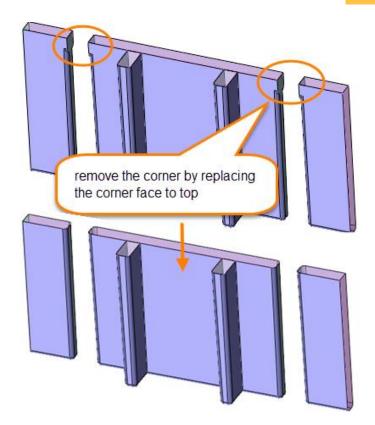
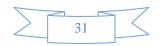


Figure66 Trim the corner on bottom

ix. Modify other shapes by simplify command as follows:

			-	
🔯 Simplify		23		
🗸 🗙 🖸	1	١		
▼ Required				
Entities	4 picked	×		
▼ Settings				
Minimal vo	lume		-	>
Least exten		\geq		
▼ Tolerance				
Tolerance	0.01	mm 💲		
			↓	
				\mathbf{i}
H				$\left(\right)$

Figure 67 Simplify the shapes





x. Group the electodes by different color as follows:

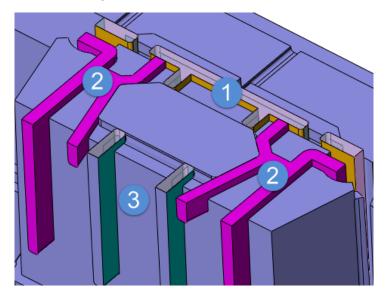


Figure 68 Group the electrode by different color

Since the electrode's thickness is too small (about 1.2 mm) thus it is very necessary to stiffen it by adding some stiffer. Next let's add it to each electrode group.

STEP 07 Add stiffer for electrode group 1

i. Offset the top face by 1 mm again as follows:

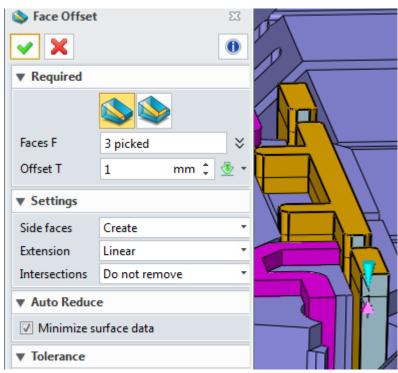


Figure69 Offset the top face of eletrode group 1





ii. Create stock as follows:

🧊 Stock	23				
✓ X	0				
▼ Required					
		_3			
Shapes	3 picked 🗧 🗧				
Plane	<u>●</u>				
▼ Dimensions					
Туре	By side 🔹				
Length(X)+ () mm 🗘 🖑 🔻 - 0 mm 🇘 🖑 🔻				
Width(Y) +	3 mm 🗘 🕭 🔻 - 0 mm 🌲 🍜 🔻				
Height(Z)+() mm 🗘 🕸 🔻 - 3 mm 🌲 🥸 🔻				

Figure 70 Create stock for electrode group 1

iii. Trim it by face as follows:

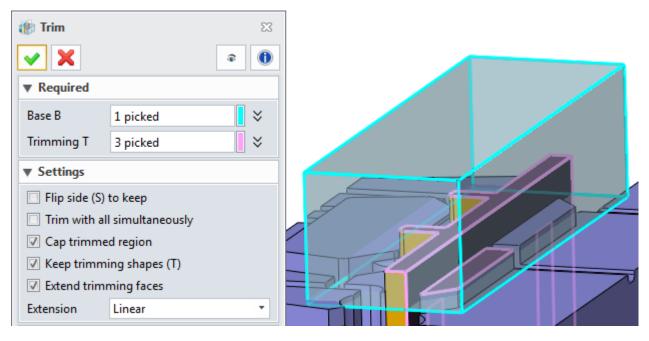


Figure71 Trim the stock by face





iv. Combine the trimmed shape with group 1 shape as follows:

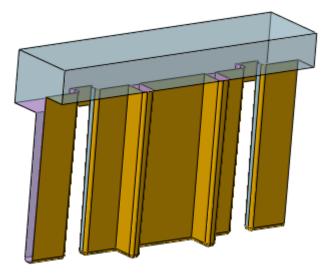


Figure 72 Combined the trimmed shape with group 1

v. Just only show this shape and then divide it by face as follows:

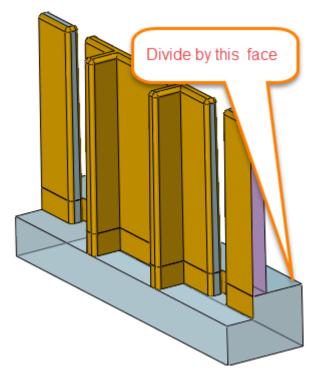


Figure 73 Divide the combined shape





vi. Simplify as follows:

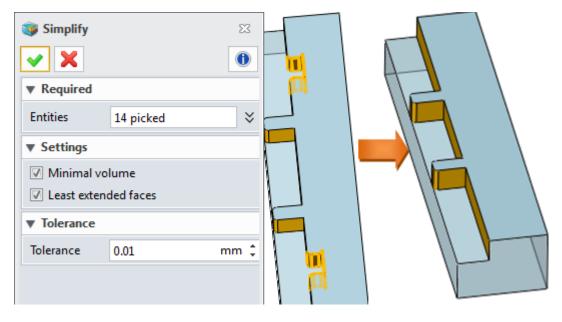
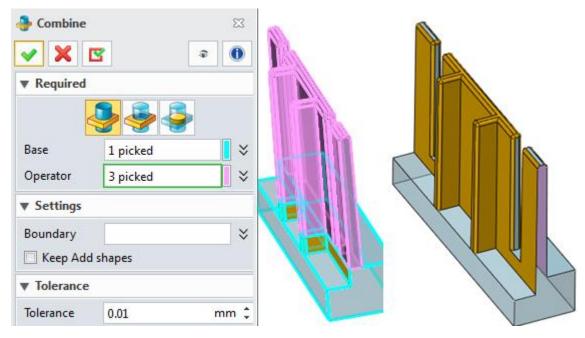
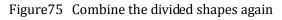


Figure 74 Simplify the half bottom of the divided shape

vii. Combine the divided shapes again as follows





STEP 08 Add stiffer to electrode group 2





Second Se		
Faces F Offset T ▼ Settings	2 picked ¥ 1 mm ‡ 💇 *	
Side faces	Create •	
Extension Intersections	Linear • Do not remove •	ų į
▼ Auto Reduct ✓ Minimize s		

i. Offset the top face of the eletrode shapes as follows:

Figure 76 Offset top face of electrode shapes

ii. Create sketch based on the top face of electrode as follows:

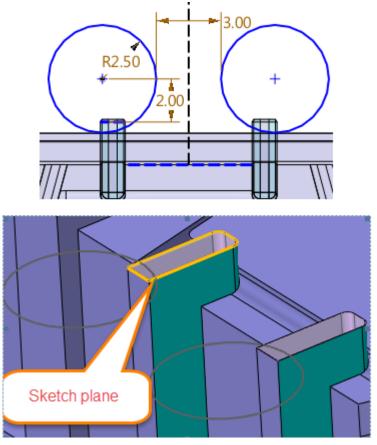


Figure77 Create sketch





SExtrude		x O			
▼ Required					
Profile P	Sketch3	i 🖢			
Extrude type	2 sides	-			
Start S	0 mm	‡ 🗄 👻		`	
End E	-14.76841 mm	‡ 🗄 👻			
Direction		՝ 🕹 י			
Flip face dire	ection				
▼ Boolean					
3	🥩 🎓 🍣			14.768	
Boolean shapes	S3 S4	â			
		× 🔮			J

iii. Extrude the sketch as follows:

Figure 78 Extrude the sketch

iv. Add fillet at the corners as follows:

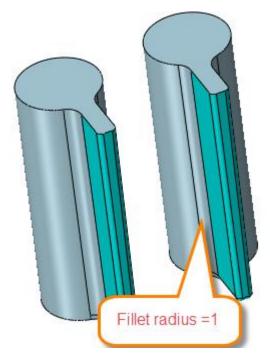


Figure 79 Add fillet at the corners





STEP 09 Add stiffer for group 3

Offset the top face and side face of shapes of group 3 by 1 mm again as follows:

🔖 Face Offse	t E3	
🗸 🗙	0	Dob
▼ Required		
Faces F	2 picked	
Offset T	1 mm 🗘 🖑 👻	
▼ Settings		

Figure80 Offset the top face of electrode group 3

🔖 Face Offset	23	
✓ X	0	
▼ Required		
Faces F	2 picked	
Offset T	1 mm 🗘 🖑 👻	
▼ Settings		
Side faces	Create *	
Extension	Linear 💌	
Intersections	Do not remove 🔻	

Figure 81 Offset the side faces

Next let's go to add stiffer for them:

i. Create stock for the electrode shape by shaping on the left side as follows:



Stock ∞	
▼ Required	
Shapes 2 picked 😵	
▼ Dimensions	-2-
Type By side * Length(X)+ 2 mm 2 5 * - 2 mm 2 5 *	
$\begin{aligned} & \text{Width(Y)} + 2 \text{mm} \downarrow \bigcirc \forall e 2 \text{mm} \downarrow \bigcirc \forall e 2 \\ & \text{Width(Y)} + 2 \text{mm} \downarrow \bigcirc & \forall e 2 \text{mm} \downarrow \bigcirc & \forall e 2 \\ & \text{Height(Z)} + 2 \text{mm} \downarrow \bigcirc & \forall e 2 \text{mm} \downarrow & \bigcirc & \forall e 2 \\ & \text{Height(Z)} + 2 \text{mm} \downarrow & \bigcirc & \forall e 2 \text{mm} \downarrow & \bigcirc & \forall e 2 \\ & \text{Height(Z)} + 2 \text{mm} \downarrow & \bigcirc & \forall e 2 \text{mm} \downarrow & \bigcirc & \forall e 2 \\ & \text{Height(Z)} + 2 \text{mm} \downarrow & \bigcirc & \forall e 2 \text{mm} \downarrow & \bigcirc & \forall e 2 \\ & \text{Height(Z)} + 2 \text{mm} \downarrow & \bigcirc & \forall e 2 \text{mm} \downarrow & \blacksquare & \forall e 2 \text{mm} \downarrow & \bigcirc & \forall e 2 \text{mm} \downarrow & \bigcirc & \forall e 2 \text{mm} \downarrow & \bigcirc & \forall e 2 \text{mm} \downarrow & \blacksquare & \forall e 2 \text{mm} \downarrow & \blacksquare & \forall e 2 \text{mm} \downarrow & \blacksquare &$	

Figure82 Create stock for electrode group 3

ii. Trim it as follows:

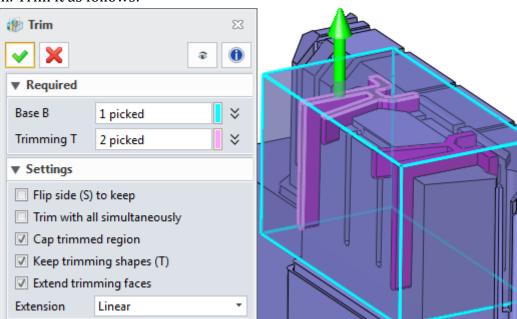


Figure83 Trim the stock by faces





iii. Combine the trimmed stock shape with the electrode shape as follows:

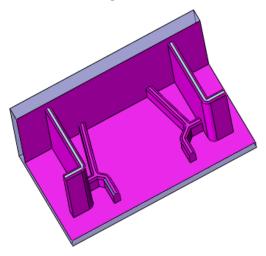


Figure84 Combined the trimmed shape with electrode shapes

iv. Fillet the out side edges by radius of 0.5 mm as follows:

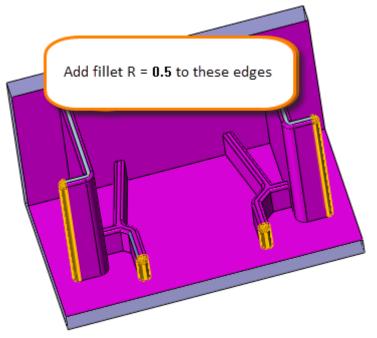


Figure85 Fillet the outside edges

v. Fillet other edges by raidus of 1 mm as follows:





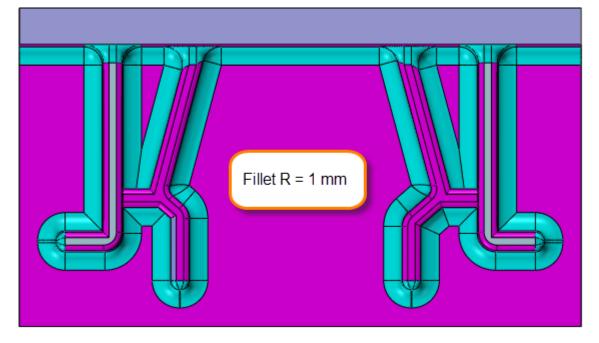


Figure86 Fillet other edges by raidus of 1 mm

- STEP 10 Add blank for each group as follows:
 - i. Add blank for group 1 as follows:
 - 1) Basic dimension for blank:

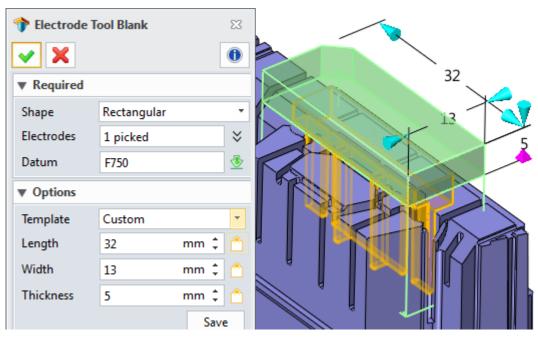


Figure87 Basic dimension for blank of electrode group 1





2) Origin and Mark setting :

Origin Properties Mark 4 >	Origin Properties Mark
Height	Position
*	0000
Position	
	C setback 3
	C setback 3 R setback 0
Reverse Z And Length 💌	
Reverse Z And Length Rotation 0 deg ‡ 🔮 🕶	R setback 0 ‡
	R setback 0 Center Diameter 4
Rotation 0 deg 🗘 👻 🔻	R setback 0 + Center Diameter 4 + Rotation 0 deg 2 *
Rotation 0 deg Image: Constraint of the second	R setback 0 Center Diameter 4 Rotation 0 deg 2 Round blank dimensions

Figure88 Origin and mark for blank of electrode group 1

Change the face color of blank to "brown" and confirm the command. We can get the result as follows:

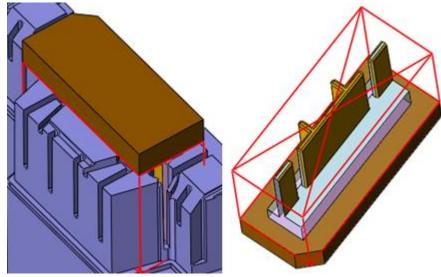


Figure 89 Added blank for electrode group 1





ii. Add blank for electrode group 2 as follows:

1) Basic di	mension for	r blank:		_				
Telectrode To	ool Blank		ΣS					
🗸 🗙 🖪	1		0		3			
▼ Required				1		\geq		/
Shape	Rectangular		-		1	×	16	
Electrodes	2 picked		×					\leq
Datum	F825		₫					\$
▼ Options							K	
Template	Custom		-					
Length	16	mm 🗘	۵					
Width	12	mm 🗘	۵					
Thickness	5	mm ‡	۵	A Carlor				
		Sav	e				2	

Figure90 Basic dimension for blank of electrode group 2

2) The orgin and mark use the same setting as electrode group 1. Confirm it then we can get the following result:

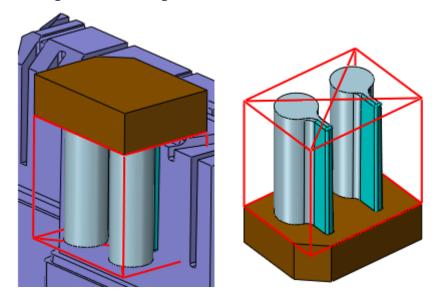


Figure 91 Added blank for electrode group 2





iii. Add blank for group 3

1) Basic dimension:

🅎 Electrode 1	fool Blank		23			
🖌 🗙 C	3		0		20	_
▼ Required					35	
Shape	Rectangula	r	-		V	5
Electrodes	1 picked		\approx		TAN	
Datum	F774		₫	(Internet		
▼ Options					A RIFE	T
Template	Custom		•			
Length	35	mm 🗘	۵			
Width	20	mm 🗘	٢			
Thickness	5	mm 🗘	۵			

Figure92 Basic dimension for blank of electrode group 3

2) Also apply the same origin and mark setting and we can get the following result :

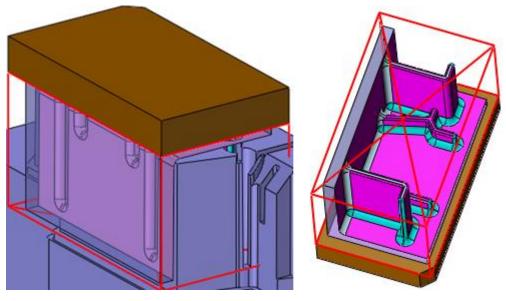


Figure93 Added blank for eletrode group 3



1.3.2 Create Electrodes for Feature Group2

In order to have a clear idea about the creating sequence we can also number the electrode in different area as follows:

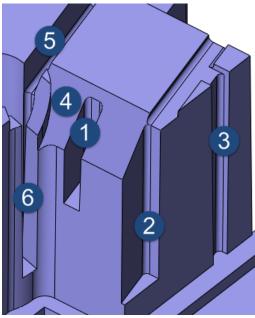


Figure94 Number the electrode by position

STEP 01 Create electrode 1

i. Create stock for the electrode 1 as follows:

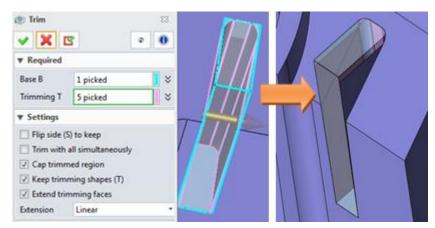
🥪 Stock		23	7
🗸 🗙		0	
▼ Required			
	I		
Shapes	6 picked		
Plane			
Dimension	s		
Туре	By side		
Length(X)+ () mm 🛟 🥸 🔻 - 0	mm	
Width(Y) + () mm 🗘 掛 * - 0	mm	
Height(Z)+ () mm 🗘 🥸 🔻 - 0	mm	
Side Increme	nt 0	mm	

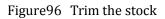
Figure95 Create stock for the open pocket area





ii. Trim it





STEP 02 Create electrode2

i. Since the position for electrode 2 is in open area and the area is so small, in order to make the shape have enough strength, we can create a bigger stock as follows:

🮯 Stock		23		
✓ X	[0	AV V	\leq
▼ Required		(
	I			
Shapes	3 picked			
Plane				
Dimension	IS		2 2 2	2
Туре	By side		Y 1	7
Length(X)+	2 mm 🗘 🕭 🔻 - 0 🛛	mm		
Width(Y) +) mm 🗘 🍜 = - 0 🛛	mm		
Height(Z)+	2 mm 🗘 🖑 🔻 - 0	mm		
Side Increme	nt 0	mm		
Symmetri	ic			

Figure97 Create stock for electrode 2

ii. Trim the stock to get the electrode shape as follows:





🐌 Trim 🛛
✓ X
▼ Required
Base B 1 picked
Trimming T 3 picked
▼ Settings
Flip side (S) to keep
Trim with all simultaneously
Cap trimmed region
✓ Keep trimming shapes (T)
Extend trimming faces
Extension Linear

Figure 98 Trim the stock to get the electrode 2

iii. Fillet the electrode 2 shape as follows:

🌍 Fillet	23			
🖌 🗙 🖸	0			
▼ Required				
Edges E	3 picked 🛛 🗧			
Radius R	1 mm 🗘 垫 🔹			
▼ Shape of Fillet				
Arc type	Circular 🔹			
Relief	0 mm 💲 垫 🔻			
▼ Variable radi	us			
Hold line	*			
-Variable radiu	IS			
Add	Modify Delete			
Vertex	∛			

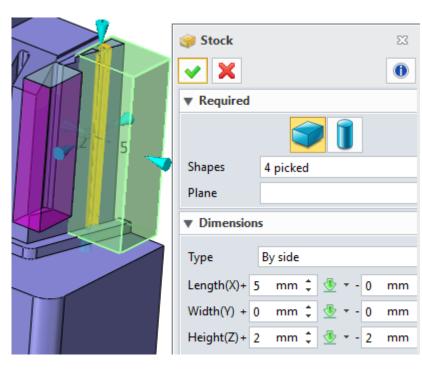
Figure99 Fillet the edges of the electrode 2

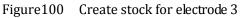
STEP 03 Create electrode 3

i. It is the same that we can stiffen the electrode by creating a bigger stock as follows:









ii. Trim the stock as follows

			🛞 Trim		23		
Â		\checkmark	✓ X		÷ ()		
í			▼ Required				
			Base B	1 picked		->	
			Trimming T	6 picked	×		
			▼ Settings				
			Flip side (S)	to keep			
			Trim with al	l simultaneously			
			🔽 Cap trimme	d region			
			Keep trimming shapes (T)				
			Extend trime	ming faces			
			Extension	Linear	•	- UI	

Figure101 Trim the stock

iii. Then offset the face to get clearance as follows:





Sece Offset		F	2
▼ Required			
	s		
Faces F	2 picked 🛛 🕹		
Offset T	-1.5 mm 🗘 🕭 🔻		
List	⊻ >		
▼ Settings			
Side faces	Create *		
Extension	Linear 🔹		
Intersections	Do not remove 🔹		17
▼ Auto Reduc	e		
Minimize s	urface data		

Figure102 Offset face

iv. Fillet the corner edges as follows:

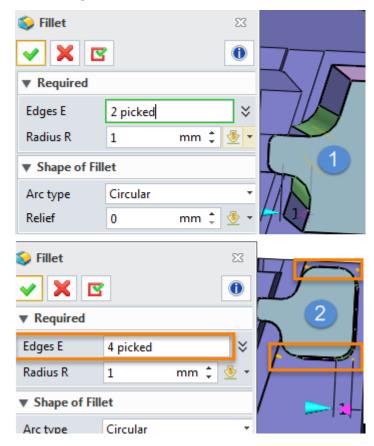


Figure103 Fillet the corner edges





STEP 04 Create electrode 4

i. Create stock as follows

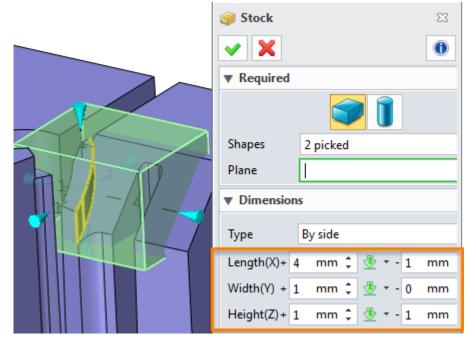


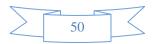
Figure104 Create stock for electrode 4

ii. Trim by bottom face:

🛞 Trim	23	
✓ X	@ ()	
▼ Required		
Base B	1 picked 🛛 🕹	
Trimming T	1 picked 🛛 🕹	
▼ Settings		
Elip side (S)) to keep	
Trim with a	ll simultaneously	
Cap trimmed region		
🔽 Keep trimm	ning shapes (T)	
Extend trim	iming faces	

Figure105 Trim by bottom face

iii. Trim by side faces





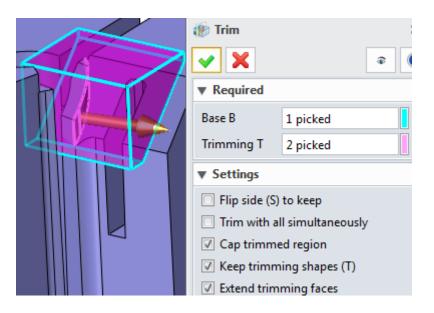


Figure106 Trim by side faces

iv. Set up color for final electrode shape as follows:

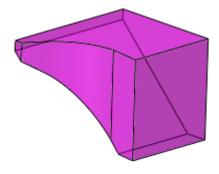


Figure107 Electrode 4

STEP 05 Use the same way we can create the electrode5 as follows:

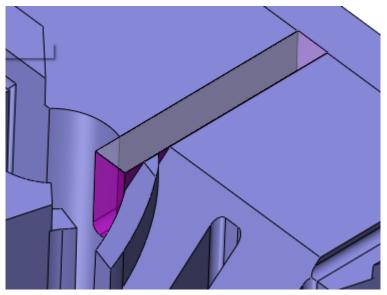


Figure108 Electrode 5





STEP 06 Create electrode 6

To create a good shape for the electrode 6 we can use a sketch to create it as follows:

i. Create sketch on the bottom face as follows:

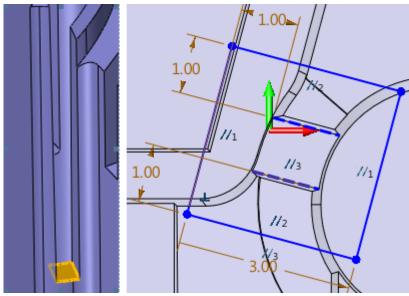


Figure109 Create sketch on bottom face

ii. Extrude it to the top face as follows:



Figure110 Extrude sketch until to the top face







iii. Replace the side face to get the electrode 6 as follows:

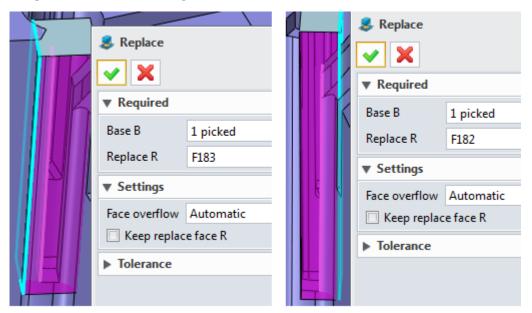


Figure111 Replace the side faces of stock

Result is as follows:

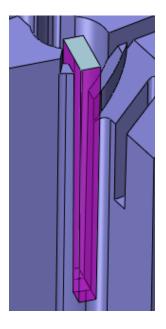


Figure112 Electrode 6

So far, we have finished all of the electrode shapes in the position 2. except some electrode shape like 3, 4, and 5. It is the same that we need to add stiffer for the others 1, 5, 6. Next we will add stiffer as follows:





STEP 07 Create the first stiffer for electrode 6 as follows:

i. Offset the outside face by 1 mm as follows:

Sece Offset	x ()		
▼ Required			
	s		
Faces F	1 picked 💙		
Offset T	1 mm 🗘 垫 👻		
List	1 picked ≚ ×		
▼ Settings			
Side faces	Create *		
Extension	Linear 🝷		
Intersections	Do not remove		
▼ Auto Reduce			

Figure113 Offset the outside face by 1 mm

ii. Create sketch on the top face as follows:

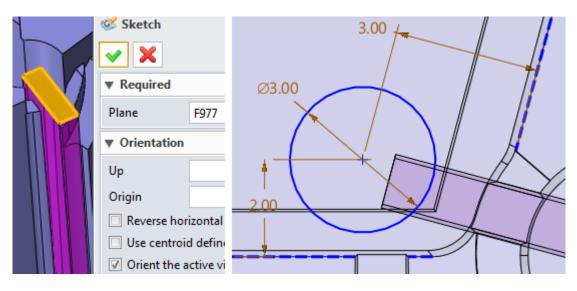
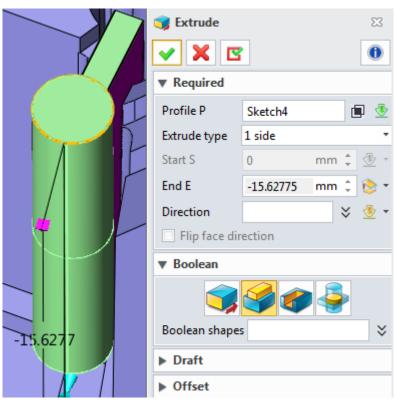


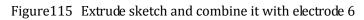
Figure114 Add sketch on top face







iii. Extrude it and combine with electrode 6 as follows:



iv. Fillet the edges as follows:

 Fillet Fillet Required 	1		23		7	H
Edges E Radius R	2 picked	mm ‡	× 	P		
▼ Shape of Fill	et				y	
Arc type	Circular		•		X	
Relief	0	mm 🌻	- 💆			

Figure116 Fillet the edges





STEP 08 Create stiffer for electrode 5 as follows:

i. Offset electrode face as follows:

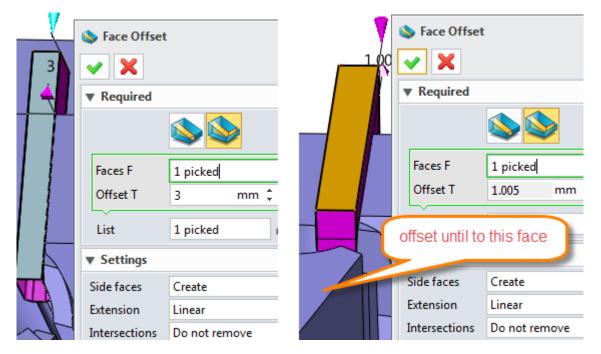


Figure117 Offset side face and top face of electrode 5

ii. Create sketch on top face as follows:

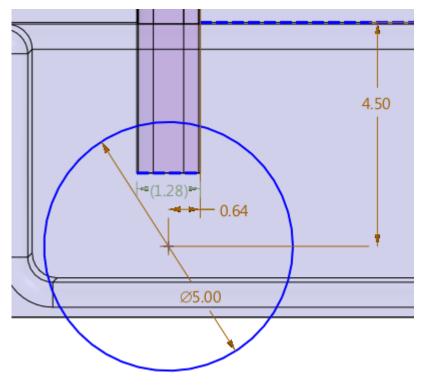
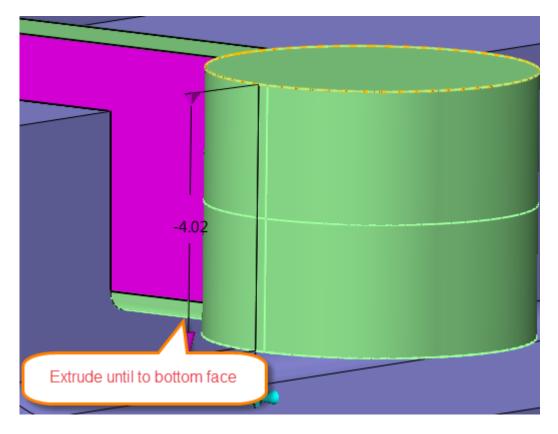


Figure118 Create sketch for electrode 5 on top face







iii. Extrude sketch and combine it with electrode 5 as follows:

Figure119 Extrude sketch and combine with the electrode 5

iv. Fillet the corner as follows:

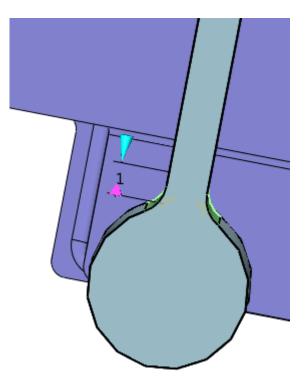


Figure120 Fillet corner edges





STEP 09 Create stiffer for electrode 1

i. Offset side face and top face as follows:

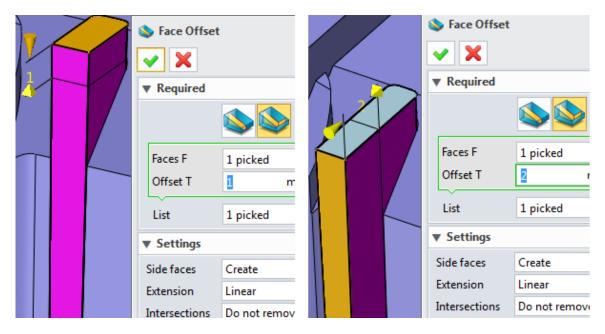


Figure121 Offset the side face and top face

ii. Create sketch on the top face as follows:

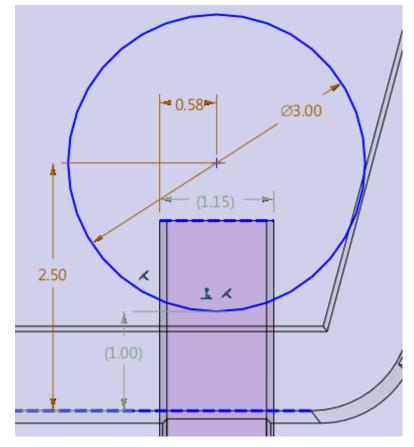
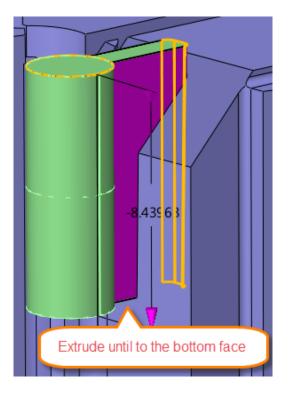


Figure 122 Sketch on the top face of electrode 1







iii. Extrude the sketch until to bottom face of electrode 5 as follows:

Figure123 Extrude sketch until bottom face of electrode 5

iv. Fillet the corner edges as follows

🌍 Fillet		23	ſ	
🖌 🗙 I	3	0		V
▼ Required			A	
Edges E	2 picked	*		+-+
Radius R	1	mm 🗘 垫 🝷	/()
Shape of F	illet			

Figure124 Fillet the corner edges





STEP 10 Align all the electrode shapes' top face to same level by replacing face as follows:

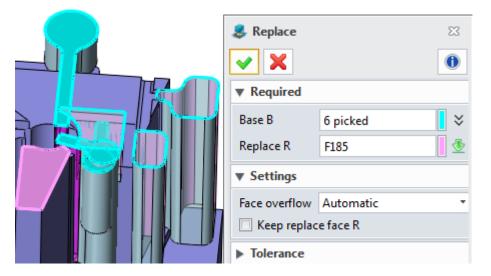


Figure125 Align all of the electrodes' top face to same level

STEP 10 Add blank for the electrodes

i. Firstly, we can observe the electrode and actually we can group the electrode 1, 2, 3 and 5 into one group and share the same blank as follows:

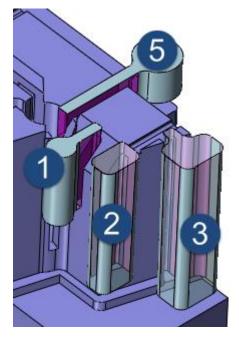


Figure126 Group electrodes into one group

- ii. Next let's Add blank for the group :
 - 1) Basic dimension for the blank:



Electrode design



	🅎 Electrode T	ool Blank	23
	✓ X	٢	
	▼ Required		
22	Shape	Rectangular	-
	Electrodes	4 picked	\approx
25	Datum	F1060	₫.
	▼ Options		
	Template	Custom	•
	Length	25	mm 🗘 📩
	Width	22	mm 🗘 📩
	Thickness	6	mm 🗘 📩
			Save

Figure127 Basic dimension for blank of electrode group

2) Orign and Mark setting as follows:

Origin Properties Mark • •	Origin Properties Mark 4		
Height	Position		
*	0000		
Position			
	C setback 4		
	R setback 0 🌲		
Reverse Z And Length *	Center Diameter 4		
Rotation 0 deg 🗘 🛬 🔹	Rotation 0 deg 🗘 🍜		
Round blank dimensions	Round blank dimensions		
🔲 Round blank origin	Round blank origin		
🗵 Use local coordinate frame	Use local coordinate frame		
🔽 Align blank with model space axis	Align blank with model space axis		

Figure128 Origin and Mark setting for blank of electrode group





3) Result is as follows:

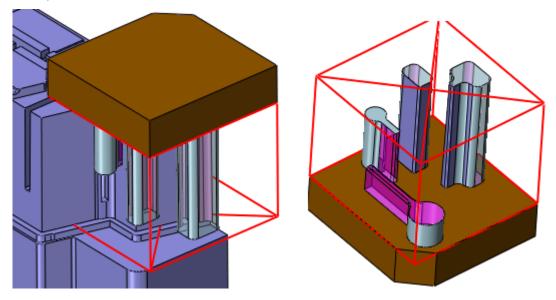


Figure129 Added blank for electrode group

- iii. Add blank for electrode 4
 - 1) Basic dimension for blank of electrode 4

🍿 Electrode T	ool Blank	23
🗸 🗙 🖸	3	0
▼ Required		
Shape	Rectangular	-
Electrodes	1 picked	\approx
Datum	F1062	₫
▼ Options		
Template	Custom	•
Length	10	mm 🗘 📩
Width	10	mm 🗘 📩
Thickness	5	mm 🗘 📩
		Save

Figure130 Basic dimesnion for blank of electrode 4

2) Origin and Mark setting as follows:





Origin Properties Mark • •	Info Origin Properties Mark			
Height	Position			
*	0000			
Position	DBD			
	C setback 2			
	R setback 0 ‡			
Reverse Z And Length *	Center Diameter 4			
Rotation 0 deg 🗘 🖑 👻	Rotation 0 deg 🗘 👁 👻			
Round blank dimensions	Round blank dimensions			
Round blank origin	Round blank origin			
Use local coordinate frame	☑ Use local coordinate frame			
Align blank with model space axis	Align blank with model space axis			

Figure131 Origin and Mark setting for blank of electrode 4

3) Result is as follows:

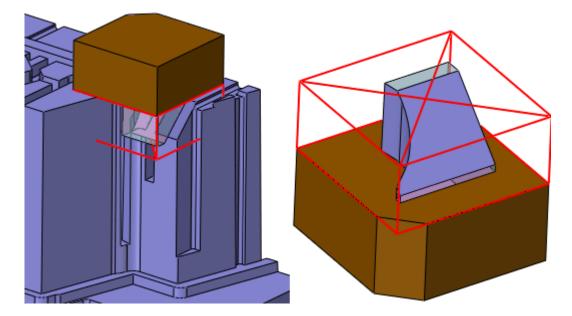


Figure132 Added blank for electrode 4





iv. Add blank for eletrode 6

1) Basic dimension for blank of electrode 6

	🍿 Electrode T	ool Blank	23
8	🗸 🗙 🖸	2	0
	▼ Required		
6	Shape	Rectangular	•
	Electrodes	1 picked	*
	Datum	F1057	₫
	▼ Options		
	Template	Custom	•
	Length	6	mm 🗘 🗂
	Width	8	mm 🗘 🗂
	Thickness	5	mm 🗘 🗂
			Save

Figure133 Basic dimension for blank of electrode 6

2) Origin and Mark setting as follows:

Origin Properties Mark 4 >	Origin Properties Mark 4 🕨			
Height	Position			
	00000			
Position				
	C setback 2			
	R setback 0 ‡			
Reverse Z And Length *	Center Diameter 2			
Rotation 0 deg 🗘 👻 🔻	Rotation 0 deg 🗘 👻 🔻			
Round blank dimensions	Round blank dimensions			
Round blank origin	Round blank origin			
✓ Use local coordinate frame	Use local coordinate frame			
Align blank with model space axis	Align blank with model space axis			

Figure134 Origin and Mark setting for blank of electrode 6





3) Result is as follows:

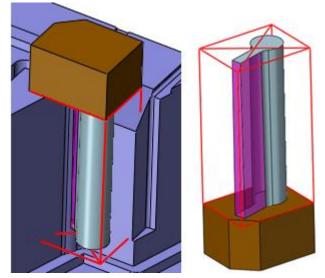


Figure135 Added blank for electrode 6

1.3.3 Sparking Drawings for All Created Electrodes

Here let's use the customized base point to create the sparking drawing. As follows:

🛐 Sparking D	raw	23	15	No.	1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-	
🗸 🗙 C	3 (0 🚺				ST
Required					1 BUT IN	U.
Workpiece	S1 👲	∕				
Electrodes	6 picked	*				
Options						
Frame	Custom	•				
Base point	,-50.02,34.5529 🗧 💆	-				
	<u> </u>					

STEP 1 Specify base point

Figure136 Create sparking drawing based on customized base point

STEP 2 Create general drawing and individual sparking drawing for each electrode as follows:





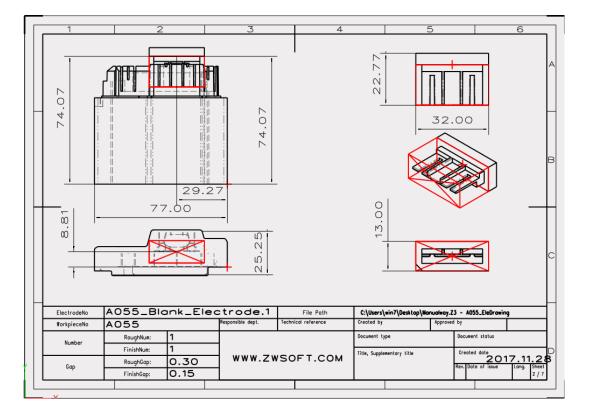


Figure137 One of created sparking drawing for individual electrode

STEP 3 If necessary , we can export the drawing as PDF file for workshop as follows:

ſ	🖗 Select file for e	xport						× 5	5		6	-
	Save in:	Ja ZW3D		- 🕝 🏚 📂								
	Ca	Name	*	Date modif	ied	Туре						Ľ
	Recent Items	퉬 Standard parts		11/7/2017 1	1:38 AM	File folder		1		N		
-	Desktop								32.0			ŀ
	Desktop								52.0	<u> </u>		
							Preview		\wedge			
	My Documents											E
									X			
	Computer								X			
		4									_	
		File name: Sprak	ing drawing.pdf			Save						
			File (*.pdf)			Cancel						
		Save as type.	ne (.pu)	•		Cancer						
												C
	† `											
	ElectrodeNo	A055_BI	onk_Elec	trode.1	F	ile Path	C:\Users\win7\D	esktop\War	iuolwoy.Z3	- A055_EleDrowing		Ŧ
	WorkpieceNo	A055		Responsible dept.	Technical r	eference	Created by		Approved t			
	Number	FinishNum: 1			WW.ZWSOFT.COM		Document type Title, Supplementary title		1	Document status		
				www.zw						Created date	7.11.	28
	Gap	RoughGap: FinishGap:	0.30						R	tev. Date of issue	Lang. S	heet
		r manoup.	10.10									<u> </u>





🐲 Sheet PDF Settings										
Export to										
File C:\Users\win7\Documents\ZW3D\Spraking drawing.pdf										
PDF Setting										
General PDF Info Security										
Export Type	-Paper setting									
O 3D PDF O 2D PDF	Orientation	-								
2D PDF Export Settings	Paper Size	A4	•							
Resolution(DPI) 400	Unit	mm	•							
Export Area Entire Sheet 💌	Height	297								
Pick Area	Width	210								
Notice The PDF document requires PDF Reader 7.1.0 or later version to open										
Default	ОК	Cancel								

Figure138 Export the sparking drawing as PDF

1.4 <u>Summary</u>

So far, we have finished the electrode design for these samples by both automatic way and manual way.

From the whole process you will get the idea about how to use ZW3D's electrode modules and learn how to use the typical manual tools for the complicated electrode design. Besides it also introduced how to add the stiffer for thin and narrow electrode.

Finally, it introduced how to create the blank for electrodes and create the sparking drawing for EDM.

