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PowerSHAPE 2015 R2

# Reference Help

Delcam Electrode



## **PowerSHAPE**

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### **Patent Information**

Emboss functionality is subject to patent number GB 2389764 and patent applications US 10/174524 and GB 2410351.

Morphing functionality is subject to patent application GB 2401213.

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# Delcam Electrode

**Delcam Electrode** incorporates:

- design in PowerSHAPE. This uses **Electrode Wizard - Design**.
- machining in PowerMILL.
- inspection in PowerINSPECT.

All manufacturing data is transferred seamlessly between the modes using the [.trode](#) file format.

Delcam Electrode creates electrodes that are used with Electro Discharge Machining (EDM). It can also create setup sheets for the electrodes. Running Delcam Electrode, creates the following:

- **Electrode** — The burn region, base, and clearance on pre-modelled solids are identified and the burn-region shading is added. The shading, with values for burn height and base height are exported in the [.trode](#) file and read by the **Electrode Machining Wizard** in PowerMILL.
- **GA sheet** — This is a top-down view of the model, with the electrode and holders positioned in the burn position. Balloons give the EDM details for each electrode. Values on the setup sheets are rounded to the general tolerance.
- **Electrode Detail sheet** — This shows a view of the individual electrode with the wireframe outline of the stock material. It gives the details for machining the electrode. The sheet is automatically updated if you change the properties of the electrode.

The Electrode detail page that is created when geometry is exported or used by PowerMILL is now compatible with the following web browsers:

Internet Explorer  
Firefox  
Mozilla (SeaMonkey)  
Netscape  
Opera

**See Also:**

Starting Delcam  
Electrode from  
PowerMILL (see  
page 5)

Changing the  
Electrode options  
(see page 6)

Tips for creating  
electrodes (see  
page 65)

Side-sparking and  
vector-burn  
electrodes (see  
page 71)

Modifying an  
electrode (see page  
82)

Exporting and  
Importing  
Electrodes (see  
page 89)

Setting up your  
own blanks (see  
page 99)

Using a materials  
alias file (see page  
121)

Setting up  
catalogues for  
holders

Starting Delcam  
Electrode in  
PowerSHAPE (see  
page 5)

Creating an  
electrode (see page  
22)

Creating multiple  
electrodes for the  
same region (see  
page 69)

Creating a copy of  
an electrode (see  
page 75)

Sequencing of  
electrodes (see  
page 86)


Shading the burn  
area of an  
electrode (see page  
98)

Customisation of  
drawings (see page  
101)

Generating a  
summary  
spreadsheet (see  
page 122)

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# Starting Delcam Electrode from PowerMILL

- 1 With components selected, click the **Create an electrode**  button on the PowerMILL toolbar.



This starts the electrode session.

- 2 Click **Create an electrode**  on the electrode toolbar.



The first page of the Electrode wizard is displayed.

The following options become available on the Electrode toolbar when the appropriate electrode GA and electrode detail sheets have been generated:



— Switch to electrode model window.



— Switch to electrode GA window.



— Switch to next electrode detail window.




— Switch to previous electrode detail window.

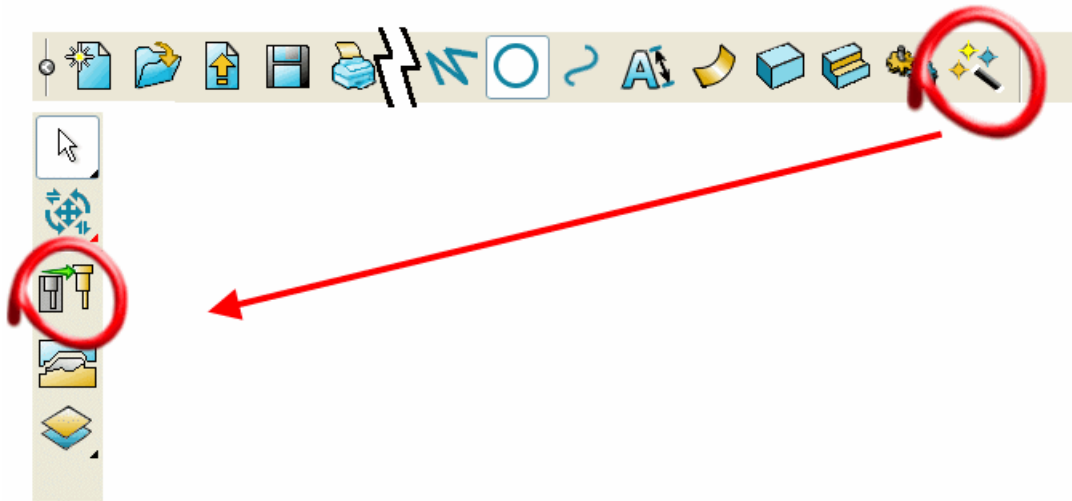
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# Starting Delcam Electrode in PowerSHAPE

To start the Electrode Design Wizard from the main toolbar:

- 1 Ensure you have an active solid.
- 2 Select **Wizards**  on the main toolbar.

- 3 Click the **Create an electrode**  button on the Wizards toolbar.







Alternatively, you can select **Object > Wizards > Electrode** from the menu.

In addition to running the Electrode Wizard, using Delcam Electrode enables you to switch between the electrode model and viewing the GA and detail sheets.

- 1 Select **Electrode** from the **Module** menu.
- 2 Select **Create an electrode**  from the Electrode toolbar.



The following options become available on the Electrode toolbar if the appropriate electrode GA and electrode detail sheets have been generated:

-  — Switch to electrode model window.
-  — Switch to electrode GA window.
-  — Switch to next electrode detail window.
-  — Switch to previous electrode detail window.

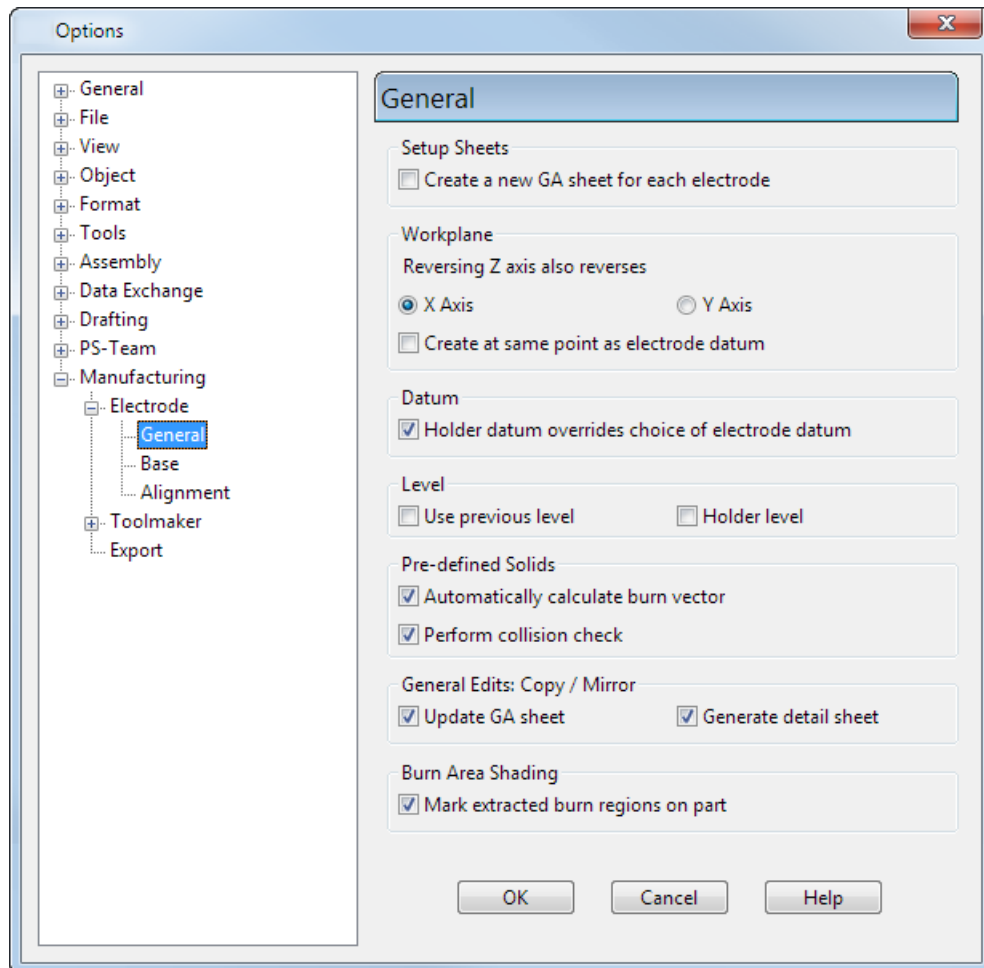
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## Changing the Electrode options

- 1 Select **Tools > Options** from the menu to display the **Options** dialog.
- 2 From **Manufacturing**, select **Electrode**. The Electrode options are divided into these pages:




- **General** (see page 8)
- **Base** (see page 10)
- **Alignment** (see page 12)



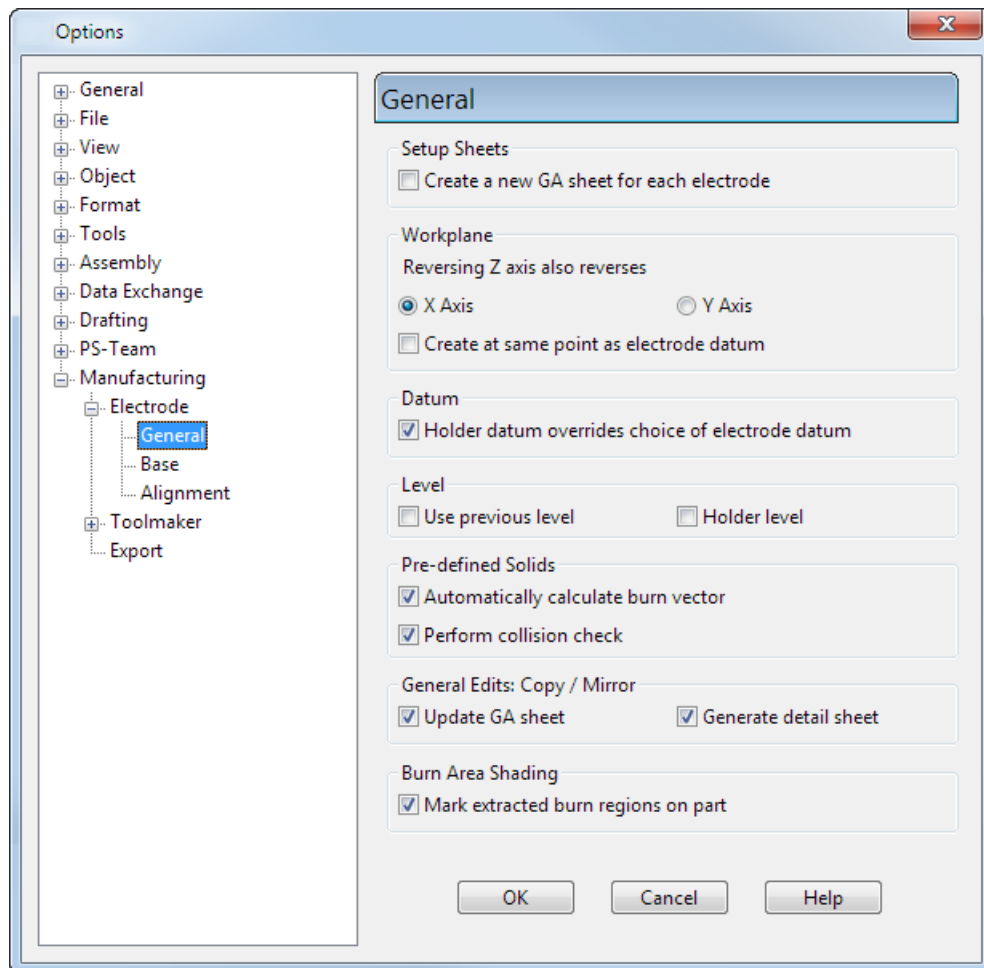
- 3 Using these pages of options, make the required changes to control the default behaviour of Delcam Electrode.
- 4 Click **OK**.



You can also change Electrode options by selecting  on the Select Region page of the Electrode Wizard

## General page

This option page enables you to control the default behaviour of the Electrode Wizard.



**Setup Sheets** — Select this option to create a separate General Assembly sheet for each electrode created by the wizard.

**Workplane** — This group of options enables you to define the position and orientation of the workplane.

**Reversing Z axis also reverses** — When the electrode workplane is reversed in Z, this specifies which of X or Y is also reversed.

**Create at same point as Electrode Datum** — Select this option to create the workplane at the electrode datum, rather than at the bottom of the blank.

### Datum

**Holder datum overrides choice of electrode datum** — Deselect this option to keep the electrode datum at the designated point, even if you specify a holder.

### Level

**Use previous level** — Select this option to create all electrodes on the same level as the previous electrode. Deselect it to create a new electrode on the next unused, unnamed level.

**Holder level** — Select this option to create the electrode holder on the same level as the electrode. Deselect it to create the holder on the **Electrode Holders** level.

### Pre-defined Solids

**Automatically calculate burn vector** — If selected, the burn vector is automatically calculated and the electrode extracted in the direction of the calculated burn vector. If deselected, electrodes are always extracted in Z direction.

**Perform collision check** — Use this option to control collision checking between pre-modelled electrodes and the part. When a collision is detected, you can twiddle the model and zoom to inspect the offending region.

**General Edits: Copy/Mirror** — These options enable you to control the updating of GA and Detail sheets when an electrode is copied, rotated, or mirrored using general edits.

**Update GA sheet** — Select this option to automatically update the GA sheet for electrodes that are copied, mirrored, or rotated using general editing. Deselect it not update the GA sheet.

**Generate detail sheet** — Select this option to automatically update the Detail sheet for electrodes that are copied, mirrored, or rotated using general editing. Deselect it not update the Detail sheet.

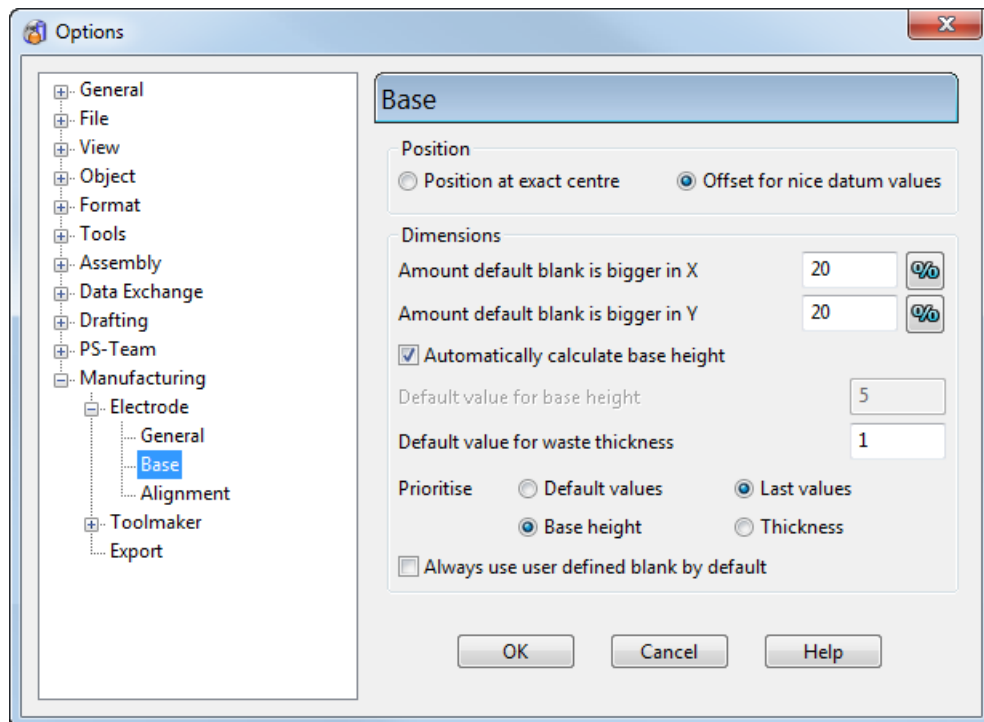
**Mark extracted burn region on part** — If selected, the burn region on the part is shaded when the electrode is extracted. This is done by changing the material of the faces in the active solid used to define the electrode burn region. This option is selected by default.



*To see the shading on the extracted burn region of the part, you must select **Style from surfaces** on the Solid popup.*

## Base page

Use this page to specify the settings for options relating to the electrode blank.





**Position** — These options define the position of the blank.

**Position at exact centre** — Select this option to position the base of the electrode blank at the exact centre of the electrode geometry.



**Offset for nice datum values** — Select this option to allow the base of the electrode blank to be offset from the exact centre of the electrode geometry to give rounded datum values.

**Dimensions** — Use this group of options to define the size of the blank.

**Amount default blank is bigger in X** — Enter the amount by which the electrode blank is larger in the X direction than the electrode geometry.

You can toggle the button to enter a percentage  or a length .

**Amount default blank is bigger in Y** — Enter the amount by which the electrode blank is larger in the Y direction than the electrode geometry.

You can toggle the button to enter a percentage  or a length .

**Automatically calculate base height** — Select this option to calculate the base height automatically.

**Default value for base height** — Enter the default value for the base height of the electrode blank. This option is available only if **Automatically calculate base height** is deselected.

**Default value for waste thickness** — Enter the default value for the waste thickness of the electrode blank.

**Prioritise** — Select what to prioritise from:

**Default Values** — Select this option to use the default values when specifying the electrode blank.

**Last Values** — Select this option to use the values that were used for last electrode blank.

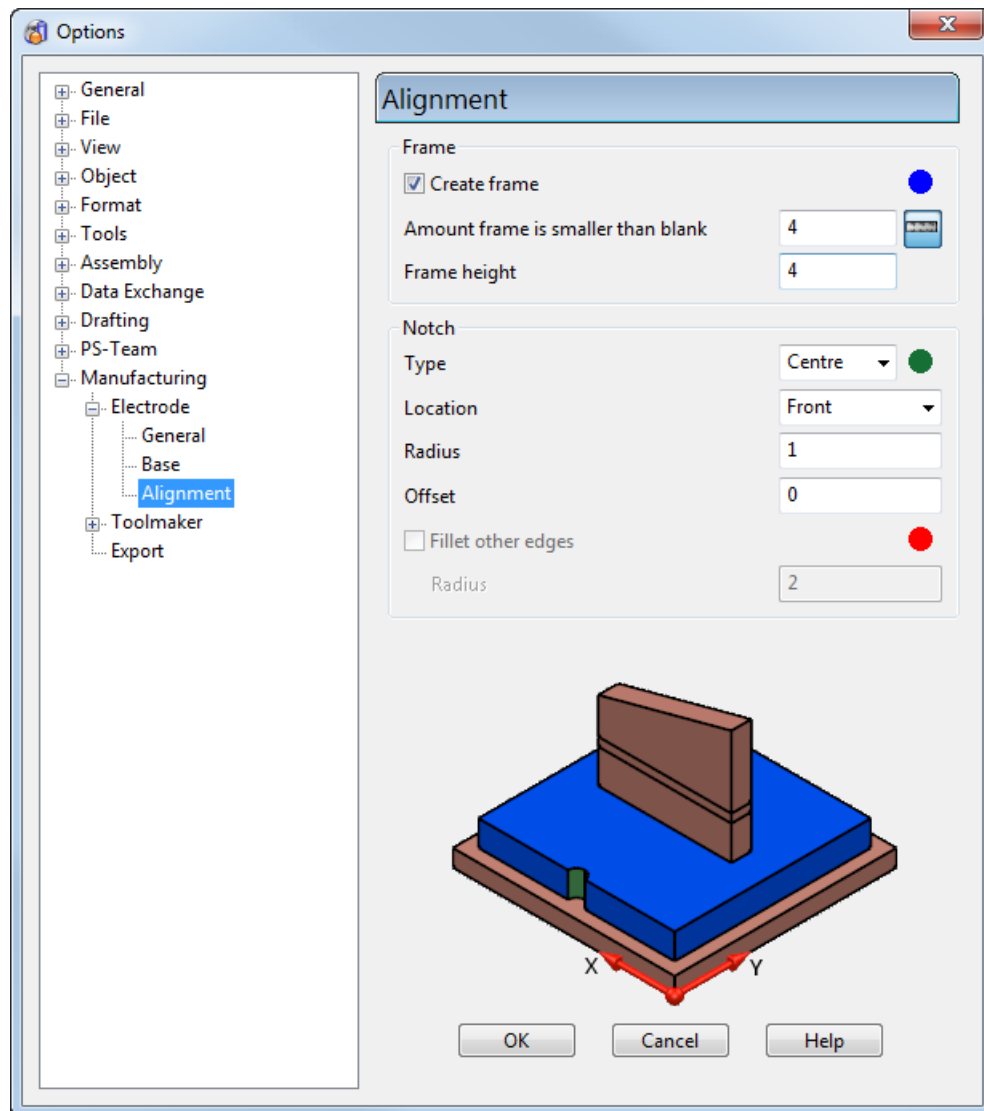
**Base Height** — If the height of the blank is fixed and this option is selected, the base height of the blank (**Base Ht**) is calculated.

**Thickness** — If the height of the blank is fixed and this option is selected, the thickness of the blank (**Thickness**) is calculated.

**Always use User Defined blank by default** — Select this option to set the default setting for the electrode blank as **User Defined**.

## Alignment page

Use this page to create an electrode frame and a notch to help align the electrode correctly.



### Frame

Use the options in this area to specify a frame.

**Create frame** — Select this option to create a frame.

You can define the following (see page 88):

- **Amount frame is smaller than blank** — Enter the distance to offset the frame from the blank.
- **Frame height** — Enter the height of the frame.

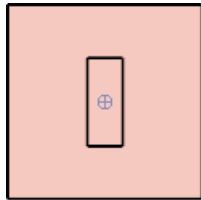
## Notch

Use the options in this area to specify an alignment notch. An alignment notch enables you to easily identify the orientation of an electrode to the part. The diagram on the page is updated when you set a new option.

**Type** — Select the type of notch you want to create from:

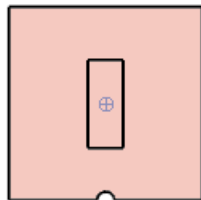
- **None** — Select this option if you do not want to create a notch.

This example shows a bottom view of an electrode with no notch:

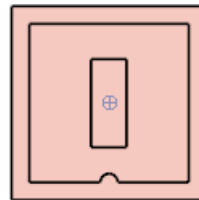


- **Centre** — Select this option to create a cylindrical groove in the centre of a side face of the base or frame.

This example shows a top view of a **Centre** notch on an electrode:

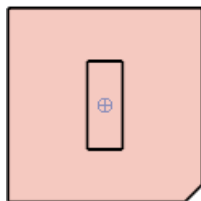


If the electrode has a frame, the notch is created in the frame:

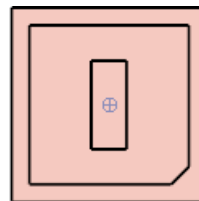


- **Corner** — Select this option to create a chamfer on a corner of the base or frame.

This example shows a bottom view of a **Corner** notch on an electrode:



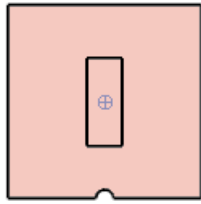
If the electrode has a frame, the notch is created in the frame:



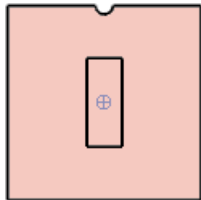
**Location** — Set the location of the notch. These examples use a bottom view.

If you are creating a **Centre** notch, select the location from:

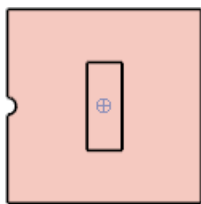
- **Front**



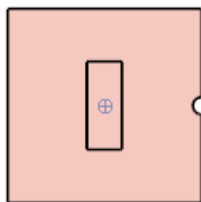
- **Back**



- **Left**

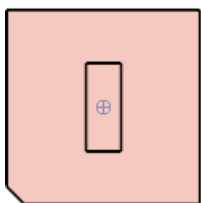


- **Right**

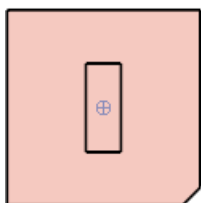


If you are creating a **Corner** notch, select the location from:

- **Front-left**

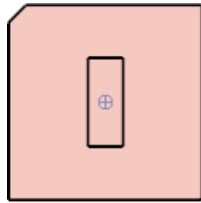


- **Front-right**

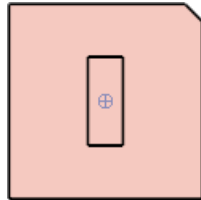




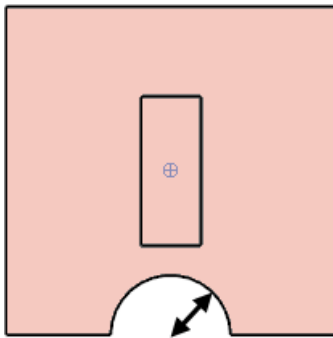
- **Back-left**



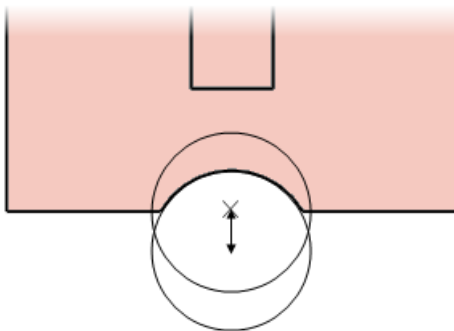
- **Back-right**



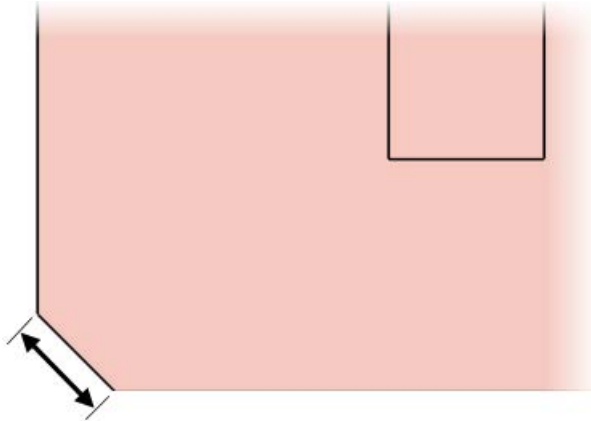
**Radius** — For a **Centre** notch, enter the radius of the cylindrical groove.



**Offset** — For a **Centre** notch, you can offset the centre of the cylindrical groove outwards. Enter a positive offset distance.

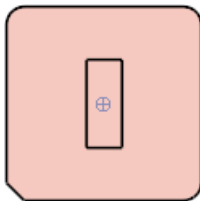


**Length** — For a **Corner** notch, enter the length of the chamfer for a corner notch.

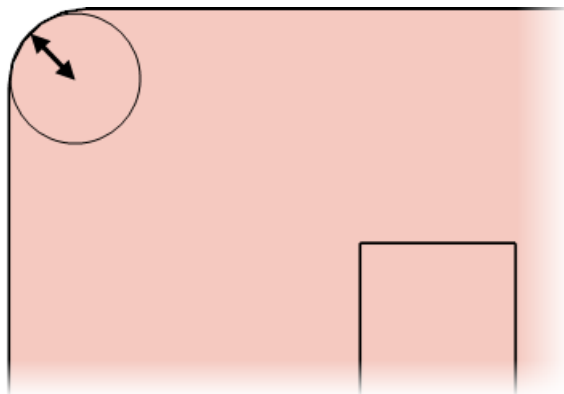


**Fillet other edges** — For a **Corner** notch, select this option to fillet the other three corners of the frame or base.

This example shows a bottom view of a **Corner** notch with **Fillet other edges** selected:




**Radius** — Enter a radius for the **Fillet other edges** option.

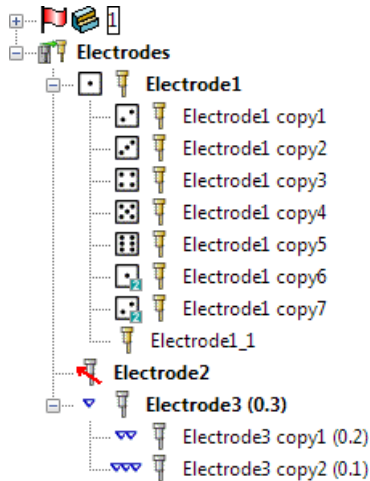







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## Electrode tree

The electrode tree displays all the electrodes and solids in the model.

All electrodes in a model are contained in the **Electrodes** category. Click the **Expand**  button to expand the category and show all the contained electrodes.



- Original electrodes are named in bold.
- Copies of electrodes appear on a sub-level to the parent electrode.
- The following icons describe the electrodes:
  -  — Identifies a copper electrode.
  -  — Identifies a graphite electrode.
  -  — Identifies the burn-form number on a Multi-Impression electrode. When a Multi-Impression electrode has more than 6 burn-forms the dice icon repeats with a subscript describing the repeat number, up to a maximum of 4, giving 24 distinct burn-forms.
  -  — Identifies an electrode with an extraction vector in two dimensions.
  -  — Identifies a Multi-Family electrode, where each burn-form is identical except for their undersizes. One icon represents a roughing electrode, two icons represents a semi-finishing electrode, and three icons represents a finishing electrode.

## Selecting electrodes in the tree

You can select multiple electrodes in the electrode tree by using **Ctrl** + click or **Shift** + click. This is the same as selecting solids or assemblies in the tree.

## Editing electrodes in the tree

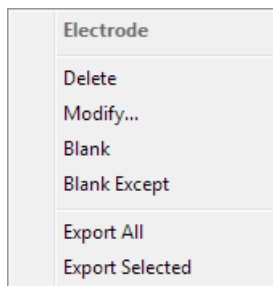
You can perform simple commands on electrodes by:

- Selecting electrodes from the tree and using common keyboard shortcuts.
- Using the options on the appropriate context menus. The context menus are slightly different for standard electrodes, Multi-Impression electrodes, and Multi-Family electrodes.

To edit electrodes from the tree:

- 1 Select an electrode from the tree.
- 2 Right-click the selected electrode.

The **Electrode** context menu is displayed.



- 3 Use the following options to edit the electrode:

**Delete** — Select this option to delete the electrode

**Modify** — Select this option to display the **Edit Electrode** dialog.

**Blank** — Select this option to blank the electrode.

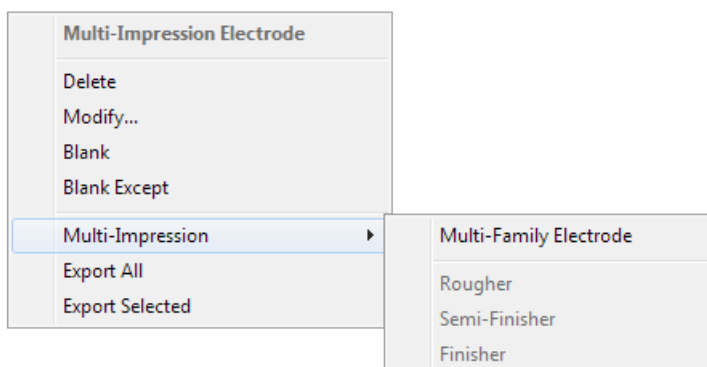
**Blank Except** — Select this option to blank all electrodes except for the selected electrode.

**Export All** — Select this option to display the **Electrode Wizard - Design** dialog, to export all electrodes in the model.

**Export Selected** — Select this option to display the **Electrode Wizard - Design** dialog, to export the selected electrodes in the model.

### Multi-Impression electrode

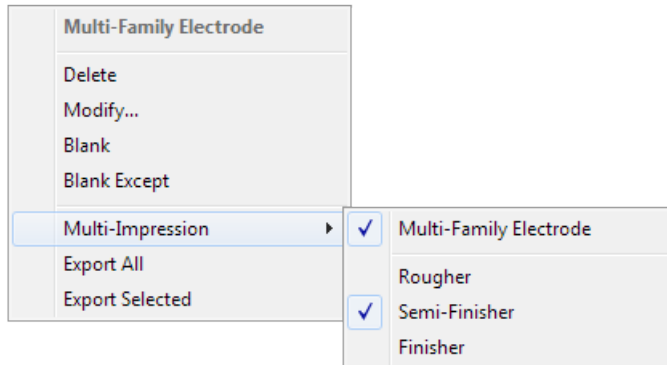
If you select a Multi-Impression electrode (see page 20), the **Multi-Impression Electrode** context menu is displayed, with additional options:



**Multi-Family Electrode** — Select this option to convert the Multi-Impression electrode into a Multi-Family Electrode.

### Multi-Family electrode

If you select a Multi-Family electrode (see page 21), the **Multi-Family Electrode** context menu is displayed, with additional options:



**Multi-Family Electrode** — Deselect this option to convert the Multi-Family electrode into a Multi-Impression electrode.

**Rougher** — Select this option to define the selected electrode as a rougher, with rough undersize values.

**Semi-Finisher** — Select this option to define the selected electrode as a semi-finisher with semi-finish undersize values.

**Finisher** — Select this option to define the selected electrode as a finisher, with finisher undersize values.

## Electrode types

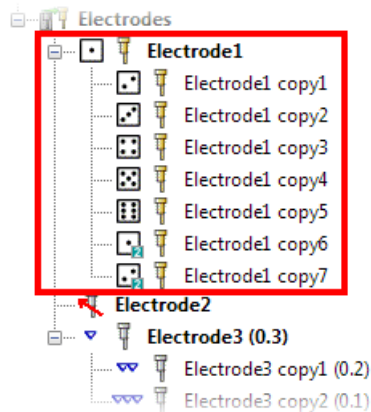
The different types of electrode are displayed in the electrode tree and are illustrated by different icons.

The electrode types displayed in the tree are:

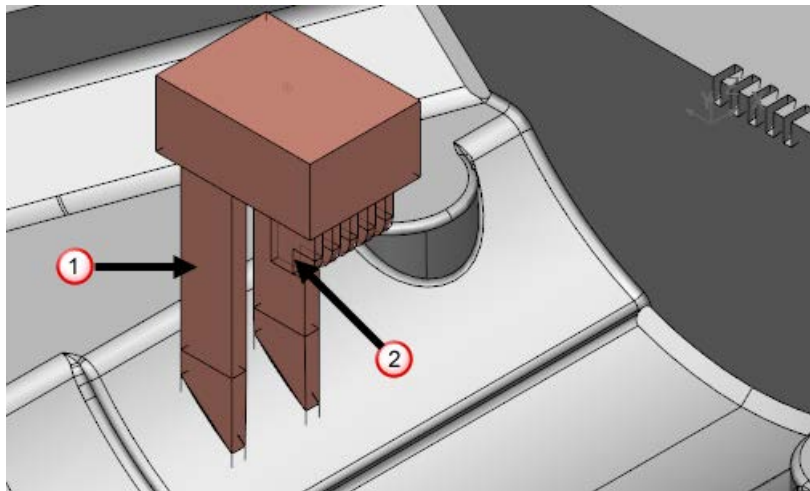
- Standard electrodes.
- Multi-Impression electrodes (see page 20).
- Multi-Family electrodes (see page 21).

## Multi-Impression electrodes

Electrodes with multiple burn-forms on a single blank are defined and grouped in the tree as Multi-Impression electrodes (see page 78).




The number of burn-forms on an electrode is indicated by the dice icon in the tree. The example below shows an electrode with two burn-forms on a single blank



① — First burn form.

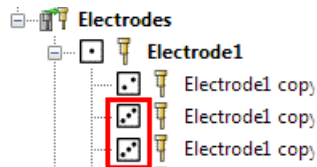
② — Second burn form.

When an electrode has more than six burn-forms the dice icon restarts at one, but has an overlaying subscript that represents the repeat number, for example the seventh burn-form shows .



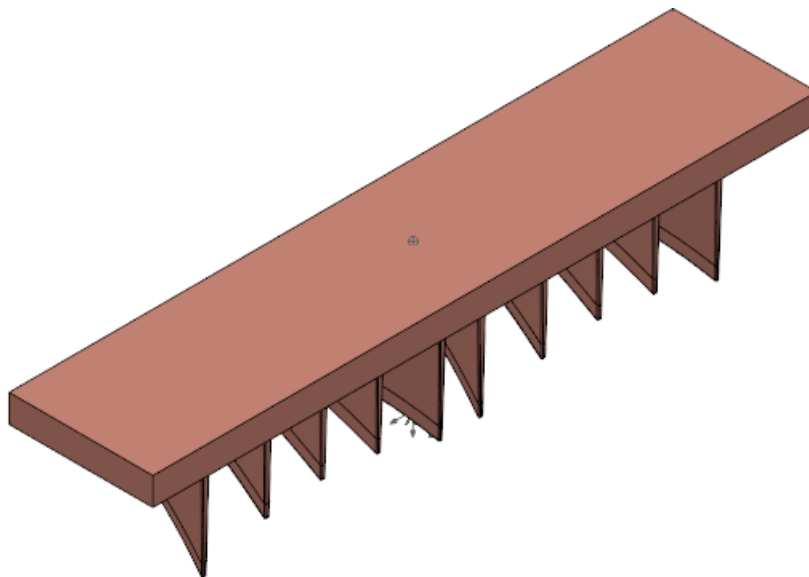
*A Multi-Impression electrode can have a maximum of 24 distinct burn-forms.*

If a burn-form is used to burn more than one location, it appears more than once in the list. For example the Multi-Form electrode below has three burn-forms, where the third burn-form is used twice:



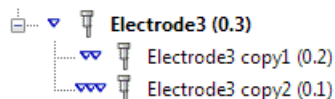
## Multi-Family electrodes

Multi-Family electrodes are Multi-Impression electrodes where the burn-forms are identical except for their undersizes.



You can define a Multi-Family electrode (see page 81) from a Multi-Impression electrode.

Multi-Family electrodes are displayed in the electrode tree:




The icons represent the undersizes of the burn-forms, which are displayed in brackets after the electrode name.

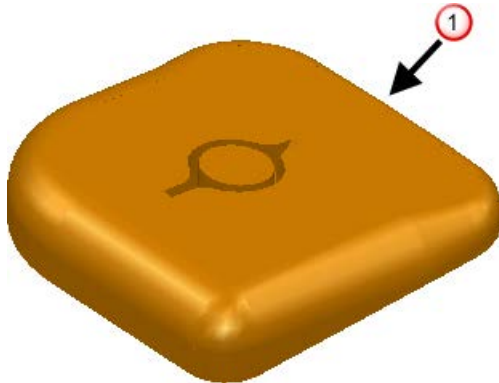
- ▼ — represents a roughing burn-form with a large undersize.
- ▼▼ — represents a semi-finishing burn-form, with a moderate undersize.
- ▼▼▼ — represents a finishing burn-form, with a small undersize.


---

## Creating an electrode


The **Electrode Wizard** helps you define the electrode.

- 1 Ensure you have an active solid .



- 2 Click the **Electrode**  button on the **Wizards** toolbar.
- 3 Select the region (see page 25) on the solid where you want to create an electrode.
- 4 Define the extension of the electrode (see page 35) that attaches the burning face to the base.
- 5 Define the electrode blank (see page 45).
- 6 Add a holder to the electrode (see page 52).
- 7 Enter general information on the electrode, generate fill-in surfaces, and generate setup sheets using the **General Options** page (see page 54).
- 8 Create a family of electrodes from the electrode you have defined using the **Electrode Family** page (see page 58).
- 9 Export the electrode and create a summary spreadsheet using the **Export Options** page (see page 8).

If you click **Finish** at any stage, the wizard creates an electrode using the current settings.

If you click the **Exit**  button, you exit, with the objects you have already created.

If you click **Cancel**, any objects created as part of the electrode are removed.

## Select product and electrode objects


Use this page to select surface data representing the part from which Delcam Electrode extracts the electrode.

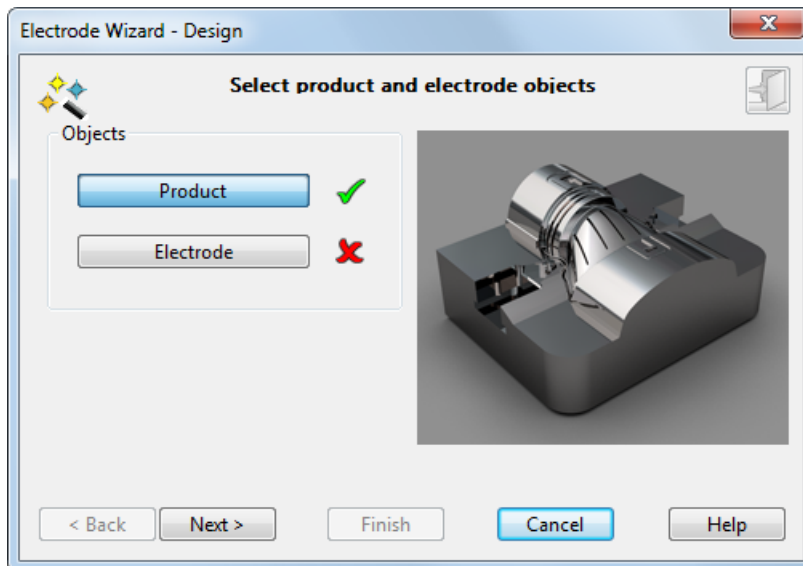




*If the selected solid is the Active solid, Product and Electrode are selected automatically and this page of the wizard is omitted.*

1 Select the solid.

2 Click  from the Wizard toolbar to display the **Select product and electrode objects** page of the Electrode wizard.

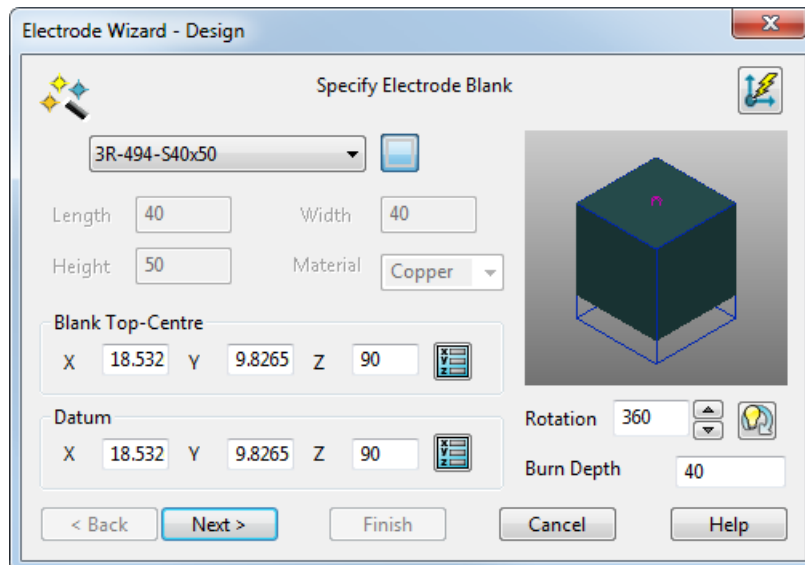


3 If required, click **Electrode** and select additional electrode surfaces for shutout faces at the intersection of ribs.

4 Click **Next** to display the **Select Regions** page (see page 25) and create the electrode in the normal way.

## Electrode wizard - Specify Electrode Blank (pre-selected solid)



Use this page to specify the blank of the electrode when the **Product** is an active solid and the *Electrode* is a pre-selected solid.



User Defined — This selector contains standard blanks available, which fit the dimensions of the electrode. You can add your blanks to this list. For further details, see Setting up your own blanks (see page 99).

The selector also contains the **User Defined** option, which enables you to define your own blanks.

If a standard blank is selected, then its dimensions are automatically added to the wizard and you can't change the values.

 — This selects the shape of the user-defined blank. This shows a rectangle and so the blank is rectangular. For a circular blank, click this button. The image on the button changes to .


**Length** — This is the length of the rectangular blank. You can edit the length of a user-defined blank only.


**Width** — This is the width of the rectangular blank. You can edit the width of a user-defined blank only.


**Diameter** — This is the diameter of the circular blank. You can edit the diameter of a user-defined blank only.


**Height** — This is the height of the blank. You can edit the height of a user-defined blank only.

**Material** — This is the material of the blank. You can change the material of a user-defined blank only. If you change **Material** to either **Copper** or **Graphite**, the material of the electrode is changed so that the shaded version looks like the material chosen.

**Blank Top-Centre** — These coordinates default to the top-centre of the solids bounding box. They are used to position the electrode on the set up sheets. If the coordinates are not at the centre of the blank, edit the values so that they are. Enter the **X Y Z** coordinates or click the **Position**  button to open the **Position** dialog where you can use position entry tools.

**Datum Point** — This gives the position of the electrode in the model and is used for machining purposes. Input the required datum position for your electrode. Enter the **X Y Z** coordinates or click the **Position**  button to open the **Position** dialog where you can use position entry tools.

**Rotation** — This rotates the blank around the Z axis by the given angle. Enter a rotation angle or use  to specify the angle.

Click  to automatically rotate the electrode blank to the best position so that the minimum amount of blank material is wasted.



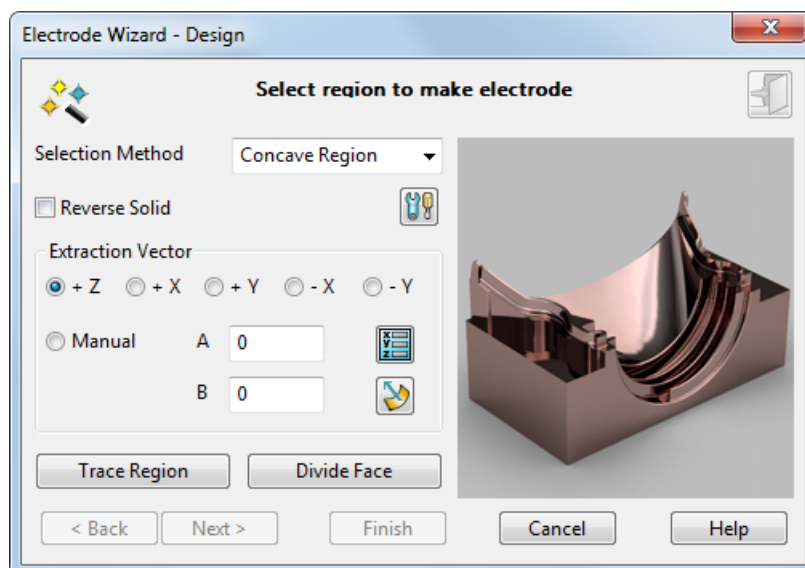
*If you rotate the blank, you may be able to specify a smaller blank for the electrode. This can reduce the amount of material wasted and also save on machining time.*

**Burn depth** — Enter the height of the burn region in the burn direction.

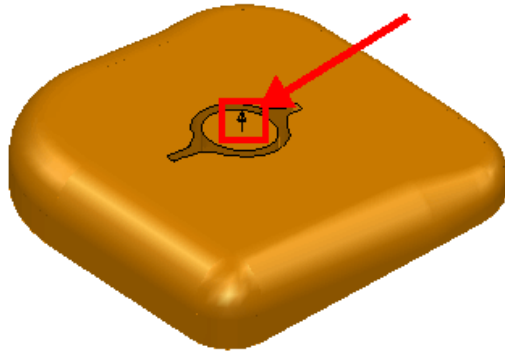
**Next** — Displays the **Specify Electrode Holder** page of the Electrode wizard. For further details, see Specify Electrode Holder page of the Electrode wizard (see page 52)

## Select Region page of the Electrode Wizard - Design

This page enables you to select the region to make the electrode.

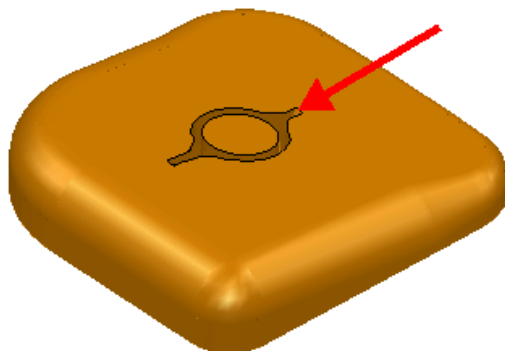


The initial direction of electrode extraction is shown on your model as a black arrow, pointing in the direction of the +Z axis.



If the wrong workplane is selected, you can select another one using the **Workplane** list  in the bottom left corner of the PowerSHAPE status bar. While this page of the wizard is displayed, you can change the general tolerance in the **Status** bar.

As you move the cursor over the solid, regions highlight. These are the regions where you can create an electrode. You can create missing geometry (see page 29) automatically in the case where geometry is missing for one or more of the electrodes required to burn a region.



- 1 Choose the selection method and make changes to the Electrode options as required.

**Selection Method** — Select an option to determine the type of region that is highlighted.

- **Single Face** — Highlights only single faces.
- **Concave Region** — Highlights concave regions on the active solid.




- **Convex Region** — Highlights convex regions on the active solid.



The surface normal of the solid is important in determining whether a region is concave or convex. Convention is for the surface normal to point away from the solid material. You can see this in the following two open solids.





**Reverse Solid** — If selected, the active solid is reversed.

 **Options** — Click this button to open the **Electrode Options** page (see page 6).

## 2 Define the extraction vector.

The electrode is created in the Z direction by default. In addition to the traditional Z direction, electrodes can also be created in X and Y direction or along any vector you define.

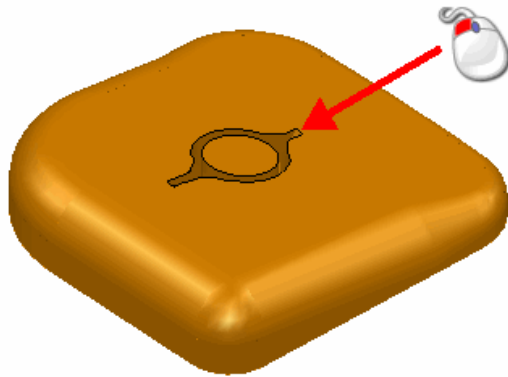
 **Position** — Click this button to display the **Position** dialog to use position-entry tools to specify the extraction vector. As you progress through the wizard, the electrode, base, and holder are created along this vector. See Side-sparking and vector-burn electrodes (see page 71).

 **Surface normal** — If selected, the burn vector is defined by clicking on a surface where the surface normal is in the required direction.

## 3 Select a region on the solid where you want to create an electrode. If you click a highlighted region, it is selected and changes colour and is shown in the graphics window of the wizard. Any regions already selected are removed from the selection.



— These buttons are displayed on the dialog when you select a region. Use these buttons to display a different view of the region in the display window.



*Press and hold the **Shift** key and click to add and remove regions.*

*Press and hold the **Ctrl** key and click to toggle in or out of the region.*

*Use box selection to select regions. Only whole faces within the box are selected, making it easier to select groups of faces. You can also use box selection with the **Shift** and **Ctrl** keys to add and remove regions.*

*To include an emboss feature, select its surrounding faces when selecting the burn region.*

**Trace Region** — You can trace a closed curve on the active solid to define the region. Click the **Trace Region** button to display the **Create Composite Curve** control panel. Use the control panel to select a curve. The curve is coloured the same as regions selected using the automatic method.

You can create electrodes from composite curves that have been defined externally and preselected before starting the wizard.



***Trace Region** is intended to be used when the automatic selection fails because the solid is linked badly or the region is too complex. Using **Trace Region** takes longer to compute the burn region, so try the selection method first whenever possible.*

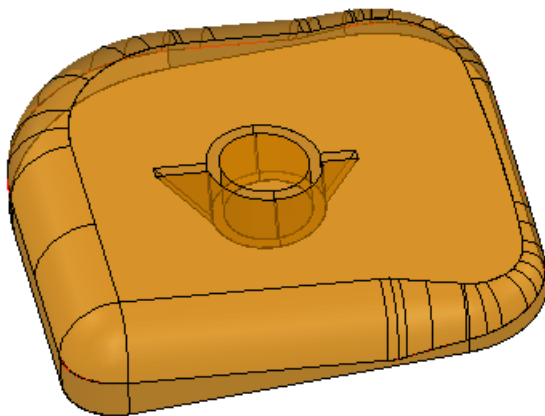
**Divide face** — You may want to select only a portion of a solid face. Click this button to display the **Divide Face in Solid** dialog (see page 33), which enables you to divide a face of a solid into two pieces.


Surfaces and composite curves are created from the selected regions and shown as selected. You can use these objects in the following ways:

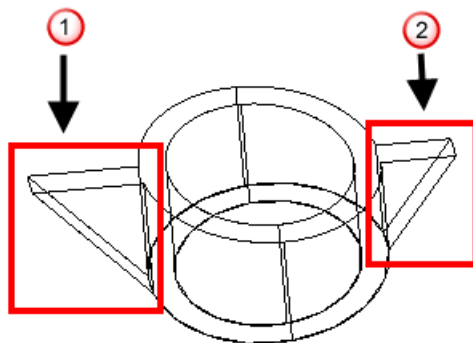
- If you select these objects and start the wizard again, they represent the selected regions and are used to create the electrode. You can add other regions to these.
- You can also use these objects to create a solid representing the electrode. You can then register a solid as an electrode (see page 68). It can also add the electrode to the EDM setup sheet.

## Creating missing geometry

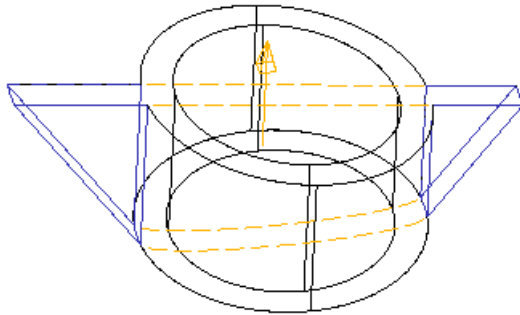
Delcam Electrode automatically creates missing geometry when the geometry for one or more of the electrodes required to burn a region are missing. The following model is used to illustrate this functionality.



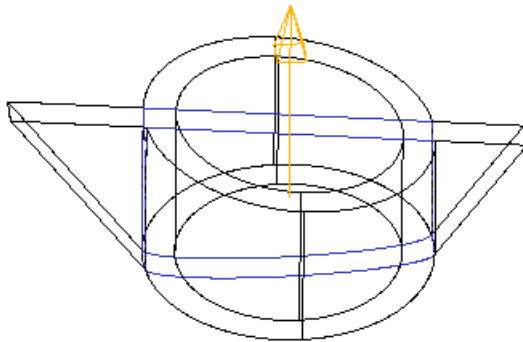
- 1 Click  (wizards toolbar).
- 2 Box select the areas marked ① and ②.



When the parts of the region either side of the missing geometry are selected, the wizard automatically detects that they can be joined and adds instrumentation to the joining wireframe.



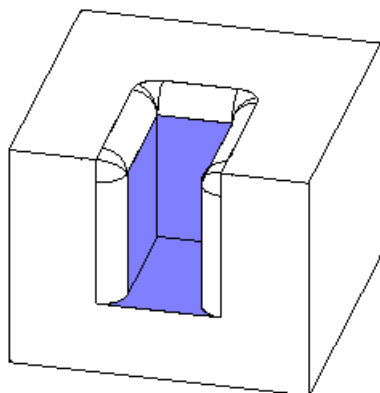
- 3 Click on the instrumentation to automatically generate the missing geometry and add it to the electrode selection.



- 4 Click **Finish** to create the electrode.

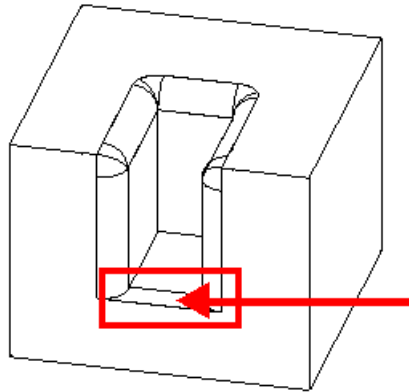
## Dividing a face

When you select the burn region, the area is highlighted





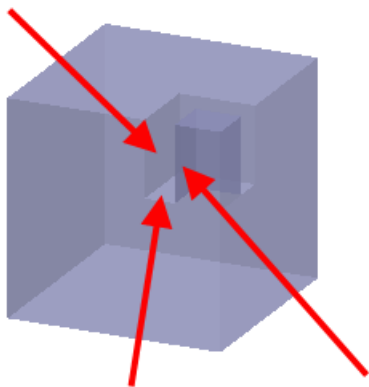
To remove a portion from the burn region you must divide the solid face (see page 33). You can then exclude the portion when selecting the burn region.



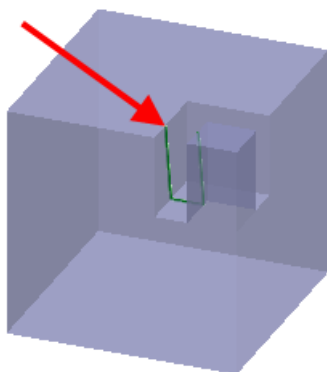
## Dividing multiple faces




You can divide multiple faces by selecting a composite curve before selecting a face to divide. All the faces in contact with the composite curve are divided in one operation.

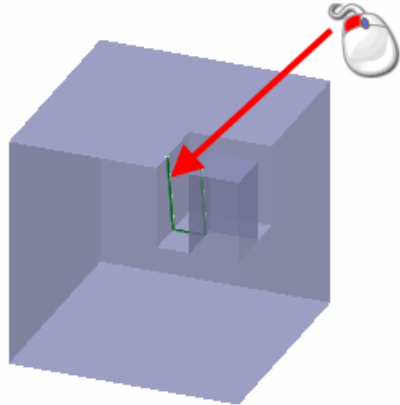
- 1 Choose an appropriate model, where you have more than one face that you wish to divide.



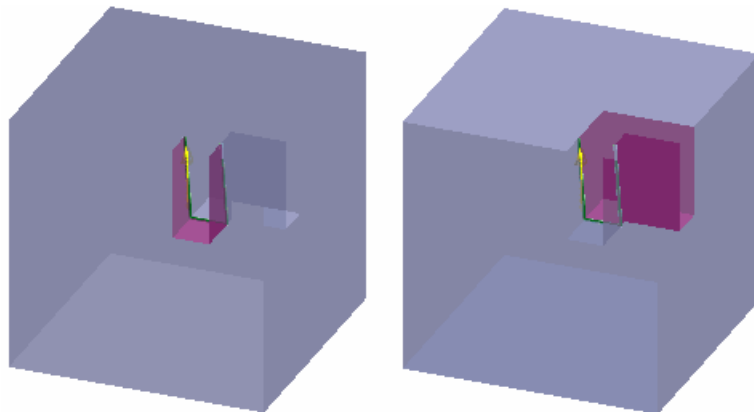
- 2 Sketch a composite curve to define where to divide the faces. The composite curve can run along lines and curves within the tolerance of the solid as well as along surface curves.



- 3 Click  Wizards.
- 4 Click the **Create an electrode**  button to start the Electrode wizard.
- 5 Click **Divide Face** to display the **Divide Face in Solid** dialog (see page 33).
- 6 Click the **Select Curve**  button.
- 7 Select the composite curve.



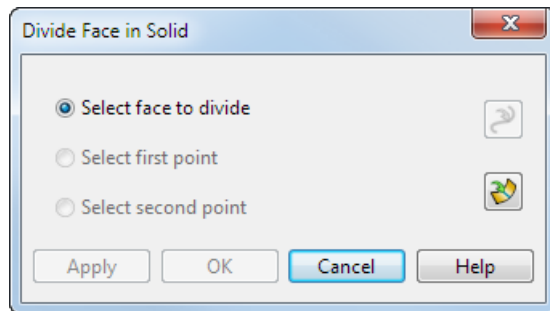
- 8 Click **OK**. The **Divide Face in Solid** dialog is closed. Move the mouse across the model. You will see that the surfaces have been divided using the composite curve.



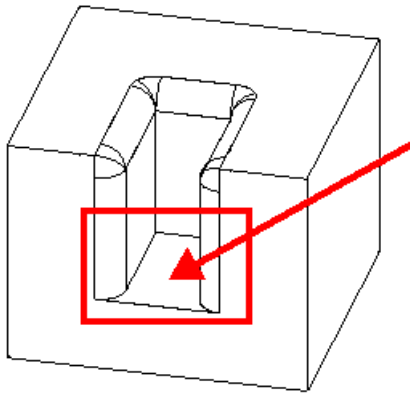
- 9 Continue using the Electrode wizard.

## Divide Face in Solid dialog

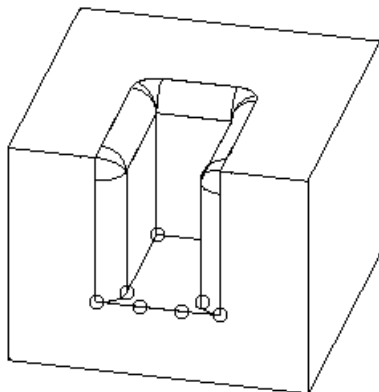
The **Divide Face in Solid** dialog enables you to divide a face of a solid into smaller pieces. To open this dialog, click the **Divide Face** button on the **Select region** page (see page 25) of the Electrode Design Wizard.





**Select face to divide** — When this option is selected, you can select a face on the solid.



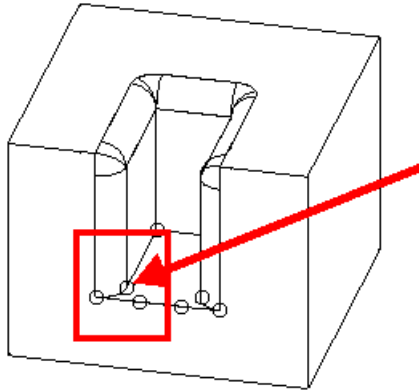
Points are displayed on the face where you can divide the solid. These are at positions where laterals and longitudinals meet the edges on the surface of the solid face.



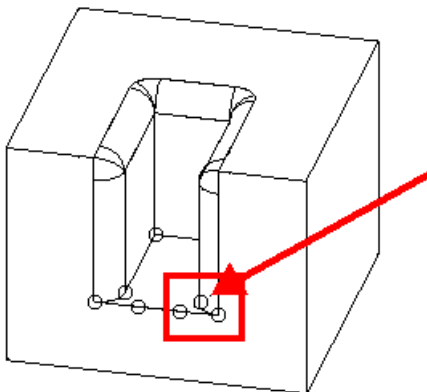
 **Insert new point** — To insert a new point on the face, click this button and then click on the boundary of the face.

 **Select curve** — You can use a wireframe object to define where the face is divided. Click this button and then the object. The wireframe object must already exist in the model before entering the wizard.

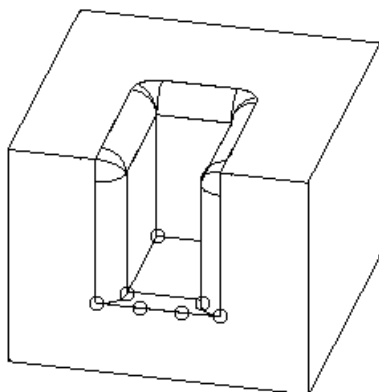
**Select first point** — When this option is selected, you can click one of the visible points. The selected point is highlighted.



**Select second point** — When this option is selected, you can click one of the visible points.



The selected point is highlighted and a line is drawn where the solid face will be divided.



**Apply** — Click this button to divide the solid face at the two selected points. The dialog remains open, ready for you to continue dividing other faces.

**OK** — Click this button to divide the solid face at the two selected points and close the dialog.

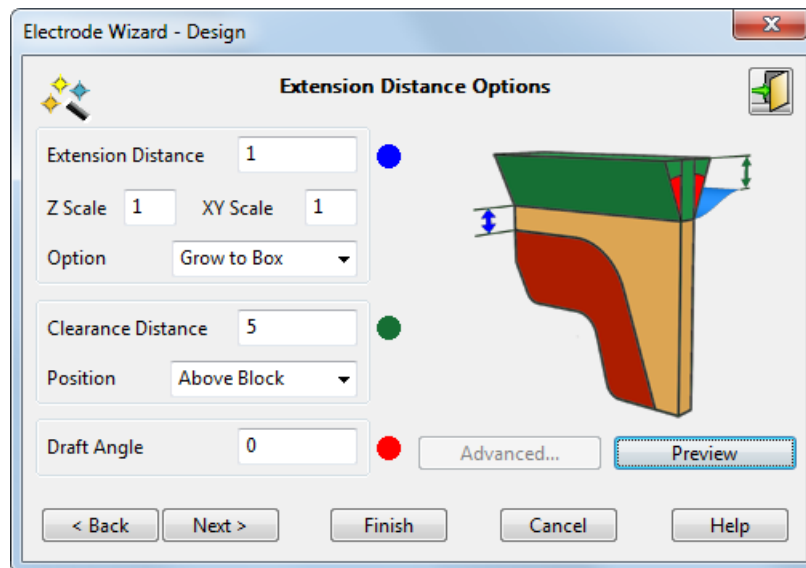
**Cancel** — Click this button to close the dialog without saving any changes.



*If the divided face is already selected as part of the burn region, it is removed from the selection.*

## Extension Distance Options page of the Electrode wizard

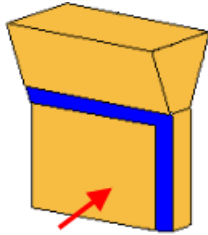
This page enables you to define the extension of the electrode that attaches the burn region to the base.



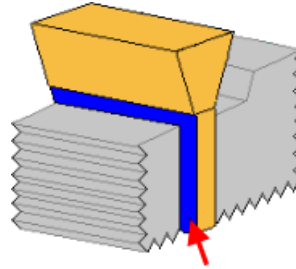
The diagram shows where the three values apply to using the blue, red, and green colour codes.

**Extension Distance** — Enter the extension of the burn region of the electrode.

This example shows an electrode on its own, with the burn region marked with the arrow:



This is the electrode in a solid, with the **Extension Distance** marked with the arrow:



**Z scale** — Enter the value you want to scale the extension by in the Z direction.

**XY scale** — Enter the value you want to scale the extension by in both the X and Y directions.

If you want the extension in the Z direction to be a different length from that in the X and Y directions, use the **Z scale** and the **XY scale** boxes. However, the resulting extension is still tangent continuous with the underlying faces of the solid. Therefore the distances extended may not equal the distance multiplied by the scale factor.

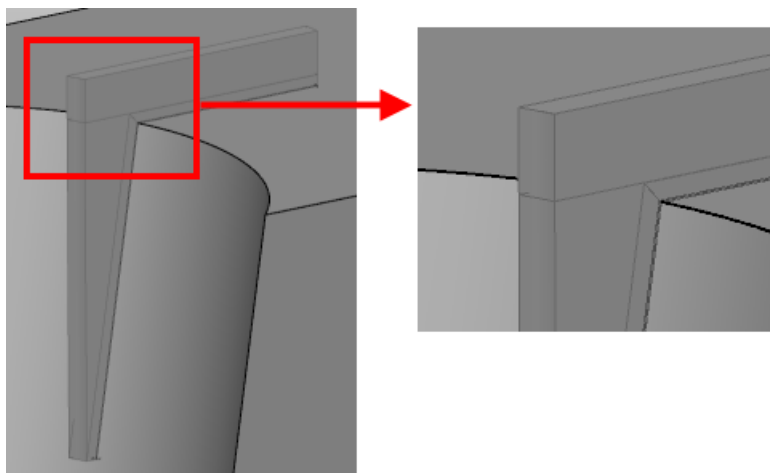
Normally, you do not enter two scale values. One of the scale values remains 1 to match the length of the extension distance. If the other value is 1, then the extensions in the Z and XY directions are the same. If it is not 1, the extensions in the Z and XY directions are different.

**Option** — Select how the burn region is extended.

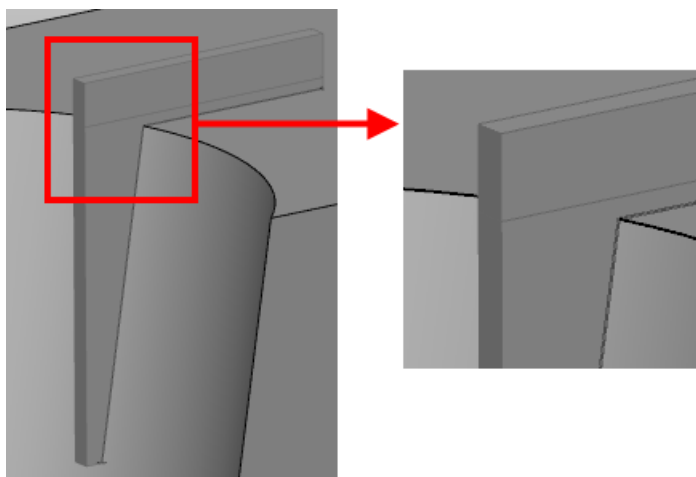
You may find that an option does not work for a particular electrode. If you are unsure which option to use, try one and click the **Preview** button. If you are not happy with the results, then try another option.

**Grow to Box** — This option uses an expanded bounding-box of the burn region as a target to limit the extension. The surfaces are generally extended further than the extension distance until they intersect with this box. This produces a square, planar side to open-ended ribs.

The normal extension methods do not give the desired result because the angle on the edge of the rib produces an angled face on the electrode in the clearance region where the shape is not critical.

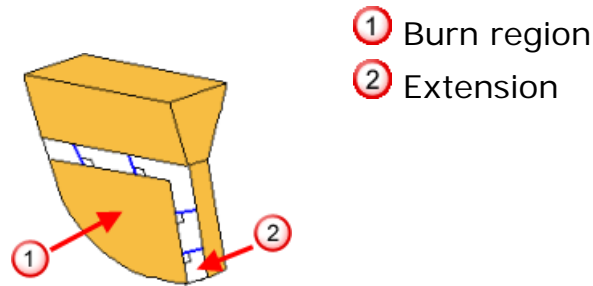


The **Grow to Box** solution gives a neater electrode.

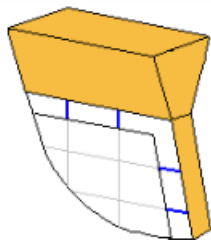


*The greater the curvature of the edge of the rib, the greater the benefit of using **Grow to Box**.*

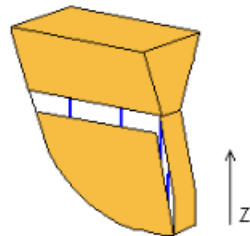
**Normal to Edge** — The extension is perpendicular to the edge of the burn region.



**Surface Internals** — The extension is along the direction of the laterals/longitudinals on the underlying surface of the burn region.

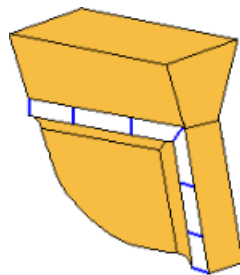


**Align Vertically** — The extension is aligned vertically along the Z axis.



The internal curves of the extension are aligned with the Z axis, but the extension itself is still tangent continuous to the burn region. For this reason, this option is not suitable for extending faces that lie flat in the XY plane.

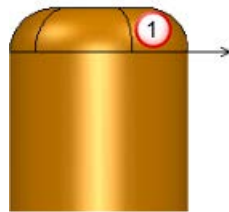
**Split surface** — The extension is along the surface normal of the underlying surface. Select this option and enter an **Angle**. The default angle for the split surface is  $90^\circ$ .



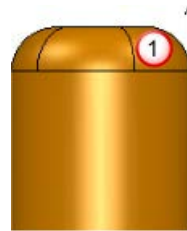


This option is most suitable for convex upstand regions. Without this option, you get a razor edge. In the diagram below, you can see an example of such a region. The arrow shows the direction of the extension.

Split surface option:



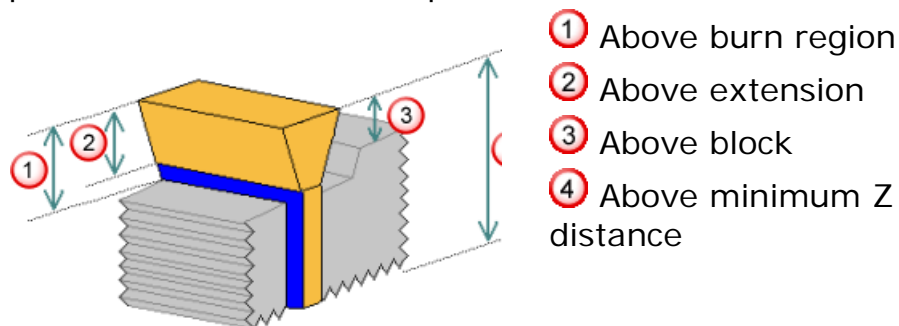
Other options:



① Burn region

This option is also suitable for regions that have fillets at their edges.

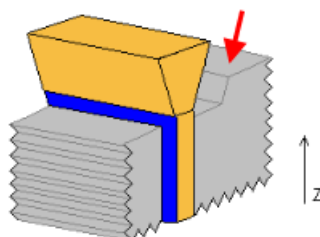
**Clearance Distance** — This is the distance of the electrode base from the selected **Position** option, measured along the Z axis. The base is the part of the blank at the top of the electrode.



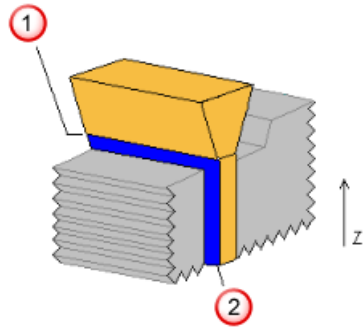
You can enter a negative value for the clearance distance. When the base is created, Electrode automatically trims it so that it does not collide with the solid. If the negative value is low enough, you can create an electrode whose base matches the top of the solid. This is known as an *offset base electrode*.

**Position** — If you change the **Position** options, the graphic in the wizard changes to show where the base position is calculated.

**Above Block** — This is the highest point of the solid from the XY plane, marked with the red arrow:



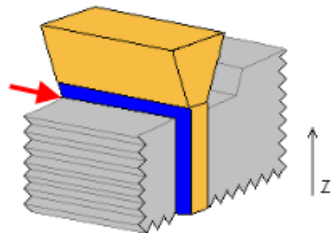
**Above Extension** — This is the highest point of the extension of the burn region from the XY plane.



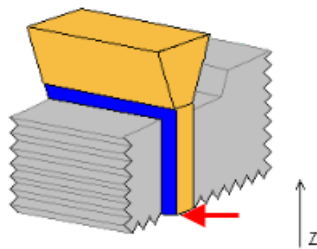
① **Above Extension**

② **Extension Distance**

**Above Burn Region** — This is the highest point of the burn region from the XY plane, marked with the red arrow:

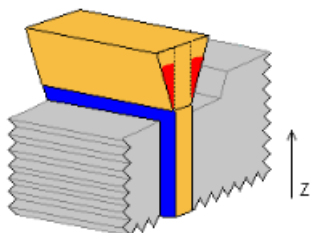


**Above Z min** — This is the minimum Z value of the selected burn region, marked with the red arrow:



For this option, you cannot use negative values for the clearance distance. If the clearance distance is less than the height of the burn region, an offset base style electrode is created.

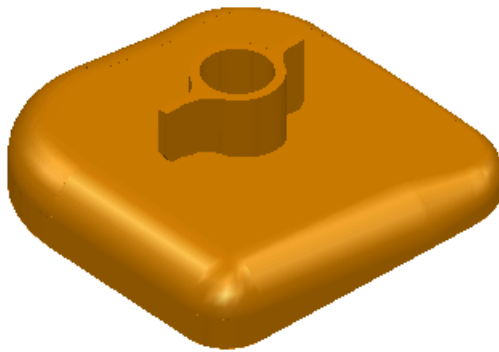
**Draft Angle** — This is the angle on the extension of the electrode, excluding the part which extends from the burn region. It is measured from the Z axis. The draft angles are marked in red on the diagram:



**Preview** — When you click this button, the extension and clearance surfaces produced by the wizard are collision-checked against the part. The user is warned of any collision.

The electrode is displayed in the model window using the values from the dialog. Change the values if necessary and click **Preview** again.

**Advanced** — This enables you to define different directions for particular segments of the electrode extension, using the Advanced Extension options (see page 42).



**Exit** — Click this button to exit the wizard. The electrode is created as a solid and remains selected. You can modify the solid and enter the wizard again. This will register the solid as an electrode. See Registering a solid as an electrode (see page 68) for further details.

**Next** — The extension and clearance surfaces produced by the electrode wizard are collision-checked against the part. You are warned of any collision and the Specify Electrode Blank page of the Electrode Wizard (see page 45) is displayed.

## Advanced Extension options

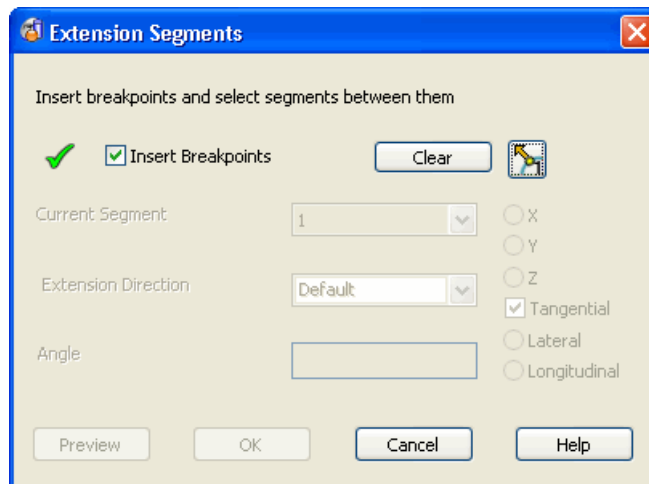
- 1 If there is more than one exterior edge to the electrode region(s), the **Select Edge** dialog is displayed so that you can select the edge to modify.




- 2 Select an edge number. You can also select the edge in the graphics window. The edge is highlighted on the model.
- 3 Click **Dismiss** to display the Extension Segments dialog (see page 42).


## Extension Segments dialog

Use the **Extension Segments** dialog to break the edge into segments. For each segment, you can then specify the direction of the extension.



**Insert Breakpoints** - If *ON*, you can insert and remove breakpoints from the selected edge. The breakpoints divide the edge into smaller segments. To insert breakpoints, click positions on the edge.

 — If this button is displayed, the breakpoint is selected as a single breakpoint.

 — If this button is displayed, the breakpoint is selected as a split point that can go in both directions.

**Clear** — Click this button to remove all selected breakpoints. To select a breakpoint to clear, press and hold the **Ctrl** key and click the breakpoint.

When you have entered the breakpoints, turn *OFF* the **Insert Breakpoints** option to make the other options active.

**Current Segment** — Select a segment from the list or click a segment on the model in the graphics window. The segment is highlighted in the model and has an arrow in it giving the default direction of the extension.

**Extension Direction** — Select a direction from the list. This list contains the following four directions:

**Default** — Uses the direction as specified on the **Electrode** wizard. You can reverse the direction of the laterals.

**Curve Normal** — Uses the direction along the normal of the curve of the selected edge.

**Along Axis** — Uses the direction along the specified axis on the dialog. If you select this option, you must choose from the following to define the extension more precisely.

**X** — Align extension to the X axis.

**Y** — Align extension to the Y axis.

**Z** — Align extension to the Z axis.

**Tangential** — If *ON*, extend tangential to the surface. If *OFF*, extend exactly along the axis.

**Surface Internals** — Uses the direction along the internal curves of the surface. You can choose to extend along the **Lateral** or **Longitudinal**.


When you select an option, the arrow changes to the specified direction. To reverse the direction of the laterals to the opposite side of the composite curve, click the arrow.

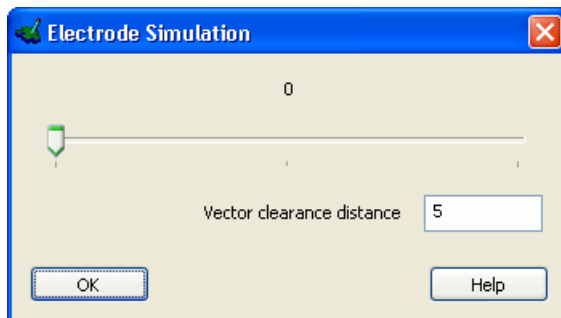
**Angle** — This is the angle the new surface segment is projected from the existing surface.

**Preview** — This displays the direction of the laterals in the whole of the extension surface.

**OK** — Click this button to save the changes and return to the Electrode wizard.

## Electrode Simulation dialog

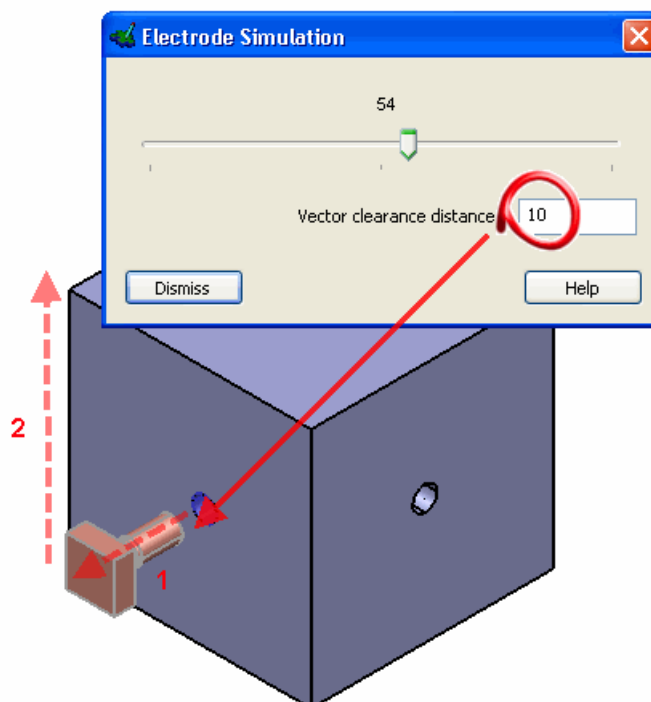
This dialog is displayed when you click on the  button on the **Specify Electrode Blank** page or by selecting **Simulation** from the Electrode context menu.



As you move the slider to the right, the electrode moves upwards. When you move the slider to the left, the electrode moves downwards, simulating the electrode burning motion.

The simulation of the electrode burning motion reflects the **Extraction Vector** you defined on the first page of the wizard.

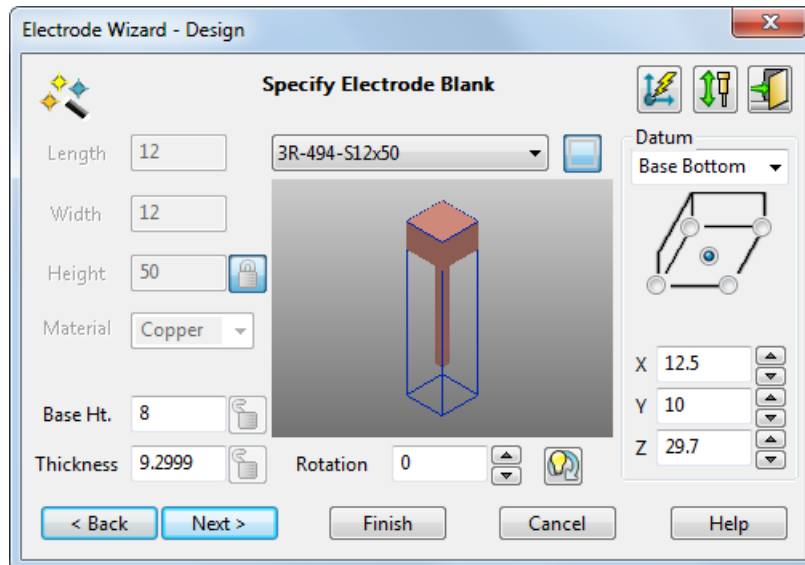
- If your electrode is extracted along the Z axis, the simulation shows the extraction as a continuous motion.
- If your electrode is extracted in a different direction, there are two stages to the extraction motion as shown below:



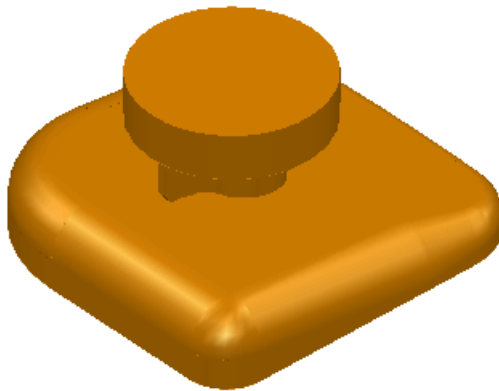
- 1 The electrode is extracted along the extraction vector until it is clear of the burn region by the **Vector clearance distance**.
- 2 The electrode is extracted as normal along the Z axis.

## Specify Electrode Blank page of the Electrode Design Wizard

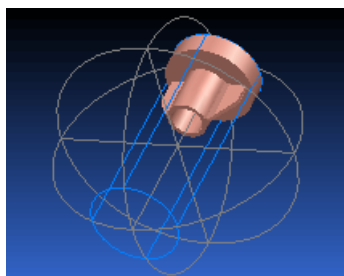
Use this page to specify the blank of the electrode.



The top part of the blank forms the base of the electrode. The base is automatically drawn in the model window using the values in the wizard. As you update the blank in the wizard, the electrode updates in the model window.



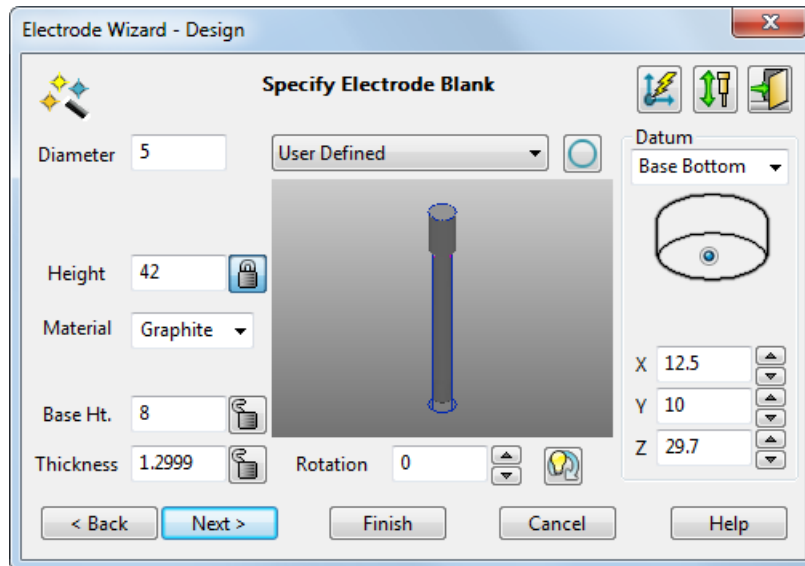
You can rotate, zoom, and pan the image of the electrode in the wizard using the mouse. See "Middle mouse button" in the Basic concepts Manual for details on how to change the view using the mouse.









3R-493-D20x50 — Select a blank from the list of available standard blanks that fit the dimensions of the electrode. You can add your blanks (see page 99) to this list.

The options available in this dialog depend on the blank you select from the list.

You can create a custom blank by selecting the **User Defined** option from the list. Additional options are now available.



  **Shape** — If you selected a standard blank, the shape of the blank is shown by this icon. You cannot change the shape of a standard blank.

  **Shape** — If you are creating a user-defined blank, you can toggle this button to set the shape. Ensure the rectangle  icon is displayed to create a rectangular blank. Ensure the circle  icon is displayed to create a circular blank.

**Length** — If you are using a standard rectangular blank, the length is displayed. If you are creating a user-defined rectangular blank, enter the length.

**Width** — If you are using a standard rectangular blank, the width is displayed. If you are creating a user-defined rectangular blank, enter the width.

**Diameter** — If you are using a standard circular blank, the diameter is displayed. If you are creating a user-defined circular blank, enter the diameter.

**Height** — If you are using a standard blank, the height is displayed. If you are creating a user-defined blank, enter the height.





**Height, Thickness, and Base Ht.** are related. If you change one of these values, one of the other values changes too. For further details, see *Tips for creating electrodes* (see page 65).

**Material** — If you are using a standard blank, the blank material type is displayed. If you are creating a user-defined blank, select the material type from copper or one of three grades of graphite.

The details of the different grades of graphite are given below.

Name	Grade	Grain size
Graphite-1	High	< 3µm
Graphite-2	Medium	3-10µm
Graphite	Low	> 10µm

These grades are used by the **Electrode Family** page (see page 58) when using the recommended values for the undersizes.


The electrode is shaded using the chosen material.




You can add new materials to this list (see page 121).

**Base Ht.** — Enter the height of the base.

**Thickness** — This is the minimum Z thickness that is machined from the blank. It is the amount of waste. By setting a small **Thickness**, you can minimise the waste material and the amount of machining required. You should use zero thickness only if the blank has been pre-ground to the desired surface finish.

**Rotation** — This rotates the blank around the Z axis by the given angle. Enter a rotation angle or use  to specify the angle.

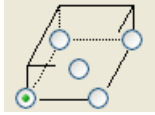
Click  to automatically rotate the electrode blank to the best position so that the minimum amount of blank material is wasted.

If you rotate the blank, you may be able to specify a smaller blank for the electrode. This can reduce the amount of material wasted and also save on machining time.

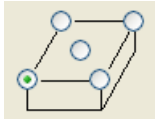
**Datum** — This gives the position of the electrode in the model and is used for machining purposes. For each of the options, you click radio buttons to choose where the datum is positioned.

Use the list to select the face of the electrode where the datum lies. The faces of the electrode are: the **Base Top**, the **Base Bottom**, and the **Electrode Bottom**. If you change the face, the image below the menu changes.

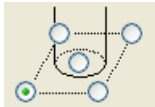
For the **Base Bottom** option, the image looks like:



For the **Base Top** option, it looks like:



For the **Electrode Bottom** option, it looks like:

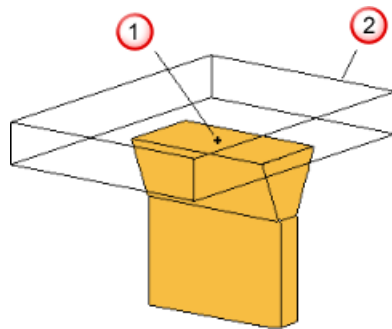


When a circular blank is selected, the image looks like:



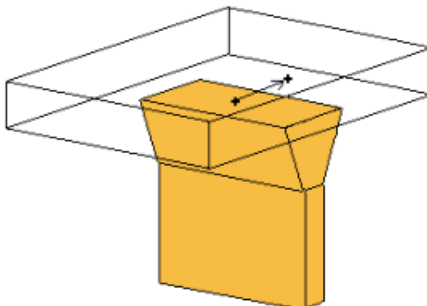
For circular blanks, the datum can be positioned at the centre of each face.

**X, Y, and Z** — These are the coordinates of the datum relative to the current workspace. If you change these values, the base of the electrode moves relative to the datum. Suppose you have the following.

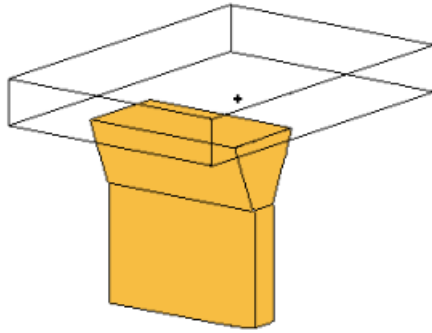


- ① Datum in the middle of the bottom face
- ② Electrode base

Move the datum as shown below:



The base moves too.



The **Z** coordinate is available only if you select **Base Top** or **Base Bottom**. If you change the **Z** value, the height of the base changes.



*For EDM setup, the actual position values are rounded to the nearest 0.1mm/0.01 inch/10 thousandths.*



**Vector Burn** — Click this button to display the **Vector Burn** dialog (see page 49).



— Click this button to raise the **Electrode Simulation** dialog.




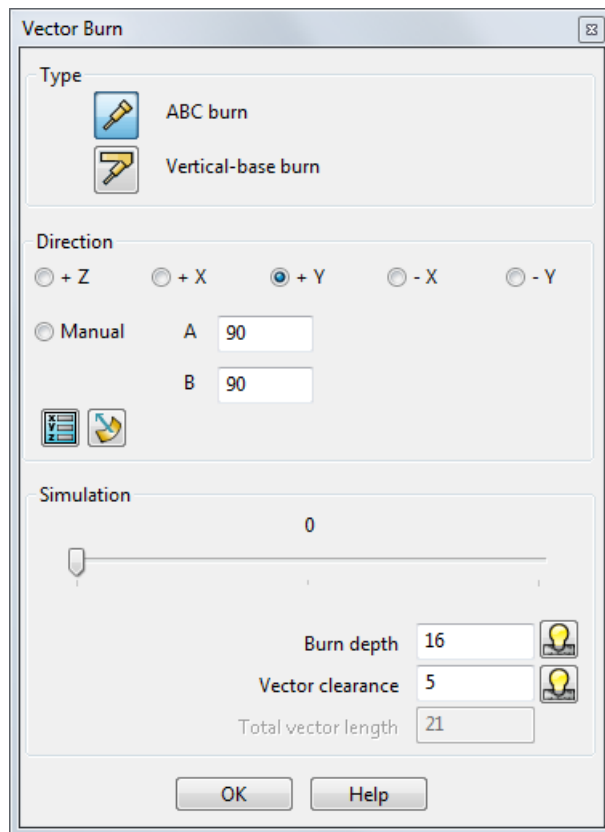
— Click this button to exit the wizard. The electrode and base are created as separate solids and remain selected. You can modify the solids, add them together, and enter the wizard again. This registers the solids an electrode (see page 68).

**Next** — Adds alignment notches to the base and displays the **Specify Electrode Holder** page of the Electrode wizard.



## Vector burn electrodes

Vertical base vector burn is supported for pre-modelled electrodes.

Use the **Vector Burn** dialog to select the type of vector burn to use. To open the **Vector Burn** dialog, click the **Vector Burn**  button on the **Specify Electrode Blank** page (see page 45) of the Electrode Design Wizard.





1 Select the **Type** of burn you require:

-  **ABC burn** — Select this option to create a vector burn electrode where a special holder angles the electrode relative to the part.
-  **Vertical-base burn** — Select this option to create a vector burn electrode that uses a standard holder and the electrode is angled into the blank.

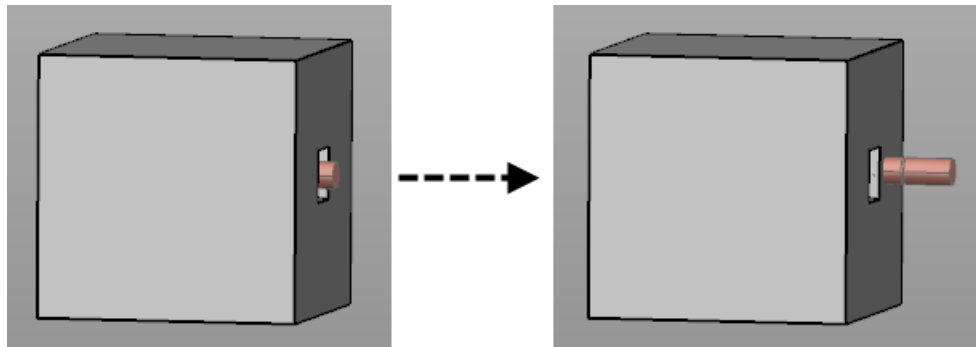
2 Define the extraction direction using the options in the **Direction** area of the dialog. You can use pre-defined vectors or create a custom vector by selecting the **Manual** option. Using one of the pre-defined vectors automatically inserts the correct values in **A** and **B**.


The electrode is created in the **Z** direction by default. In addition to the traditional **Z** direction, electrodes can also be created in **X** and **Y** direction or along any vector you define.


 **Position** — Click this button to display the **Position** dialog to use position-entry tools. Use this dialog to specify the extraction vector.

 **Surface Normal** — Use this button to define the burn vector by clicking on a surface where the surface normal is in the required direction.

- 3 Drag the **Simulation** slider to simulate the extraction of the electrode, so that you can check that you have defined the electrode vector correctly. In the case where an electrode is used under an overhanging region of the part, use the simulation to check that the electrode is clear of the part when it is withdrawn.



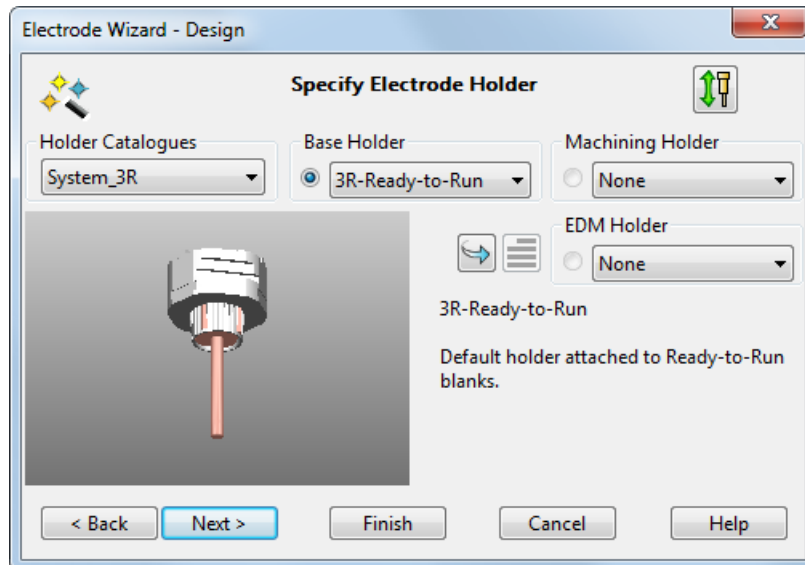
**Burn depth** — This is the height of the burn region in the burn direction. Click the **Calculate**  button to calculate the dimension of the burn vector in the direction you have specified (Z by default)

**Vector clearance** — This is the amount the electrode is clear of the part in the vector part of the motion. Click the **Calculate**  button to calculate the clearance that is required to ensure that the electrode is clear of the part.

**Total vector length** — This is automatically calculated and is the sum of the burn depth and the vector clearance.

## Specify Electrode Holder page of the Electrode Wizard - Design

Use this page to specify a holder for the electrode.



**Holder Catalogues** — Select a catalogue. The default catalogue for the current blank is automatically selected if one is specified.

To set up a default catalogue for blanks, see [Setting up your own blanks](#) (see page 99) for details.

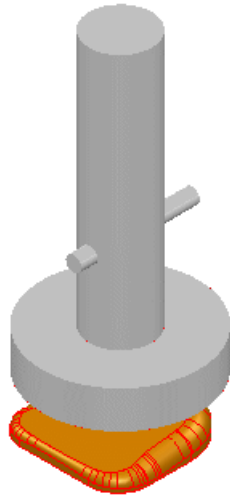
To set up your own catalogue of holders, see [Setting up catalogues for holders](#) for details.

**Base Holder** — This holder clamps directly onto the blank. The default holder for the current blank is automatically added if one is specified. To set up a default holder for blanks, see [Setting up your own blanks](#) (see page 99) for further details.

**Machining Holder** — This holder is fixed to the Base Holder during the machining process and is optional.

**EDM Holder** — Same as the **Machining Holder**, but is used during the EDM process.


When you select a holder from the list, it is drawn in the graphic window in the dialog






Next to each list is a radio button. This chooses what is displayed in the viewers. There are two viewers on the wizard.


On the left of the Electrode wizard, there is a view of the electrode base and the current holder(s) depending on the selected radio button. If you select to view a **Machining Holder** or **EDM Holder**, the blank, base holder, and the selected holder are displayed.

When you select **Machining Holder** or **EDM Holder** in the list, the radio button of the **Base Holder** is no longer available to prevent confusion.

 **Rotate** — Click this button to rotate the selected holder by 90° with respect to the blank. If the base holder is selected, the base holder rotates. If a **Machining** or **EDM Holder** is selected, both the selected holder and the base holder rotate.

 and  — Display a graphic or text description in the lower right window of the wizard.

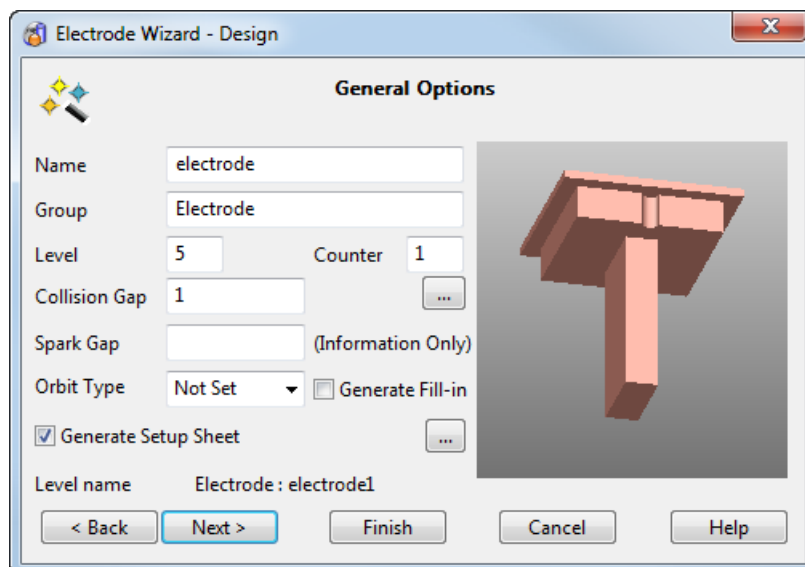
 — The bitmap (if available) of the selected holder is displayed. Select this option to display the text description.

 — Displays a text description of the selected holder. Select this option to display the graphic of the holder.

**Next** — Displays the **General Options** page (see page 54) of the Electrode wizard.

## General Options page of the Electrode Wizard - Design

Use this page to enter the general options for the electrode. An image of the electrode is displayed in the graphic window alongside the options.



**Name** — Enter the name of the symbol of the electrode. It is also the name of the level on which the electrode is created.

**Group** — This is name of the group that contains the level of the electrode.



*You can enter a name only if the level given in **Level** is currently unnamed.*

**Level** — This is the number of the level on which the electrode is created. If the level is currently unnamed, it is named using the string in **Name**.

**Counter** — Sets the counter number used in electrode names. Each electrode is named using the text in the **Name** and **Counter** values.

By default the counter starts at 1 so the default electrode names are:

**electrode1**

**electrode2**

**electrode3**

You can set the counter to any integer value (or leave it empty) as long as the name string combined with the counter string is unique. If it is not, the counter is incremented automatically until the name and counter combination is unique.

If the counter string is empty, the next value is **2** not **1** because it is generally too confusing to have the second electrode labelled **1**.



If you change the name string, the counter is automatically reset to the first unique number for that name. For example, suppose you have the following electrodes in a model.

*trode1, trode2, trode3*

*rib1, rib2, rib3, rib4, rib5*

*extra10, extra11, extra12*

If *extra12* was the name of the last electrode created, the **General Options** page of the **Electrode** wizard would display **Name** as *extra* and **Counter** as 13.

If you change **Name** to *trode*, **Counter** changes to 4.

If you change **Name** to *rib*, **Counter** changes to 6.

If you change **Name** to *extra* again, **Counter** changes to 1.

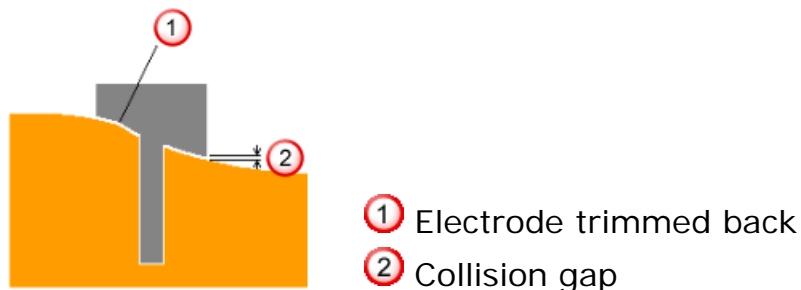
In this last case, the value of **Counter** is not exactly what we want because we started the names of the electrodes called *extra* at 10.


We can change **Counter** to 13 (if we remember where we left off) or 10 (if we only remember that we started at 10).

If we set **Counter** to 10, an error dialog is displayed telling us that this counter value is already taken and the counter is automatically incremented to the next available value, in this case, 13.

**Collision Gap** — (Not available for electrodes created outside the wizard) The Electrode Design Wizard avoids collisions between the electrode base and the active solid. The electrode base is automatically trimmed back to avoid collisions. The gap between the electrode base and the active solid is set using the **Collision Gap** value.

In the example below, the electrode base is trimmed to avoid collisions.



 **Dialog** — Click this button to open the **Additional Electrode Details** dialog (see page 57).

**Spark Gap** — This value appears on the set up sheet. It is not used by PowerSHAPE, but is exported to PowerMILL. If it is undefined, leave the text box empty.

**Orbit Type** — You can set an orbit pattern to control the movement of the machine head during EDM. The movement takes up the difference in dimensions between the electrode, which is machined undersize, and the actual cavity required in the workspace.

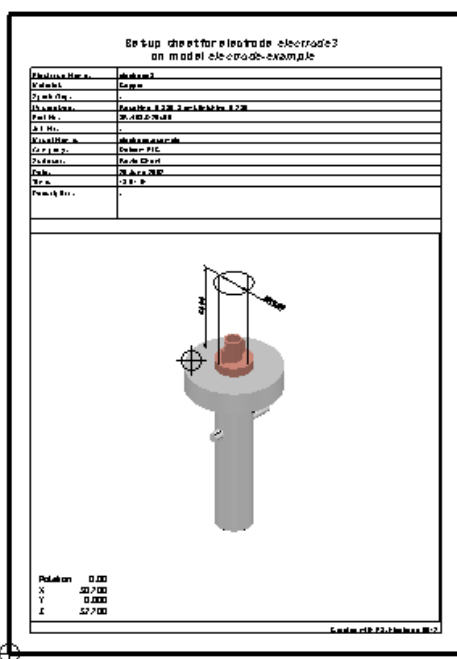
- **Hemisphere** (3D)
- **Circle** (2D)
- **Square** (2D)
- **Star** (2D)
- **Custom**
- **None** (No orbit needed)
- **Not set** (unknown)

**Generate Fill-in Surface** — Select this option to create fill-in surfaces that cover the burn regions of the electrode. The fill-in surfaces are created on the **Electrode Fill-in Surfaces** level. This level is in the same group as the electrode. If the level doesn't exist, a new one is created.

**Generate Setup Sheet** — If selected, setup sheets for the electrode are created. By default, two setup sheets are created:

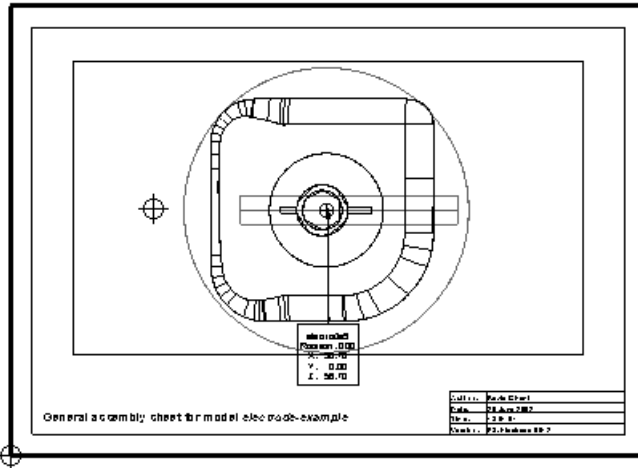
- **Machining**

The **Machining setup sheet** is created for each electrode. By default, it contains an isometric view of the electrode, which shows the electrode's dimensions. It also contains the rotation and the origin of the electrode in the bottom left corner.



- **EDM**

By default, the **EDM setup sheet** contains a top view of the model and electrodes in the model. Balloons mark the origin and rotation of each electrode. This sheet is updated each time you create an electrode and generate the setup sheet to show all the electrodes for this model.

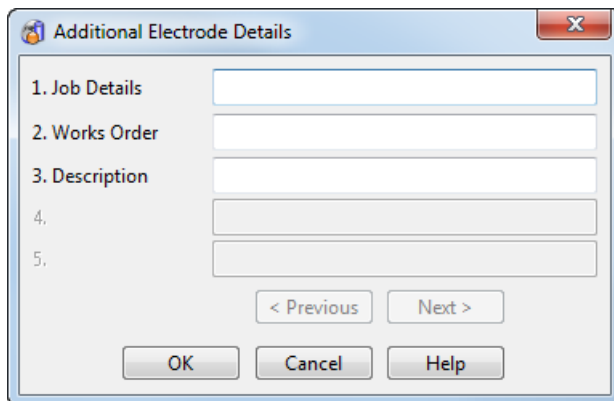


You can change the setup sheets to suit your requirements (see page 101).

**Next** — Click this button to move to the **Electrode Family** page (see page 58) of the Electrode wizard.

## Additional Electrode Details dialog

Information entered into this dialog is added to any set up sheet that is created for the electrode.



**Job Details** — anything entered in this text box is remembered when a new electrode is created.

**Works Order** — anything entered in this text is cleared when a new electrode is created.

**Description** — anything entered in this text is cleared when a new electrode is created.

You can configure the way in which **Job Details**, **Works Order**, and **Description** work using the [electrode\\_additional\\_details.con](#) configuration file.

This file can be found in the following folder:

[C:/dcam/product/powershapeXXXX/file/electrode](#)

where [XXXX](#) is the version number of PowerSHAPE and [C](#) is the drive on which PowerSHAPE is installed.

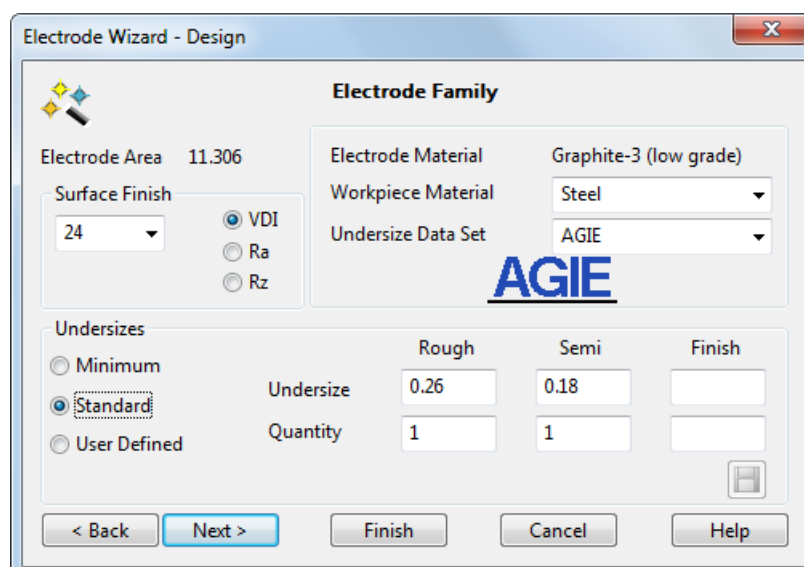
Details on how to configure the details are included in the configuration file.

For further details, see Adding more Additional detail fields (see page 127)

## Electrode Family page of the Electrode wizard

You can define a family of electrodes from one electrode. This family is used to spark different stages of the same region. The different stages possible are rough, semi, and finish.

- The electrode for the rough stage burns away most of the material from the region.
- The electrode for the semi stage removes more material from the region to give a smoother finish.
- The electrode for the finish stage burns the final bits of material from the region. It gives the best finish on the surface.



Use this page to define the electrode family.

**Electrode Area** — This is the surface area of the electrode. It is automatically calculated by PowerSHAPE.

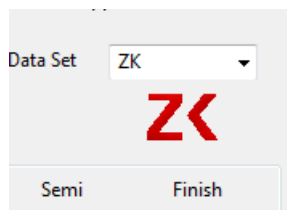
**Electrode Material** — Material used by the electrode. If you want to associate custom material names with one of the internal materials of Electrode, you can add the materials to the Electrode alias file (see page 121).

**Surface Finish** — Enter the value required for the end finish. Values are provided by AGIE. As a rough guide, the lower the value, the smoother the finish.

**VDI/Ra/Rz** — Select the units of the surface finish.

**Workpiece Material** — Select a different workpiece material. The list that is displayed reflects the Undersize Data Set that is selected.

**Undersize Data Set** — Select the default data set to be used for electrode undersizes. The logo of the currently selected option is displayed below the list.

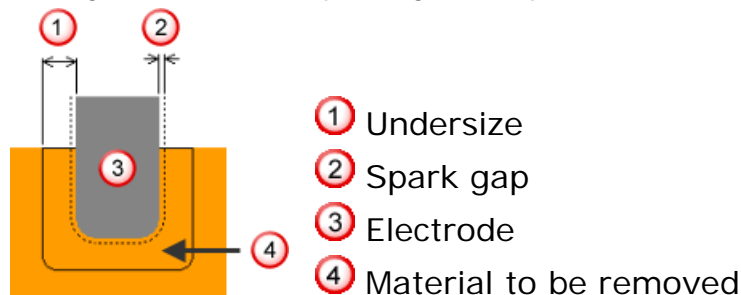


Use the [electrode\\_undersizes.con](http://electrode_undersizes.con) file to control the undersize data sets that are available in the wizard. The file is installed in:

[PowerSHAPE152XX/file/electrode](http://PowerSHAPE152XX/file/electrode)

You can edit the configuration file to suppress competitors logos and datasets. Full instructions for customising the configuration are included in the file. By default all available datasets are included in the **Undersize Data Set** list and the logo of the selected data set is displayed.

**Undersizes** — This section sets the undersize for each electrode in the family. Select the option you require.

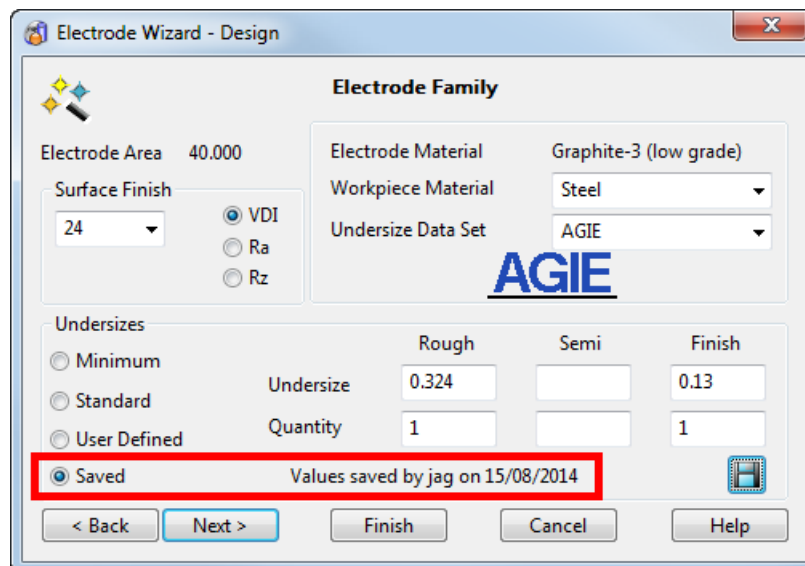


**Minimum** — The recommended undersize values for the **Rough**, **Semi**, and **Finish** electrodes are automatically inserted. These values are provided by the manufacturer. Use this option to preserve sharp corners.

**Standard** — The recommended undersize values for the Rough, Semi, and Finish electrodes are automatically inserted. These values are provided by AGIE.

**User Defined** — To specify your own values, select this option and enter the required values. You can save user-defined **Undersizes** to use the next time a similar electrode is extracted.

- 1 Select **User Defined** and enter the appropriate **Undersizes** and **Quantities**.
- 2 Click **Save**.



The **Saved** option is automatically selected, together with information about who saved the information and when it was saved.

Next time you create an electrode with the same settings (burn area, material, surface finish), the saved settings will be used by default.



*If you don't want to define a family of electrodes, select **User Defined** and don't enter any values.*

The recommended undersizes depend on the material selected. You get different undersizes for Copper, Graphite-1, and Graphite-2 for the same **Surface Finish** value. Graphite and Graphite-2 have the same values.



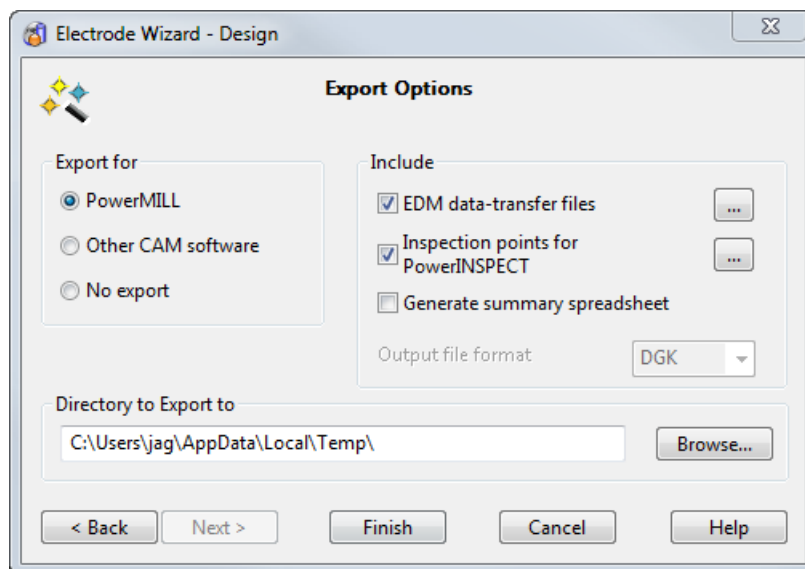
*Only one electrode is created in the model when a family is defined. The undersize values for the family can be transferred to PowerMILL. It is then used to create the different toolpaths from the same electrode.*

**Quantity** — Enter the quantity required for each family member. These quantities are used in the setup sheet and in the exported HTML.

**Next** — Displays the **Export Options** page of the Electrode wizard (see page 61).

## Export Options page of the Electrode wizard

This sets the options to export the electrode.



**Winstat Export Enabled** — If this is displayed, it indicates that the Winstat interface is enabled.

You can define the names of the objects in the Winstat database using the file named [winstat\\_naming.con](#) in the following folder:

`c:\dcam\product\powershapeXXXX\file\electrode`

where **XXXX** is the version number of PowerSHAPE and **C** is the drive where PowerSHAPE is installed. Instructions and examples are also held in this file.

The syntax for naming objects is:

**[object name]: [pattern]**

where

**object name** is one of `project_name`, `workpiece_name`, `edm_name`, or `logical_electrode_name`.

**pattern** is the string to use as the default name, with replacement strings enclosed in angle brackets.

The following are examples of the syntax used for naming objects

```
project_name: Delcam-<model_name>
workpiece_name: <project_name>-50-001
edm_name:
X<x>_Y<y>_Z<z>_C<c>_<logical_electrode_name>
logical_electrode_name: <project_name>-60-<nnn>-
<type>
```

### Export for

Select what you want to export for:

**PowerMILL** — Select this option to export a `.trode` file. In addition, the electrode and fill-in surface, if created, are exported in `.dgk` files.



If you export an electrode that includes an emboss feature, a [.dmt](#) file is generated for the emboss feature in the electrode.

Other details from the electrode (for example, the material and holders) are exported in an XML file.

Details of the electrode are also stored in [.html](#) and [.csv](#) files. An image of the electrode is stored in a [.jpg](#) file and displayed in the [.html](#) file that is automatically displayed in the side panel. This shows the electrode in burn-area shading complete with a colour key to the right of the image. All files are named using the name of the electrode.




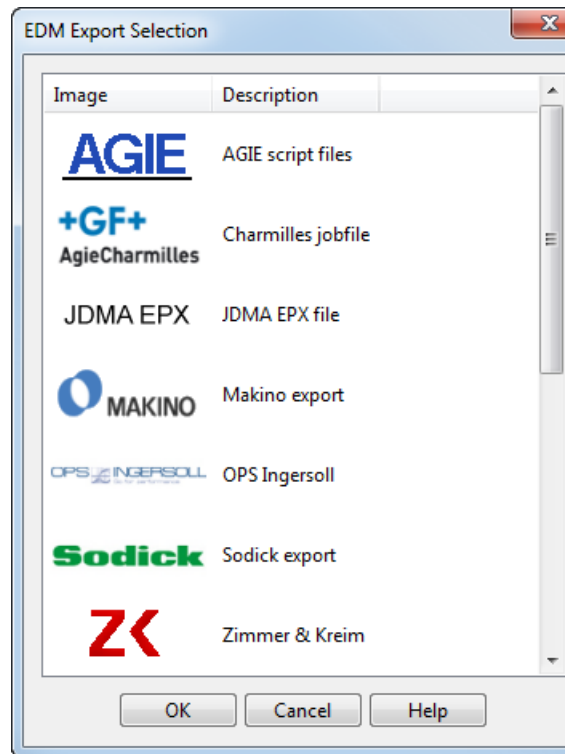
**Other CAM software** — Select this option to export to CAM software other than PowerMILL.

**No export** — No data is exported.

### Include

Use the options in the **Include** section to specify the export information:

- 1 Select **EDM data-transfer files** to export EDM setup files. This option is selected by default.
- 2 Click the **Ellipsis**  button to display the **EDM Export Selection** dialog.



You can export:

- AGIE script files
- Charmilles jobfile
- JDMA EPX file
- Makino export
- OPS Ingersoll
- Sodick export
- Zimmer & Kreim
- Mitsubishi EPX format
- Mitsubishi NC (ESPER) format
- Exeron
- ONA
- CERTA QMeasure inspection format

- 1 Select the required option. As well as the options shown above, the dialog may include:

**Custom script** — User-defined scripts are included using this option.



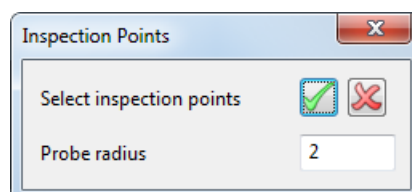
*ONA EDM scripts can be produced in two styles, automation and classical. Automation is the default style that PowerSHAPE uses, however the classical style script format can be produced by editing the config file [ona\\_export.con](#) in the delcam electrode tree.*

**OPS + MultiProg** — This is the same as **OPS-Ingersoll** (see page 92) export but starts **MultiProg** (if installed) after exporting the data.

- 2 Select **Inspection points for PowerINSPECT** to select inspection points. The option is selected by default.

- a Click the **Ellipsis** button to display the **Inspection Points** dialog.

Select the inspection points and enter the **Probe radius**.



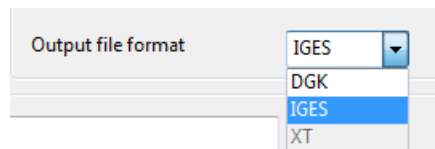
These inspection points are exported as PowerINSPECT compatible .pts files that are included in the .trode file archive.



*You can edit inspection points on an existing electrode by clicking **Inspection Points** on the **Edit Electrode** dialog (see page 83) to display the **Inspection Points** dialog.*

- a Select **Generate Summary Spreadsheet** to export a spreadsheet file containing the details of all the electrodes in the model. When creating the last electrode or electrode copy, select this option.

- b Select the **Output file format**.



- 3 Enter a path for the **Directory to Export to**, or click the **Browse** button to navigate to the required folder. The export data is sent to this directory.



*You can export to directories only on the local and mounted drives.*

- 4 Click **Finish** to complete the Export Wizard. The electrode base is automatically trimmed back to avoid collisions and the electrode is created as a symbol and put it on the required level. Once the electrode is created, you are asked if you want to create another electrode using the wizard.

In addition:

- A new workplane is also created with the same name as the electrode. This workplane is for machining purposes.
- If **Generate Summary Spreadsheet** is selected (see page 122), clicking **Finish** generates two files:

electrode\_summary.csv

electrode\_summary.html

- If the electrode is exported, the [html](#) file containing details about the electrode is displayed in the browser window.



*If the electrode is not what you expected, read [Tips for creating electrodes](#) (see page 65) and try creating it again.*

---

## Tips for creating electrodes

Here are some tips to help you create electrodes:

- Checking direction of Z axis (see page 66)
- Using the correct selection method (see page 66)
- Dealing with top fillets (see page 66)
- Experimenting with extension options (see page 67)
- Setting the height dimensions of a user defined blank (see page 67)

## Checking direction of Z axis

The electrode is extracted along +Z axis. If the Z axis is not aligned correctly, create a new workplane with the Z axis aligned in the direction of the desired electrode extraction. A common problem is having this axis in the wrong direction or opposite orientation.

## Using the correct selection method

When selecting the burn region on the **Select Region** page of the **Electrode** wizard, we suggest you use the selection methods in the following order:

- 1 Selection Method** — Always try the **Concave Region** option first (use the **Convex Region** option if you are creating the electrode from the inside of the solid). This is the easiest and most reliable method.
- 2 Box selection** — Try box selection next. The best approach is:
  - a** Drag a box around the desired region.
  - b** Select **Single Face** from the **Selection Method** menu.
  - c** Turn on shaded mode.
  - d** Press and hold **Ctrl** and click to toggle in and out any missed or unwanted faces.
- 3 Trace Region** — Only use this option as a last resort. It is intended as a fallback when the first two methods fail because the solid is linked badly or the region is too complex. Compared to the other two options, it takes the longest to compute the electrode.

## Dealing with top fillets

You can make the electrode using fillets which run along the top of the solid. If you do, we recommend you use one of the following:

- a zero extension distance.

- a non-zero extension distance and the **Split Surface** option from the **Extension** options on the **Extension Distance Options** page of the **Electrode** wizard.

In many cases, you get much nicer electrodes if you avoid these fillets.

If you use box selection, use *Ctrl+Click* to toggle out any top fillets.



*If you use **Concave** or **Convex Regions** from the **Selection Method**, the fillets are not usually selected.*

## Experimenting with extension options

When choosing the **Extension** options on the **Extension Distance Options (see page 35)** page of the **Electrode** wizard, **Grow to box** is the default option for post-version 8 solids. For electrodes with no side openings to be extended horizontally, **Align Vertically** is probably the best option.


Also experiment with the **Surface Internals** option. It can sometimes produce the desired result when the other two are not quite right.

If the extension surfaces are proving problematic, you can try creating an electrode with zero extension and skip this stage altogether.


## Setting the height dimensions of a user-defined blank

There are three height dimensions that you can set on the **Specify Electrode Blank** page of the **Electrode** wizard:

- **Height**
- **Thickness**
- **Base Ht**


Each of these dimensions has a lock  button next to it. Use it to lock the value of a height dimension when specifying a user-defined blank.

If the overall height of the blank is fixed:

- 1 Enter the **Height** value and click the lock  button.
- 2 Enter a value for either **Thickness** or **Base Ht**.


The third value is automatically calculated.

If the thickness of the blank is fixed:

- 1 Enter the **Thickness** value and click the lock  button.
- 2 Enter a value for either **Height** or **Base Ht**.

The third value is automatically calculated.

If the base height of the blank is fixed:




- 1 Enter the **Base Ht** value and click the lock  button.
- 2 Enter a value for either **Height** or **Thickness**.

The third value is automatically calculated.

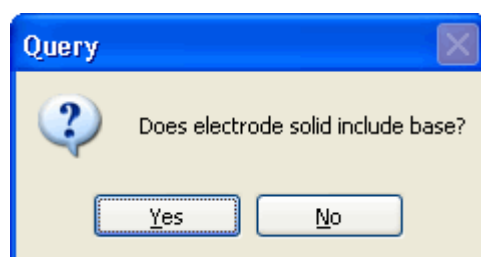
## Registering a solid as an electrode

You can register a solid as an electrode within PowerSHAPE. This electrode can then be drawn on the EDM setup sheet.

If you have a number of solids which represent an electrode and its base, you need to add them together before registering.

- 1 Make active the solid from which the original electrode was extracted.
- 2 Select inactive solids. If an active solid is included in the selection, then PowerSHAPE ignores it.
- 3 From the **Module** menu, select **Electrode**. Select  from the menu. You can also clicking the **Wizard**  button and selecting the **Electrode** button  from the wizard menu.
- 4 If your solid is a version 8 solid and contains more than 20 surfaces and is not watertight, you are asked if you want to make it watertight. If you say yes, the **Make Watertight** Wizard appears to help you make the solid watertight (within tolerance). This wizard allows you to repair the solid before using it.

If your solid is watertight, the following message is displayed



**No** - Electrode solid does not include a base. To specify the blank that becomes the base, you use the standard Specify Electrode Blank page of the Electrode Wizard (see page 45)

**Yes** - Electrode base includes a base. The Electrode wizard - Specify Electrode Blank (see page 24) page that is displayed lets you define the parameters of the blank to fit the electrode base.

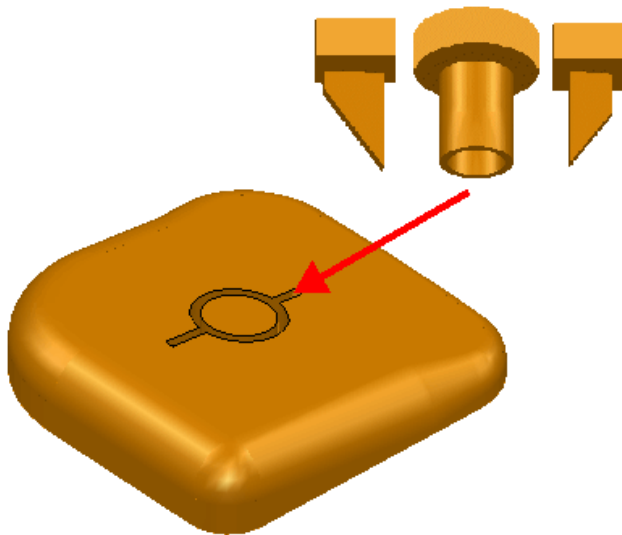
The parameters from the last electrode that you created are displayed in the dialog.

- 5 Fill in the **Specify Electrode Blank** page of the wizard to define the electrode's blank.
- 6 Click **Next** to display the **Specify Electrode Holder** page of the **Electrode** wizard. Continue to use the **Electrode** wizard to register the electrode.

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## Creating multiple electrodes for the same region

You can create multiple electrodes for the same region.

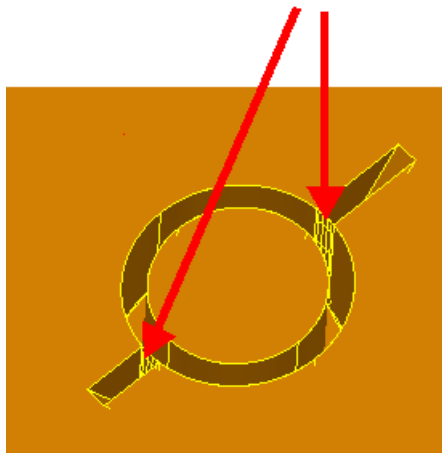


Each electrode is created separately. You must create surfaces to split the large region into smaller regions for the electrodes.

### To create one of the electrodes:

- 1 Create surfaces to divide the large region into the region for one of the electrodes.

If you want to create an electrode for the circular region, you must create the surfaces shown below.





These surfaces are used to create the electrode and are no longer available when you finish creating the electrode.



*You may want to make safe copies of the surfaces so that they can be used to create the other electrodes.*

- 2 Select the surfaces that enclose the region of the electrode.
- 3 From the **Module** menu, select **Electrode** to display the **Select Region** page of the **Electrode Wizard**.

This is the same as clicking the **Solid**  button and, from the **Solid creation** menu on the right side of the toolbar, selecting the **Electrode**  button.

- 4 Use the **Electrode Wizard** to create an electrode (see page 22).

When selecting the burn region on the **Select Region page of the Electrode Wizard**, you must use a method other than **Auto Region Selection**, for example the box selection or individual faces. We recommend you use box selection.

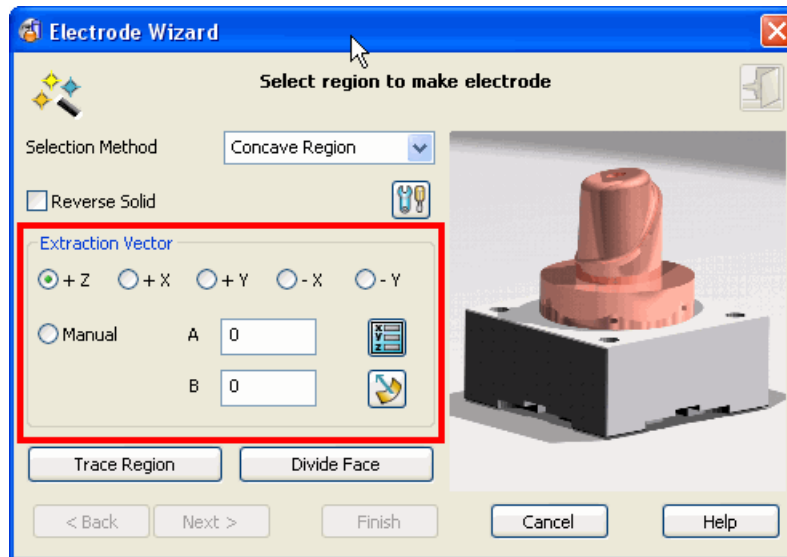
The surfaces are highlighted as selected when the **Select Region page of the Electrode Wizard** is displayed.

When a burn region is selected, it is displayed with any pre-selected surfaces in the display window on the **Select Region page of the Electrode Wizard**. This makes it easier to see any unintentional gaps.

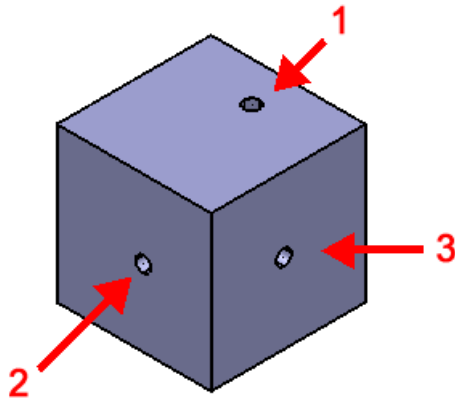


# Side-sparking and vector-burn electrodes

In addition to the traditional Z direction, you can also create electrodes in the X and Y directions or along any defined vector. As you progress through the wizard, the electrode, base, and holder are created along this vector.

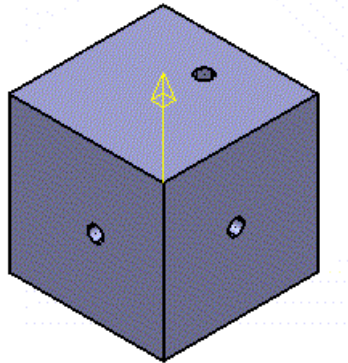


The following example illustrates this functionality.



**Extraction Vector** — These options define the vector that is used when creating the electrode. You can use pre-defined vectors or create a custom vector by selecting the **Manual** option. Using one of the pre-defined vectors automatically inserts the correct values in **A** and **B**.

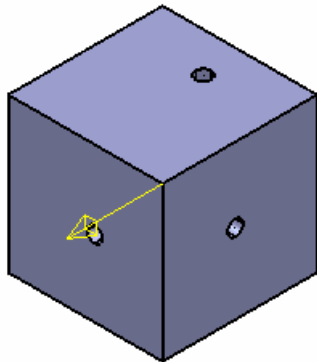
**+Z** — This is the default and is used to create a standard Z-sinking electrode. Use this option to create an electrode for the hole in face **1**. A yellow arrow indicates the direction of extraction:



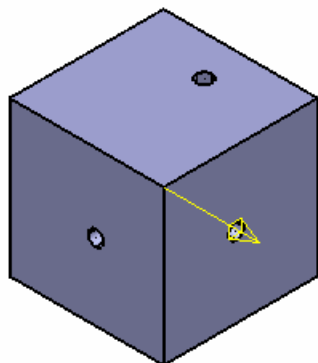
**+X** — Select  $+x$  as the extraction vector.


**+Y** — Select  $+y$  as the extraction vector.

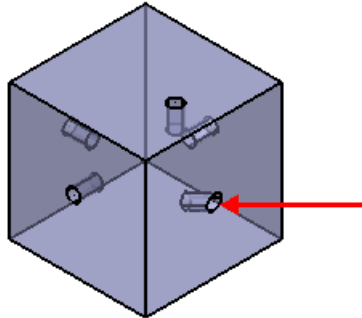
**-X** — Select  $-x$  as the extraction vector. Use this option to create an electrode for the hole in face **2**. A yellow arrow indicates the direction of extraction:



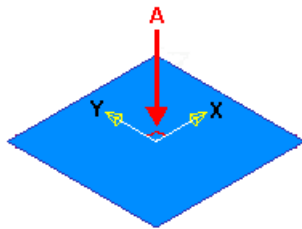
**-Y** — Select  $-y$  as the extraction vector. Use this option to create an electrode for the hole in face **3**. A yellow arrow indicates the direction of extraction:



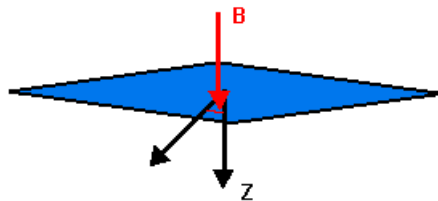
**Manual** — Manually create an extraction vector by assigning values to **A** and **B** or selecting the **Position Vector**  button. Use the **Manual** option to define a vector burn that is not aligned to an axis, such as the one shown below.



**A** — The angle of rotation of the extraction vector in XY.



**B** — The angle from the vertical.  $0$  is down the Z axis and  $90$  is a side-sparking operation.



— Opens the **Position** dialog. Use the **Vector** tab to define the extraction vector.



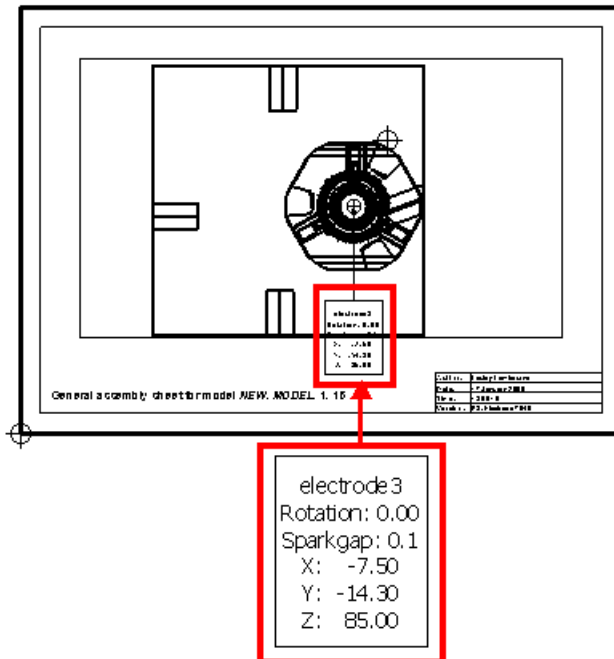
— If  $ON$ , the burn vector is defined by clicking on a surface where the surface normal is in the required direction.

## Adding user-defined text to a GA Setup Sheet

You can add user-defined text to the balloons on the GA Setup Sheet as follows:

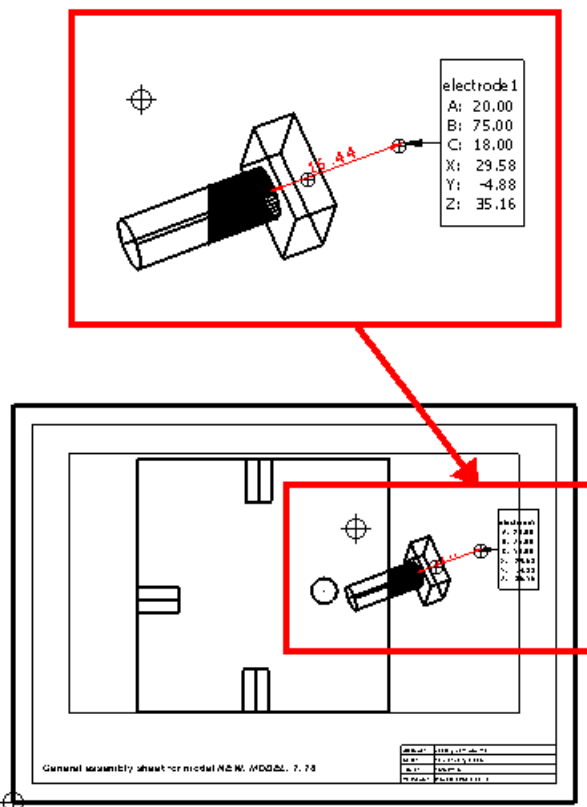
- 1 Create a text file called `electrode_extra_balloon_text.txt` to create your text.
- 2 Place `electrode_extra_balloon_text.txt` in the shareddb

Normal string substitution is performed, so if the file contains **Sparkgap: % [spark\_gap]**, the spark gap you have set whilst creating the electrode is added to each balloon.



## Adding vector-burn information to a GA Setup Sheet

When a side-sparking or vector-burn electrode is created, the vector information is included in the GA Setup Sheet.



**A, B, C** — The rotation that defines the burn vector.

**X, Y, Z** — The point where the electrode changes from Z motion to moving in along the burn vector.

---

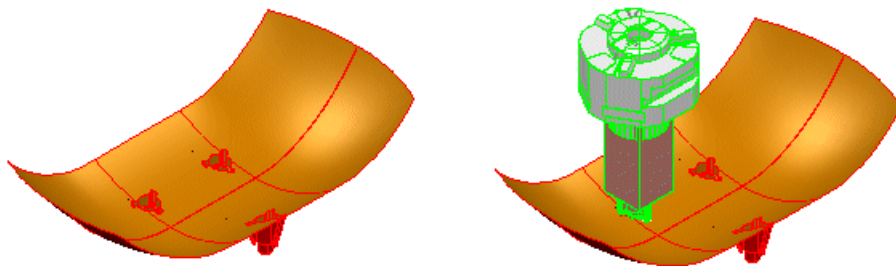
## Copying an electrode

You can copy an existing electrode to identical burn regions in different parts of the model. You also have the option to copy the fill-in surfaces and holders with the electrode and generate setup sheets. AGIE script files and summary spreadsheets can be exported for all the electrodes in the model.

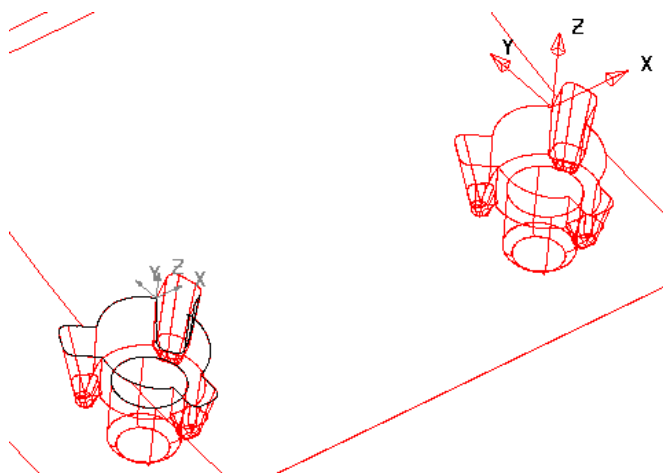



*The example shows an original electrode and one copy electrode. You can create several copies of the existing electrode at once by defining multiple workplanes.*

- 1 Create the original electrode in one of the identical burn regions.



- 2 Create the source workplane. This should be on a recognisable feature on the electrode you have just created.
- 3 Create the destination workplane on an identical region. It should be in the same relative place as the source workplane. If you are creating several copies of the existing electrode at once you will define multiple workplanes.



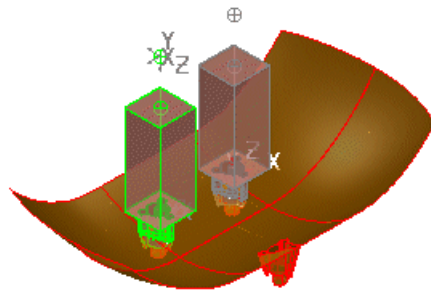
- 4 Select the source electrode and click  to start the Electrode Wizard. The **Copy Electrode** (see page 77) dialog is displayed.
- 5 Select the source workplane. The workplane will turn pink, and a ✓ will appear next to **Select source workplane**. You do not necessarily need to select a source workplane, because by default the position of the electrode workplane is used. In this case, the alignment of the base used as the reference for rotation.
- 6 Select the destination workplane. A ✓ will appear next to **Select Destination Workplanes**.
- 7 Select the options you require and click **Next** to select your **Export options**.

To create the copy of the electrode without exporting, click **Finish**.

You can use the **Export Options** to generate EDM script files and summary spreadsheet in the usual way. When the electrodes are exported it will use the original electrode family to burn in all the positions of the copies. This allows the re-use of electrodes over multiple regions and can be much more efficient.




- 8 Click **Finish**. The copy is checked for interference with the active solid and a warning is displayed if the electrode will scar the part or not burn enough.

If the copy of the electrode does not collide with the part, it is created in the correct position and rotation for each of the destination workplanes. In wireframe the copies are shaded grey.



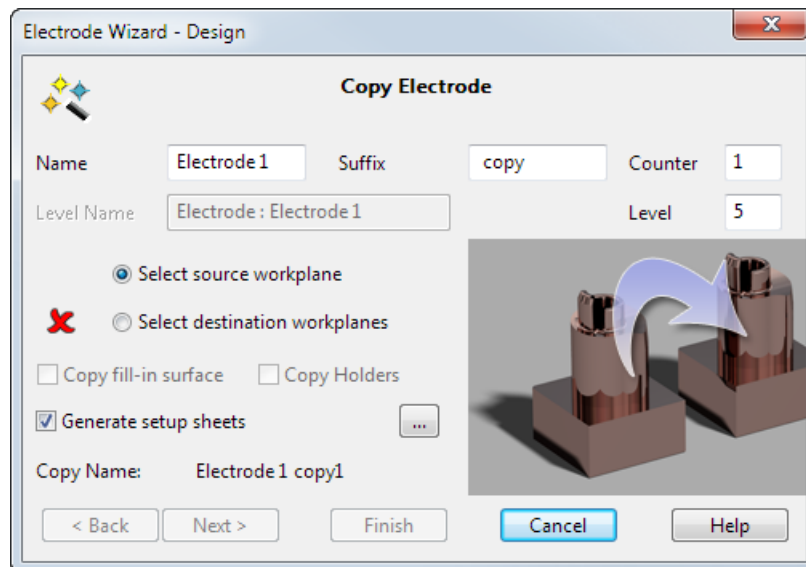
If you selected the option to create setup sheets, the copy of the electrode is added in grey to the General Assembly sheet and an individual detail sheet made for each copy of the electrode.



You can also create electrode copies using the **Move** , **Rotate** , and **Mirror**  options on the **General Edits** toolbar.

## Copy Electrode dialog

Use the options on this dialog to create a copy of an electrode in the correct position and rotation for each of the destination workplanes.



**Name** — Name of the original electrode.

**Suffix** — The default setting is *copy*.

**Counter** — The default setting is *1*.

**Level** — The level number for the copy of the electrode.

**Level Name** — If the level number inserted in **Level** is currently unnamed, you can name the level by typing in the text box. The text box will become active when an unnamed level number has been inserted in **Level**.


**Select source workplane** — Select the workplane you created on the original electrode.

**Select destination workplanes** — Select the workplanes you created on the identical burn regions.

**Copy fill-in surface** — This option is inactive if there are no fill-in surfaces associated with the selected electrode.

If this option is selected, all the fill-in surfaces that were generated for the original electrode are copied into position.

The default setting is selected, but the last setting you used will be used as the default setting when you next use **Copy Electrode**.

**Generate setup sheets** — If you want to create set up sheets of the copied electrode, make sure this option is selected. By default, two set up sheets are created: one for machining and the other for doing the sparking. If this option is selected, click the **Ellipsis**  button to modify the setup sheets using the Electrode Setup Sheet Control dialog (see page 104).

**Copy Holders** — If this option is selected, all the holders that were generated for the original electrode are copied with the electrode. This option will be inactive if there are no holders associated with the electrode selected. The default setting is deselected, but the last setting you used will be used as the default setting when you next use **Copy Electrode**.

**Copy Name** — The copy of the electrode will be given the name

<**Name**><**Suffix**><**Counter**>

If the original electrode was called *electrode\_example*, the copy will be called *electrode\_example copy1*.

The three parts to the name can be changed as required. The only condition is that the resultant name must be unique; if it is not, **Counter** is automatically incremented until a unique name is formed.

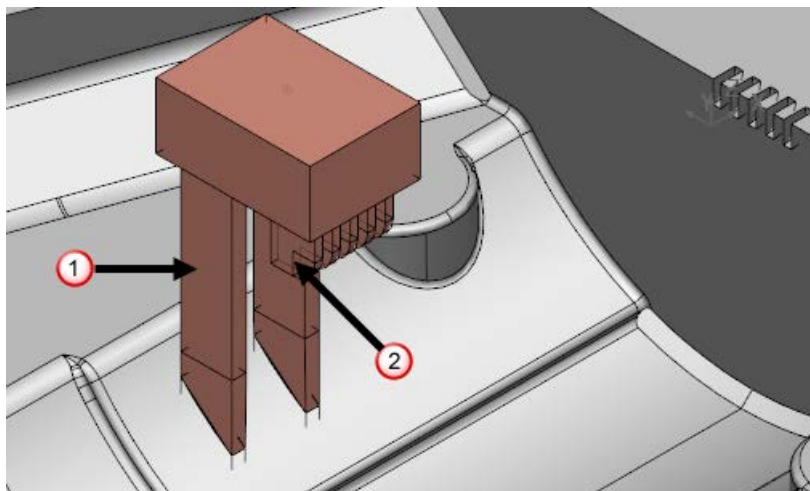
**Next** — Displays the **Export Options** page of the Electrode Wizard (see page 61).

**Finish** — If no export options are required, click **Finish** to create a copy of the electrode in the correct position and rotation for each of the destination workplanes. In wireframe, the copies are shaded grey.

---

## Creating a Multi-Impression electrode

You can create Multi-Impression electrodes, that are defined as electrodes with multiple burn-forms on a single blank.




① — First burn form.

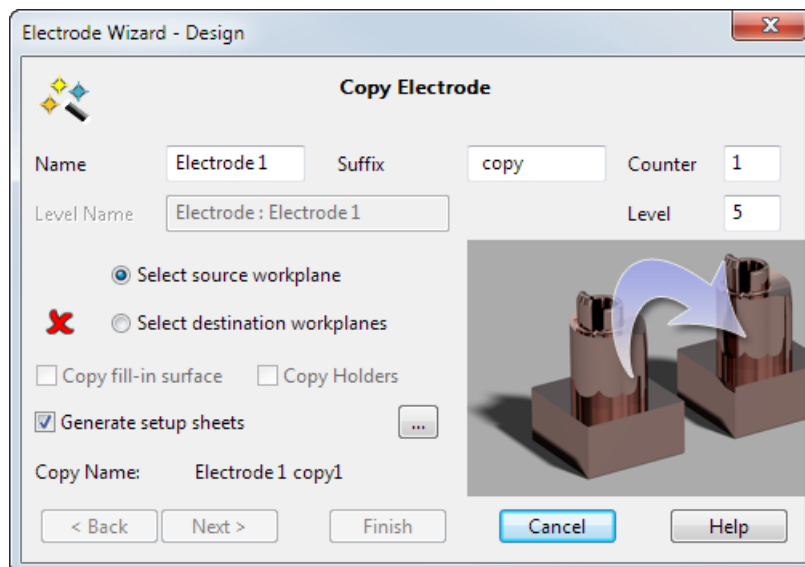
② — Second burn form.

To create a Multi-Impression electrode:

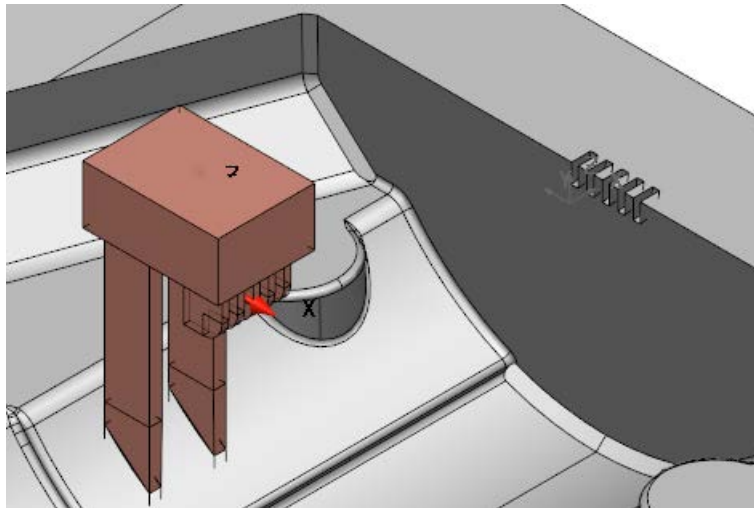
- 1 Select an electrode with multiple burn-forms.



- 2 Click the **Electrode**  button on the **Wizards** toolbar.  
The **Copy Electrode** page of the **Electrode** wizard is displayed.

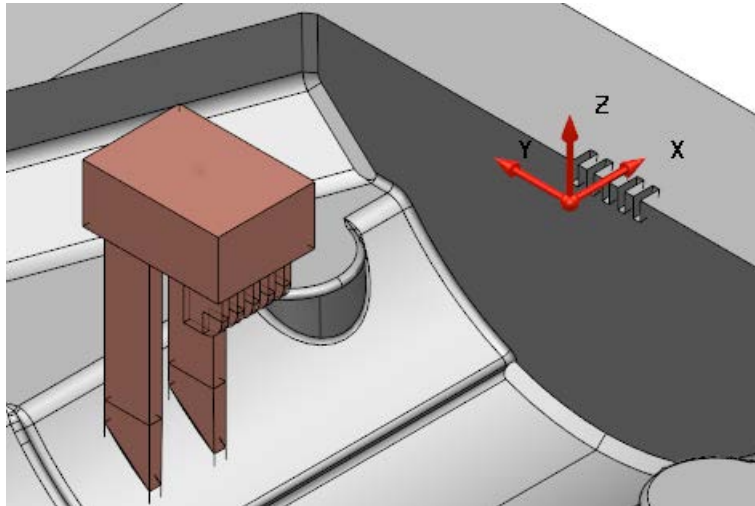


- 3 Select the workplane of the new burn-form, on the model.



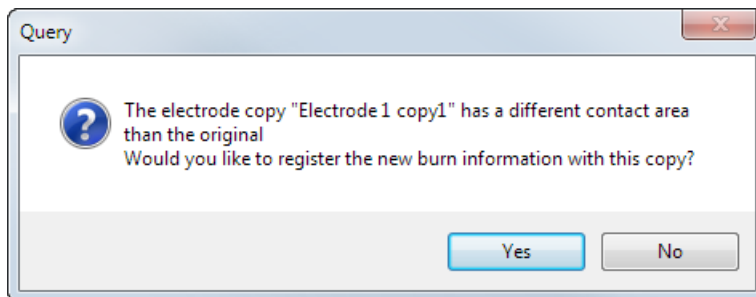
The **X** changes to a **✓**.

- 4 Select the workplane of the new burn area, on the model.



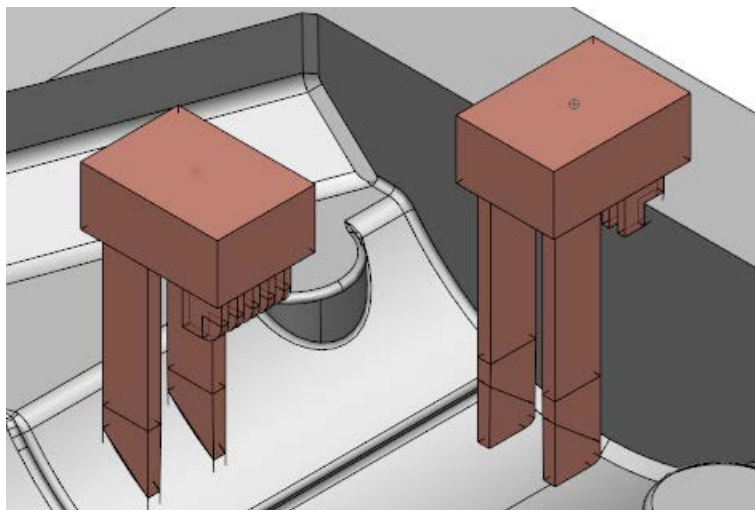
The **X** changes to a **✓**.

- 5 Click **Finish**. A message dialog is displayed.



- 6 Click **Yes** to create a Multi-Impression electrode and close the wizard.

The electrode copy is created and illustrated as a Multi-Impression electrode in the tree by a dice icon.



- 7 Repeat the process for each burn form.

If the burn forms on your Multi-Impression electrode are identical, you can convert it to a Multi-Family electrode (see page 81), where you can define different undersizes each identical burn form.

---

## Defining a Multi-Family electrode

You can use the electrode tree to define Multi-Impression electrodes as Multi-Family electrodes, and specify the undersize of each burn-form.

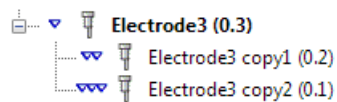
To define a Multi-Family electrode:

- 1 Select a Multi-Impression electrode from the tree.
- 2 Right-click the selected electrode.

The **Multi-Impression Electrode** context menu is displayed.

- 3 Select **Multi-Impression > Multi-Family Electrode**.

The Multi-Impression electrode is converted into a Multi-Family electrode.



The icons represent the undersizes of the burn-forms, which are displayed in brackets after the electrode name.

▼ — represents a roughing burn-form with a large undersize.

▼▼ — represents a semi-finishing burn-form, with a moderate undersize.

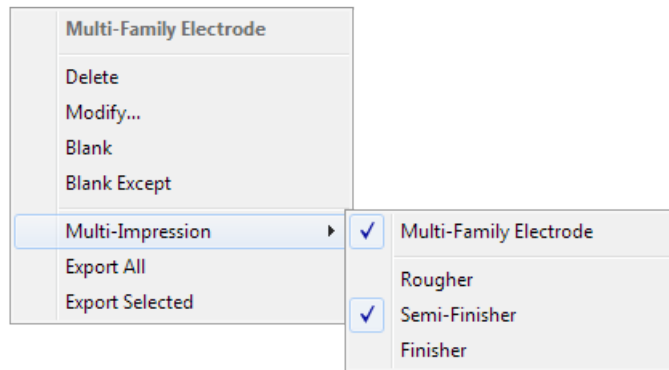
▼▼▼ — represents a finishing burn-form, with a small undersize.

### Burn-form role.

You can also use the tree to define the role of a burn-form (in a Multi-Family electrode) as a rougher, semi-finisher, or a finisher. To define a burn-forms role:

- 1 Select a Multi-Family electrode.
- 2 Right-click the selected electrode

The **Multi-Family Electrode** context menu is displayed.



- 3 From the context menu select one of the following:
  - **Multi-Impression > Rougher**
  - **Multi-Impression > Semi-Finisher**
  - **Multi-Impression > Finisher**

---

## Editing an electrode

You can edit an existing electrode as follows:

- 1 Double-click the electrode or select the electrode with the right mouse button and choose **Modify** from the context menu.
- 2 Use the options on the **Edit Electrode** dialog (see page 83) to edit the non-geometric properties of the electrode.

## Edit Electrode dialog

You can edit the non-geometric properties of an electrode using this dialog. Changing these values does not affect the physical shape of the electrode.

	Rough	Semi	Finish
Name	Electrode		
Level	5		
Material	Copper		
Undersize	0.3	0.22	
Quantity	1	1	
Spark Gap			
Surface Finish			
Orbit Type	Not Set		
Additional Details	...		
Inspection Points	...		
Setup-sheets	Settings ... View Items ...		

**Name** — Enter a name for the electrode.

**Level** — Enter the level of the electrode.

**Material** — Select the electrode material.

**Undersize** — Enter the **Undersize** values for the **Rough**, **Semi**, and **Finish** electrodes.


**Quantity** — Enter the number of **Rough**, **Semi**, and **Finish** electrodes in the electrode family.

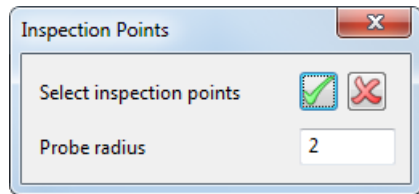
**Spark Gap** — Enter a spark gap.

**Surface Finish** — Enter the surface finish of the electrode.


**Orbit Type** — Select the orbit pattern from the list to control the movement of the machine head during EDM.

**Additional Details** — Click the **Ellipsis** ... button to display the existing **Additional Electrode Details** dialog. You can use this to update the additional information that is displayed on the setup sheet.

**Inspection Points** — Click the **Ellipsis**  button to display the **Inspection Points** dialog. Use this dialog to edit inspection points on an existing electrode.



**Setup sheets** — Click the **Ellipsis**  button to display the **Electrode Setup Sheet Control** dialog (see page 104). Use the options on this dialog to modify the setup sheets.

**View Items** — Click the **Ellipsis**  button to display the **Electrode Setup Sheet Items** dialog (see page 112). Use the options on this dialog to add other items to an existing electrode drawing view.



*If you have several copies of the same electrode, any change made to an original electrode is also applied to all the copies. Similarly, any change made to an electrode copy is reflected in the original.*

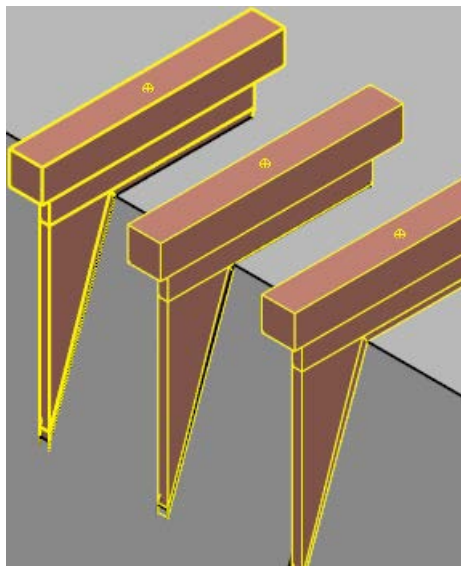
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## Collision checking electrodes

You can check for collisions between your electrodes and a part, using the **Collision Check Selected** and **Collision Check All** options on the **Electrode** context menu.

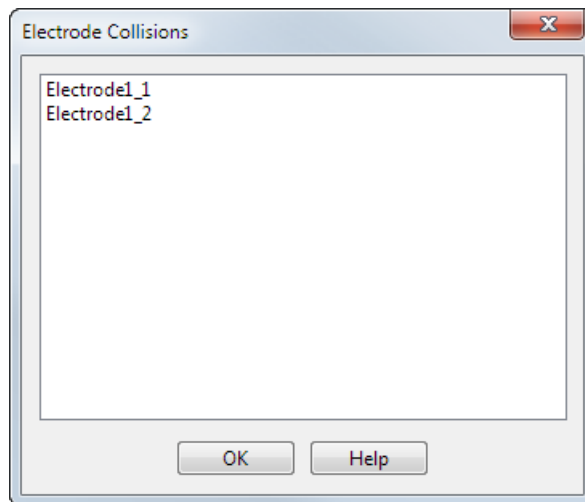
To check for collisions:

- 1 **Shift** +click the electrodes you want to check for collisions.

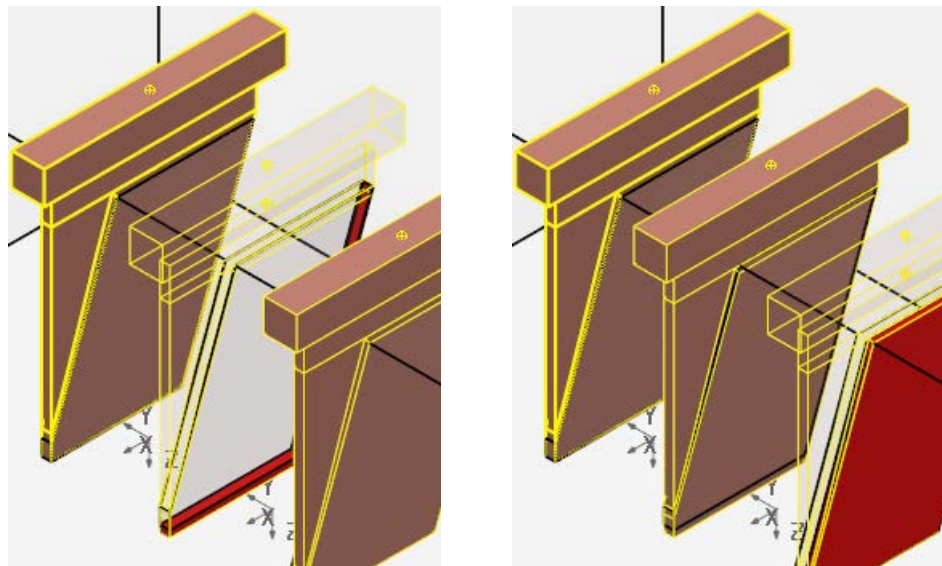


- 2 Right-click one of the selected electrodes.  
The **Electrode** context menu is displayed.

- 3 Select one of the following:
  - **Collision Check Selected** — Select this option if you want to check for collisions between the selected electrodes and the part.
  - **Collision Check All** — Select this option if you want to check for collisions between all electrodes and the part.
- 4 The **Electrode Collisions** dialog is displayed:



- 5 Click the name of an electrode to see its collision areas on the part. The collision areas are displayed in the graphics window and are highlighted in red.



- 6 Select **OK** to close the dialog.

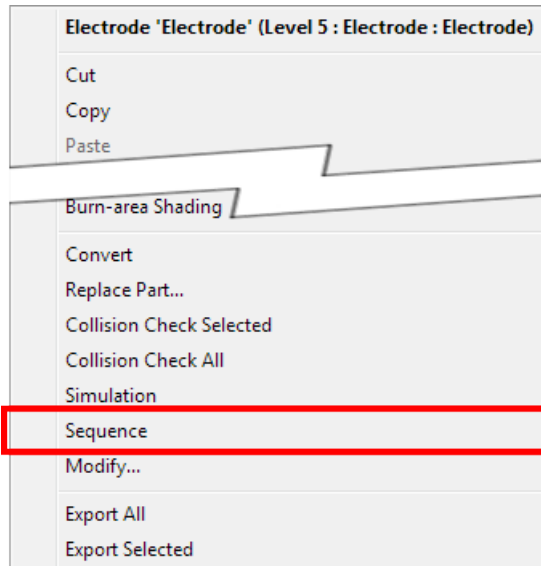


*Collision checking is also available when replacing a part (see page 117).*

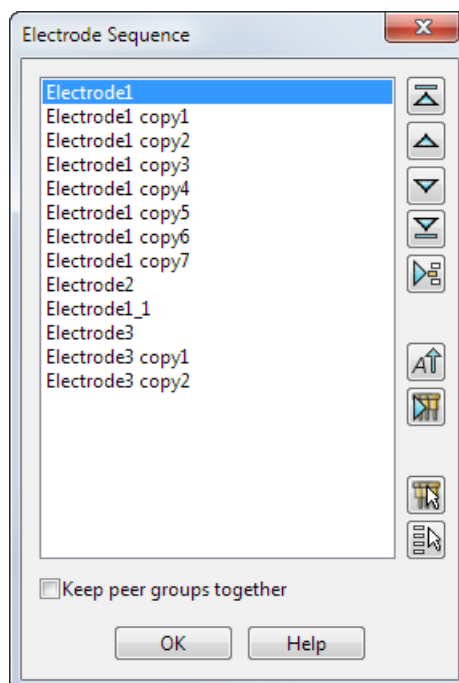
# Sequencing electrodes

The sequence of electrodes in a model can be adjusted and the order changed so that subsequent exports or the generation of a summary spreadsheet are in the required order.

- 1 Right-click an existing electrode and select **Sequence** from the menu.




- 2 The **Electrode Sequence** dialog shows all the electrodes that are in the model.





- 3 The highlighted name is the selected electrode. Choosing a different name from the list selects the corresponding electrode on the model. You can select multiple electrodes from the list using **Shift** + click or **Ctrl** + click.





4 Use the following options to manipulate the sequence list:


 **Move to top** — Moves the selected electrodes to the top of the list.

 **Move up** — Moves the selected electrodes up one place in the list. If **Keep peer groups together** is selected the selected electrodes move up the list, but never disturb another peer group.

 **Move down** — Moves the selected electrodes down one place in the list. If **Keep peer groups together** is selected the selected electrodes move down the list, but never disturb another peer group.


 **Move to bottom** — Moves the selected electrodes to the bottom of the list.


 **Insert at** — Click this button and select a position in the list to move the selected electrodes to that position. The item previously in that position is moved below the selected electrodes.

 **Sort alphabetically** — Orders the list alphabetically by electrode name. Toggle the button to sort in ascending or descending order.

If **Keep peer groups together** is selected, the electrode groups are sorted alphabetically by the name of the first item in the group.

If there are electrodes selected in the list, only the selected items are sorted alphabetically.

 **Group peers** — Places copies of electrodes directly after the first electrode from the peer group in the list. If there are electrodes selected in the list, then only the peer groups that the selected electrodes belong to are grouped.

 **Select peers** — Selects all of the electrodes in the list that form the the peer groups of the currently selected electrodes. This button is unavailable when **Keep peer groups together** is selected.

 **Clear selection** — Deselects all the selected items.

**Keep peer groups together** — Select this option to keep peer groups together when using the options in the dialog.

When selected, any time you select an electrode in the list the entire peer group for that electrode is selected.

Whenever a peer group is moved with this option selected, the electrodes in the peer group move together.



A peer group is a group of electrodes that contains an original electrode and its copies. For example, *Electrode3*, *Electrode3 copy1* and *Electrode3 copy2*.

The modified sequence affects:

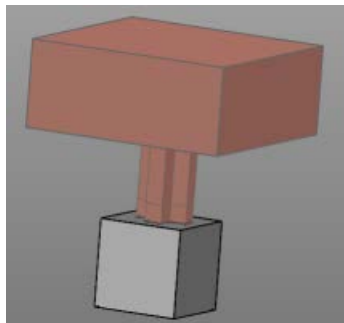
- The order of electrodes in the next summary spreadsheet you produce.
- The order of electrodes exported to AGIE, Charmilles, JDMA, or other custom script output.
- The result of entering **print electrode.list** in the command window.

---


## Electrode frames

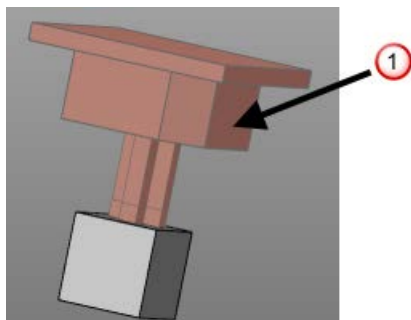
PowerSHAPE includes support for electrode frames. An electrode frame is an offset section of the electrode base that is machined accurately to allow pre-setting of the electrode.

The following electrode was created without a frame:

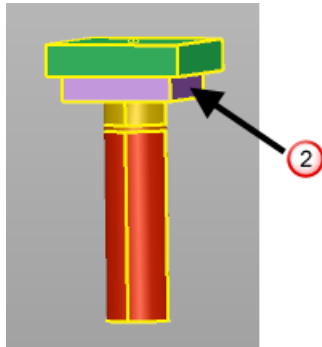


**To create a similar electrode with a frame:**

- 1 Select **Create frame** on the **Tool > Options > Manufacturing > Electrode > Alignment** page (see page 12).
- 2 Click **OK**.
- 3 Click  to start the Electrode Wizard.
- 4 Use the **Electrode Wizard** to create an electrode that includes a frame **1**.



- 5 You can display the burn region shading as follows:
  - a Display the shaded view of the model.
  - b Right-click on the electrode and select **Burn-area Shading**.



The electrode frames are coloured purple <sup>2</sup>; this allows different machining strategies to be applied easily using PowerMILL templates.

## Defining electrode frames using the blanks.csv file

You can define electrode frames by adding fields to the `blanks.csv` file that specifies the default blanks. These new fields define:

- frame length.
- frame width.
- frame height.
- chamfer size (optional).

**For example:**

```
0,blank_with_frame,12,,30,Copper,,,8,6,4,3
```

In this blank definition, the last four arguments specify the frame:

**Length:** 8

**Width:** 6

**Height:** 4

**Chamfer size (CS):** 3



*Further details on the creating blanks definitions is included in the `blanks.csv`. You can edit this with any text editor.*

---

## Exporting and Importing Electrodes

Use the following sections to find details on exporting and importing electrodes:

- Exporting to a Charmilles job file (see page 90)
- Exporting to OPS Ingersoll format (see page 92)
- Exporting data using custom scripts (see page 93)
- Exporting existing electrodes to a spreadsheet (see page 95)
- Exporting electrodes to different file formats

Before overwriting an export file you are asked to confirm the action. If you do not wish to overwrite the file, save the file with a new filename. This behaviour relates to the following export files:

- Charmilles jobfile.
- *.trode* files (electrode archive files).
- *.csv* and *.html* summary spreadsheets.

## Exporting to a Charmilles job file

If you want to export to a Charmilles job file, select the **Charmilles Job file** option on the **Export Options** page of the Electrode wizard (see page 61).

Before overwriting a Charmilles job file, you are asked to confirm the action. If you do not wish to overwrite the file, save the file with a new filename.

### Configuration options

Use the following options to customise a configuration file to be used when creating a Charmilles job file from Delcam Electrode.

The following options can be specified:

- depth\_includes\_clearance**
- convert\_undersizes**
- zero\_prepdepths**
- use\_electrode\_datum**
- extra\_job\_xml**
- no\_spaces\_in\_names**
- default\_filename**
- always\_prompt\_for\_filename**

### To change the value of an option:

- 1 Navigate to  
XXX\file\electrode  
where *xxx* is your installation folder.

- 2 Open *charmilles\_jobfile.con*. with a text editor.
- 3 In the text file, locate the option to be changed.
- 4 If the option is preceded by #, remove the #, so that the option is used when configuring the file.
- 5 Make the change to the option setting.

If you do not want to lose any changes made next time PowerSHAPE is installed, copy the modified file into your *shareddb* folder.

### **depth\_includes\_clearance**

Usually Z0 is the contact point. Z is a clearance point above Z0 and the prepdepth is the depth from Z0 (the burn depth).

It is also possible to position Z0 at Z and increase the prepdepth by the clearance. This allows flexibility over the prepdepth used which is not possible if it is rigidly defined by the burndepth.

The default setting for this option is: `depth_includes_clearance:false`

If the setting is changed to **true**, the prepdepth is increased by the clearance.

### **convert\_undersizes**

Undersizes may be defined by radius or diameter. Charmilles uses radial undersizes, but Delcam Electrode has never explicitly fixed whether it uses diameters or radii.

The default setting for this option is: `convert_undersizes: false`

If the setting is changed to **true**, the undersizes will automatically be converted from diameters to radii, using a factor of 0.5.

### **zero\_prepdepths**

If no prepdepth is defined, the jobfile will not run. This is a safety feature to force manual intervention.

The default setting for this option is: `zero_prepdepths: false`

If the setting is changed to **true**, all the prepdepths are output as zero.

### **use\_electrode\_datum**

The usual datum point for an EDM system is the bottom of the electrode in the middle. However, you may use the datum that you have set in the electrode wizard.

The default setting for this option is: `use_electrode_datum: false`

If the setting is changed to **true**, the existing electrode datum is used instead of the EDM default

### extra\_job\_xml

Use this option to add custom xml to the <Job> section of the file.

The default setting for this option is: extra\_job\_xml:

Add \ at the end of the line to continue on the next line.



*If specified the value must be correctly formatted XML or it will not be used.*

*Example:*

```
extra_job_xml: \  
  <Type>1</Type>\  
  <FlushingOnAtStart>0</FlushingOnAtStart>\  
  <TankEmptyingAtEnd>1</TankEmptyingAtEnd>\  
  <FlushingOffAtEnd>1</FlushingOffAtEnd>\  
  <UnloadToolAtEnd>1</UnloadToolAtEnd>\  
  <UnloadPalletAtEnd>0</UnloadPalletAtEnd>
```

### no\_spaces\_in\_names

The default setting for this option is: no\_spaces\_in\_names: false

By default the names of the electrode tools generated contain spaces. If you prefer to have names without spaces, set this option to true.

### default\_filename

Use this option to specify the default filename to be used. Some basic substitution strings such as <model\_name> are supported.

### always\_prompt\_for\_filename

The default setting for this option is: always\_prompt\_for\_filename: false.

Change the setting to *true* to specify the Charmilles job file filename to be used when a job file is exported.

## Export to OPS Ingersoll format

Use the [ops\\_export.con](#) file to customise the export of electrode data to the **OPS Ingersoll** format. The file is installed in:

```
PowerSHAPE152XX/file/electrode
```

PowerSHAPE exports electrodes using the cavity list notation, which groups the copies of the same electrodes and outputs their different positions as a cavity list.

The configuration file contains one option. By default this is commented out, as follows:

```
#use_cavity_lists: false
```

To export every electrode individually, edit the `.con` file to remove the `#` from the option and save the changes.

## Exporting data using custom scripts

You can generate custom scripts when exporting from the Electrode wizard (see page 61).

Ensure that you have an appropriate custom script-generating `.xml` file in the `shareddb`.

The name of the file takes the form:

```
electrode_script_fred.xml
```

where **fred** is the part of the filename that you define.

### Tags

`<electrode>` — The `<electrode>` and `</electrode>` tags enclose the substitution strings (see page 102) that define the electrode. These are expanded when Delcam Electrode processes the file. The `<electrode>` tag takes an optional `filename` attribute. If you set this, the contents of the expanded electrode tag are sent to this file not the main output file. You can use substitution strings in the filename.

`<export>` — Use this tag to export geometry or an image of the current electrode. You can use it within the `<electrode>`, `<copies>`, or `<family>` tags. The `<export>` tag takes the following attributes:

`filename` — This is the file to export. The file extension determines the export type. Supported types are `.dgk`, `.igs`, `.stp`, and `.jpg`. You can use substitution strings in the filename.

`workplane` — This is the workplane to export relative to. The options are: `"world"`, `"active"`, `"machining"`, `"inspection"`, or `"edm"`.

`<transform>` — Use this tag to output the details of a workplane transform. You can use it within the `<electrode>`, `<copies>`, or `<family>` tags, or outside all. The `<transform>` tag takes the following attribute:


`workplane` — This is the workplane to export relative to. The options are: "world", "active", "machining", "inspection", or "edm". If used outside of electrode-type tags only "world" and "active" are valid.

`<inspectionpoints>` — You can output inspection points (see page 94) in electrode custom scripts using the `<inspectionpoints>` tag within the `<electrode>` or `<copies>` tag.

A typical .xml file might look like this:

```
<csv filename="testpiece.csv">
Electrodename X-Position Y-Position Z-Position C-Position Depth
Undersize1 Undersize2 Safety-offset Comment
<electrode type="originals">
 %[name] %[x] %[y] %[box_min_z] %[rotation] %[burn_depth]
 %[roughing] %[roughing] %[material]
<copies>
 %[x] %[y] %[z] %[rotation] %[burn_depth]
</copies>
</electrode>
</csv>
```

On the **Export Options** page (see page 61) of the Electrode Wizard:

- 1 In the **Export for** section, select **Other CAM software**.
- 2 In the **Include** section, select **EDM data-transfer files** and click the Dialog  button.
- 3 In the **EDM Export Selection** dialog, select **Custom script**.

## Outputting inspection points

You can output inspection points in electrode custom scripts using the `<inspectionpoints>` tag within an `<electrode>` or `<copies>` tag.

The substitution strings available for the `<inspectionpoints>` tag are:

`%[pindex]` — This is the index of the inspection point (starts at 1 for the first)

`%[px]` — This is the X coordinate of the inspection point.

`%[py]` — This is the Y coordinate of the inspection point.

`%[pz]` — This is the Z coordinate of the inspection point.



`[%pi]` — This is the I/X dimension of the surface normal at the inspection point.

`[%pj]` — This is the J/Y dimension of the surface normal at the inspection point.

`[%pk]` — This is the K/Z dimension of the surface normal at the inspection point.

`[%poffset]` — This is the offset/undersize of the CAD model at the inspection point.

`[%pox]` — The x coordinate of the offset (actual) inspection point.

`[%poy]` — The y coordinate of the offset (actual) inspection point.

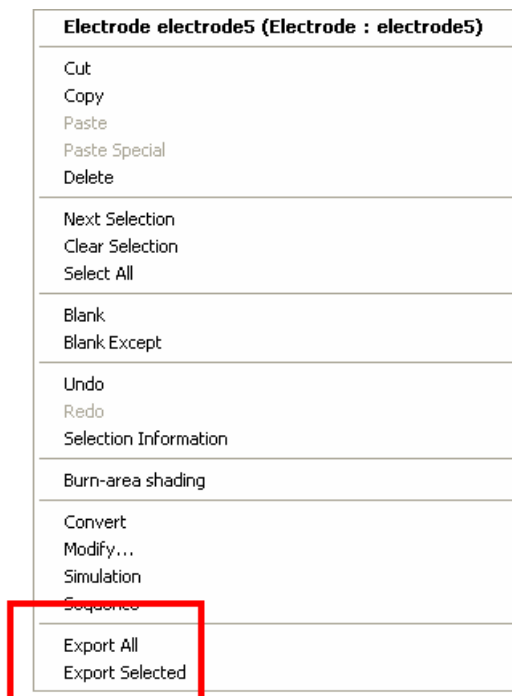
`[%poz]` — The z coordinate of the offset (actual) inspection point.



*Because the CAD geometry is modelled without the undersize removed the inspection system must either be passed the offset to take off for the undersize or be passed the offset (actual) coordinates to use if this is not supported.*

## Exporting existing electrodes to a spreadsheet

There are two export options on the Electrode menu.



**Export All** — Export all the electrodes in a model to a summary spreadsheet.

**Export Selected** — Export selected electrodes in a model to a summary spreadsheet.

## Electrode archive format (.trode)

You can export electrodes from PowerSHAPE using the Delcam Electrode archive file format (.trode).

An .trode file is a single file that stores a collection of one or more electrode .dkg files with associated metadata (.xml) files and setup sheet images.

This makes it easier to transfer electrodes from PowerSHAPE to PowerMILL when the two programs are on different machines. The transfer of an electrode from one machine to another works as follows:

- 1 PowerSHAPE generates a single .trode file instead of a whole folder of files.
- 2 PowerMILL reads in the .trode file and creates an electrode subproject as if the electrode had been created within an embedded session of PowerSHAPE.

You can access with the .trode file options using Windows Explore (see page 97)r.

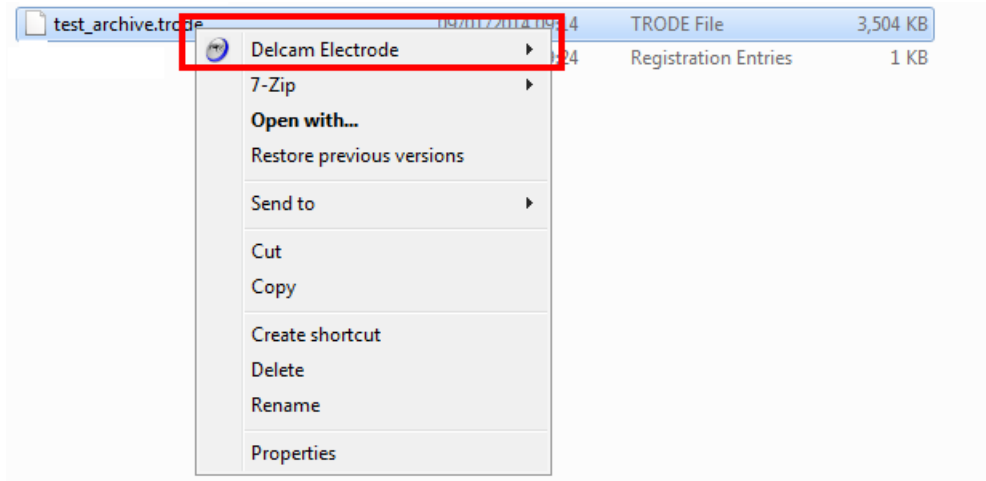
### Importing .trode files

Files that use the .trode format can be:

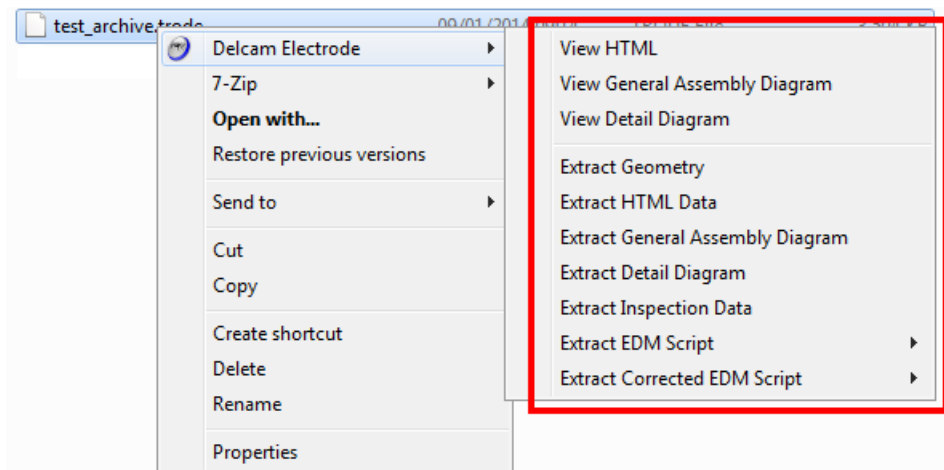
- re-imported into PowerSHAPE by selecting **File > Import**. This makes using the file format a convenient way to store electrode data.
- imported to create an electrode project in PowerMILL.

## Delcam Electrode options in Windows Explorer

- 1 Right-click on a file with a .trode extension to display a menu.



- 2 Expand the **Delcam Electrode** menu to display **View** and **Extract** options.



.trode files that have been generated by PowerSHAPE do not have any inspection corrections. These get added to the .trode archive if the PowerINSPECT Electrode Inspection Wizard is used.

If there are no inspection corrections, you can extract only the original (uncorrected) script files. They are exactly the same as when they were when originally generated by PowerSHAPE.

If there are inspection corrections, you can:

- extract scripts in their original uncorrected form.
- apply the corrections and output the adjusted version.



*You can extract all formats, but can currently correct only the following formats:*

*JDMA*

*Charmilles*

Exeron  
ONA  
Zimmer Kreim  
Sodick  
Makino  
Mitsubishi EPX  
Mitsubishi NC (ESPER)



You can also use a typed command to extract a corrected file EDM export file:

**electrodesession extract edmfiles**

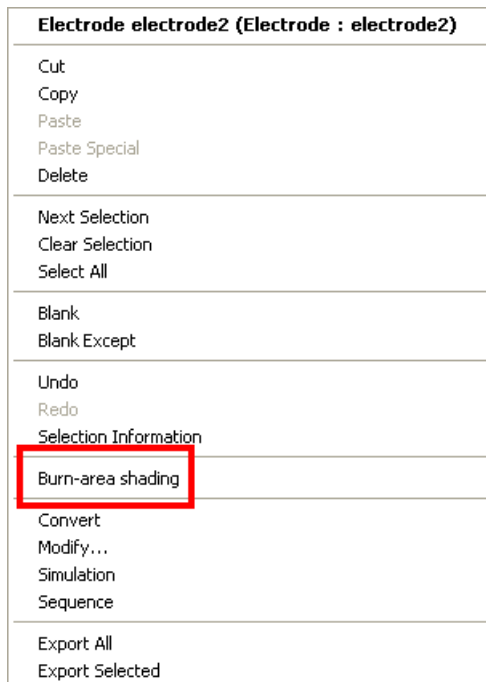
---

## Shading the burn area of an electrode

You can use the context menu to shade the burn area of electrodes. This gives flexibility for machining within PowerMILL because you can define a template to machine the different areas appropriately.

**To display shading of the burn area,**

- 1 Right click on an electrode.
- 2 Click **Burn-area shading** to toggle the shading *ON* and *OFF*.



The default shading for the faces is as follows:

- burning — red
- extension — orange

- clearance — yellow
- base — green

The settings for burn area shading are stored in:

...\dcam\product\powershapeXXXX\file\electrode\electrode\_burn\_region\_shading.con



*If you edit the Delcam default file, you must copy it into the **shareddb**, otherwise when PowerSHAPE is updated the changes and additions will be lost.*

---

## Setting up your own blanks

You can define your own electrode blanks so that they are available from the selector in the Electrode Wizard.

In

C:\dcam\product\powershapeXXXX\file\electrode

(where **XXXX** is the version number of PowerSHAPE and **C** is the drive where PowerSHAPE is installed)

there is a file called **blanks.csv**.

You can edit the original file or put a copy of it in

C:\dcam\shareddb

(where **C** is the drive on which the shareddb is installed)

and then edit the file.

When you run the Electrode Wizard, it searches the following folders in the order given for the first file to be found:

C:\dcam\shareddb

C:\dcam\product\powershapeXXXX\file\electrode



*If you edit the original file and then install PowerSHAPE later, you lose the blanks you have defined. If you copy the file into dcam/shareddb and edit it, the file is retained by subsequent installations.*

The **blanks.csv** file contains the details about the blanks. You can either read this file using spreadsheet software (such as Microsoft Excel) or a text editor (such as WordPad).

If you open this file in WordPad, it contains the following lines:

```
1,3R-494-S12x50,12,12,50,Copper,System_3R,__3R-Ready-to-Run
1,3R-494-S22x50,22,22,50,Copper,System_3R,__3R-Ready-to-Run
1,3R-494-S26x50,26,26,50,Copper,System_3R,__3R-Ready-to-Run
1,3R-494-S32x50,32,32,50,Copper,System_3R,__3R-Ready-to-Run
```

1,3R-494-S40x50,40,40,50,Copper,System\_3R,\_\_3R-Ready-to-Run  
 1,3R-494-40x22x50,40,22,50,Copper,System\_3R,\_\_3R-Ready-to-Run  
 1,3R-494-32x22x50,32,22,50,Copper,System\_3R,\_\_3R-Ready-to-Run

0,3R-494-D10x50,10,,50,Copper,System\_3R,\_\_3R-Ready-to-Run  
 0,3R-494-D12x50,12,,50,Copper,System\_3R,\_\_3R-Ready-to-Run  
 0,3R-494-D16x50,16,,50,Copper,System\_3R,\_\_3R-Ready-to-Run  
 0,3R-494-D22x50,22,,50,Copper,System\_3R,\_\_3R-Ready-to-Run  
 0,3R-494-D26x50,26,,50,Copper,System\_3R,\_\_3R-Ready-to-Run  
 0,3R-494-D32x50,32,,50,Copper,System\_3R,\_\_3R-Ready-to-Run  
 0,3R-494-D40x50,40,,50,Copper,System\_3R,\_\_3R-Ready-to-Run  
 0,3R-494-D50x50,50,,50,Copper,System\_3R,\_\_3R-Ready-to-Run

Each line defines a blank using six elements. The elements are separated by a comma.

The elements are described using the following line from the blanks.csv file.

0,3R-494-D10x50,10,,50,Copper,System\_3R,\_\_3R-Ready-to-Run

Example element	Description of the element
0	This is can be either 0 or 1. If the value is 0, the blank is circular. If it is 1, the blank is rectangular. In this example, the blank is circular. If you input any other character here, the line is ignored by PowerSHAPE. You can prevent a blank from being read into PowerSHAPE by adding a character in front of the line.
3R-494-D10x50	This is the name of the blank. The name can contain any characters except a comma.
10	If the blank is circular, this is the diameter. If the blank is rectangular, this is the length (X dimension).
	For a circular blank, this element is ignored. It is usually left empty. If the blank is rectangular, this is the width (Y dimension).
50	This is the height.
Copper	This is the material of the blank.

<code>System_3R</code>	This is default catalogue for the blank. If this specified, it is selected when the <b>Specify Electrode Holder</b> page is displayed. To set up catalogues, see Setting up catalogues for holders
<code>__3R-Ready-to-Run</code>	This is default holder for the blank. If this is specified, it is automatically added when the <b>Specify Electrode Holder</b> page is displayed. To define holders, see Setting up catalogues for holders

In `blanks.csv`, add lines to define your own blanks. If you edit the file using spreadsheet software, ensure you save it as a `.csv` file.

## Units used by the blanks

By default, the values are in mm. If you want to use other units at any time, add the following line:

**[units]**

where *units* can be one of the following: inches, thousandth, and mm. For example,

**[inches]**

All definitions after this line are read using the units stated.

To convert back to mm, use:

**[mm]**

---

## Configuring drawings

You can configure your drawings in the following ways:

- You can define the text and layout of the drawings by amending the template (see page 101).
- Define the views and the appearance of the views on the drawing (for example, orientation, font, and balloons). For further details, see Customising Electrode setup sheets (see page 103).

## Changing the template for the setup sheets

Two setup sheets are generated when you run the Electrode wizard. These setup sheets are created from template drawings in the `electrode_template` model in the `dcam/parts` folder.

- **Electrode Detail sheet** — This shows a view of the individual electrode with the wireframe outline of the stock material. It gives the details for machining the electrode. The sheet is automatically regenerated if you change the properties of the electrode. The template drawing for the machining setup sheet is called *electrode\_detail\_setup\_sheet*.
- **GA Sheet** — This is a top-down view of the model, with the electrode and holders positioned in the burn position. This is the EDM setup sheet and is called *electrode\_ga\_setup\_sheet*.

You can modify these template drawings to your own requirements.

During installation, the *electrode\_template* model is put in

[.../product/powershapeXXXX/file/electrode](#)

where XXXX is the version number of PowerSHAPE.

- When you create setup sheets for the first time, a copy of this model is automatically imported into the *dcam/parts* folder.
- The default template drawings contain a single view and text containing special strings of the form *%[string]*.
- When you generate the setup sheets from the template drawings, the views are taken from the model and the special text strings are replaced with information relevant to the electrode.
- Use the text substitution button (*Text toolbar*) to add an electrode substitution string to the drawing template.

When a drawing is created, these strings are permanently replaced by the relevant information.

A text file containing a complete list of substitution strings (see page 102) is included in the PowerSHAPE installation.



*The default template for the electrode setup sheets is automatically updated when you update your version of PowerSHAPE. However, if you have previously customised the setup sheet, installing a new version of PowerSHAPE will not overwrite the customised version.*

## Substitution strings

You can add electrode substitution strings to a drawing template using the **Text Substitutions** dialog. A text file containing a complete list of substitution strings is included in the PowerSHAPE installation. The file is called

[electrode\\_substitutions.txt](#)

This file is located in



.....\powershapeXXXXX\file\electrode

This text file is updated for each release of PowerSHAPE. In addition, any new substitution strings are highlighted in the What's New for that version.

The text substitution file is used by the following:

- summary spreadsheet (.csv)
- custom scripts
- drawing templates

## Configuring Electrode setup sheets

You can create a setup sheet that shows one or more configured views. An example of this is creating a configured combined setup sheet. The setup sheets are created from template drawings in the *electrode\_template* model in the *dcam/parts* folder.

Configuring setup sheets enables you to:

- use additional sheets in *electrode\_template*.
- adjust the setting for each view.
- use the orientation as defined in the view.
- change the relative workplane.
- add balloons, dimensions, or the part itself to an individual view.
- define the size of the font to use for balloons or dimensions.
- specify if the view should be resized if the part is added.
- define individual templates (apart from the GA) to be suppressed or enabled as required.
- specify if the detail sheet should be treated as a configurable sheet or fixed as before.
- use the **Edit Drawing** dialog to specify the positioning of electrode balloons. By default, automatically positioned electrode balloons do not overlap the view border.

The lock on the Edit View dialog locks the view direction of electrode template drawing. This is to maintain the position of the balloons in relation to the view.

If you have modified the electrode template model you must lock the views in your model to take advantage of this:

- 1 Open the model.
- 2 Display the drawings.
- 3 Lock the views.

## Configuring your setup sheets

You can configure your setup sheets in one of the following ways:

- Using the interface (see page 104). This is the recommended method.
- Using the configuration file (see page 118).




There is an example of a configured setup sheet in `electrode_template.psmodel`. This setup sheet is suppressed by default in `electrode_setupsheets.con` (see page 118).

## Controlling setup sheets using the interface

You can select:

- the setup sheet that an electrode appears on.
- the detail and custom sheets that are generated.

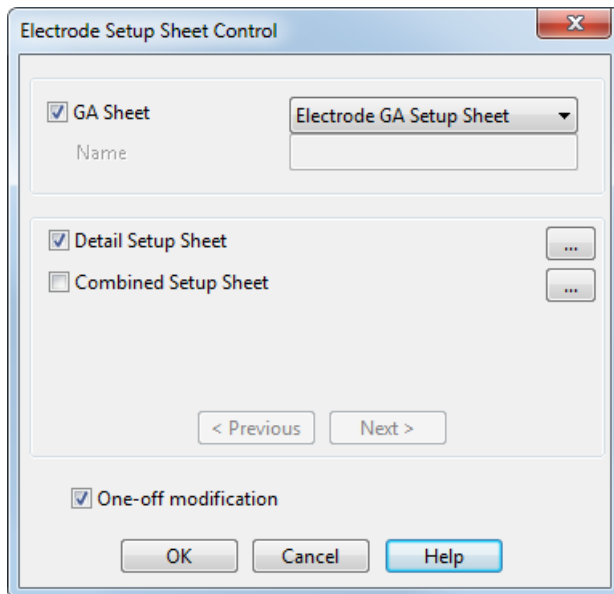
For each configurable sheet the options in the `.con` file can be overridden or modified using options on the following dialogs:

- **Electrode Setup Sheet Control** dialog (see page 104). This is displayed by clicking the **Ellipsis**  button in the following:
  - Copy electrode** dialog (see page 77)
  - Edit electrode** dialog (see page 83)
  - Electrode wizard**
- **Electrode Setup Sheet Settings** dialog (see page 107). This is displayed by clicking the **Ellipsis**  button in the **Electrode Setup Sheet Control** dialog.
- **Electrode Setup Sheet Items** dialog (see page 112). This is displayed by clicking the **Ellipsis**  button in the **Edit Electrode** dialog.

### *Electrode Setup Sheet Control dialog*

Display this dialog by clicking the **Ellipsis**  button in one of the following:

**Copy electrode dialog**  
**Modify electrode dialog**  
**Electrode wizard**



The dialog displays options for the following:

- **GA Sheet**
- **Detail Setup Sheet**
- **Combined Setup Sheet**
- any other custom setup sheets that have been created and are included in the *electrode\_template* file.

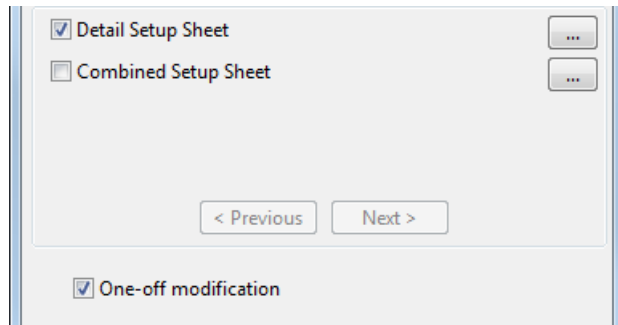
**GA Sheet** — Select this option to generate a GA sheet and select the name of the GA sheet from the list. Select **New GA** from the list to enter a new **Name**. If deselected, the sheet is not generated.




*If you open the dialog from Modify Electrode, changing GA sheet causes the electrode annotation to be moved from one GA sheet to another.*

**Name** — This option is available only if you select **New GA** from the **GA Sheet** list. Enter a new name. You must avoid special characters, but may include substitution strings (see page 102).

The central section of the dialog lists the setup sheets that exist.



For each sheet that is listed, the following apply:

- Select the option to generate the sheet. If deselected, the sheet is not generated.
- Display the relevant **Electrode Setup Sheet Settings** dialog (see page 107) by clicking the **Ellipsis**  button. Use this dialog to change a number of options, including the name of the sheet.
- If you change the name of the sheet, the change is reflected in the list of sheets on this dialog. You can make a name change permanent by clicking the **Save** button. This changes the default name for that sheet.

**Previous** and **Next** — If you define more sheets than can fit on the central section of the dialog, the **Next** button becomes active. Click this to show the next selection of sheets. If you then want to view the previous selection, click **Previous**.


**One-off modification** — If selected, the changes you have made apply to the current electrode only. If deselected, the changes are applied to future electrodes you create.

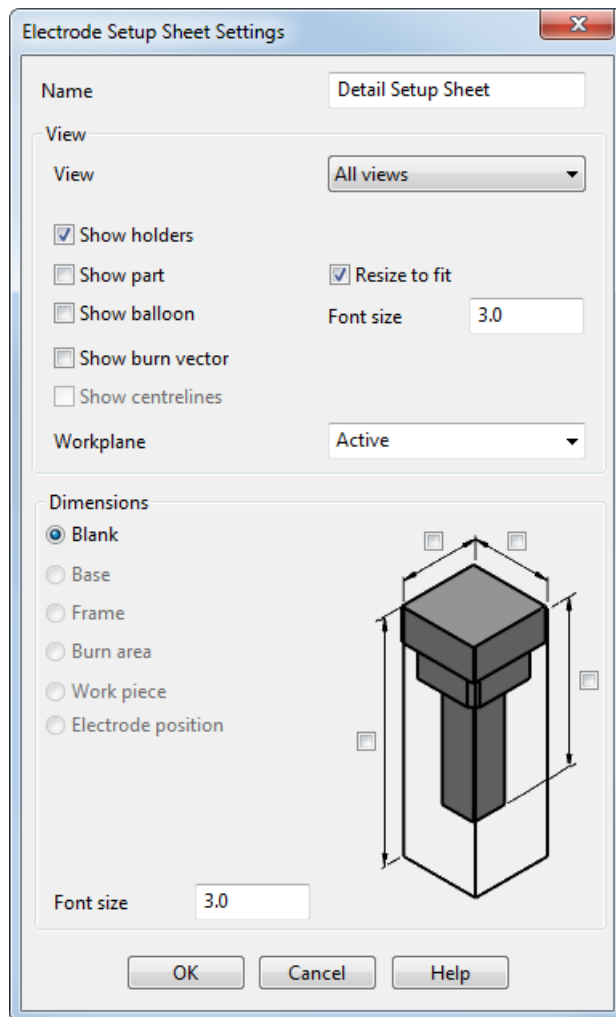
If you want the changes to become the default values for all users,

- 1 Deselect the option.
- 2 Click **Save**.

This automatically transfers the file to the *shareddb*. When the changes are saved, as much as possible of the format of the configuration file ([electrode\\_setupsheets.com](http://electrode_setupsheets.com)) is preserved, so it is safe to use a combination of manual editing and interface to make changes.

## Electrode Setup Sheet Settings dialog

This dialog displays the settings for the individual setup sheets and enables you to set the options in the configuration file using the user interface. To display it, click the **Ellipsis**  button on the **Electrode Setup Sheet Control** dialog.



**Name** — This is the name of the setup sheet on the **Electrode Setup Sheet Control** dialog (see page 104). If the **Name** of the sheet is changed, the change is also made to the name of the sheet on the **Electrode Setup Sheet Control** dialog. You can make the name change valid for an electrode, electrode session or change the default name using the options on the **Electrode Setup Sheet Control** dialog.

**View** — If you want to configure the settings for a particular view, select the view from the list. The **All views** setting enables you to change the default options.

Use the **Dimensions** area to add dimensions for different attributes of the electrode:

- **Blank**

- **Base**
- **Frame**
- **Burn area**
- **Work piece**
- **Electrode position**

The dimensions that can be displayed on the drawings depend on the view direction. You define this by selecting an option from the **View** list.

- If you select **All views** and all the views are not in the same direction, you can set X, Y, and Z dimensions. This is the default view and the only dimensions that you can display are those associated with the **Blank**.
- If you select a top view, you can include X and Y dimensions in your drawing.
- If you select a side view, you can include Z and X or Y dimensions on your diagram.
- If you select a different view, you can include X, Y, and Z dimensions on your diagram
- If your electrode template generates additional views on a **Setup Sheet**, the names of those views are displayed in the **View** list. Selecting an alternative **View** from the list enables you to dimension different attributes of the electrode.

All the following options correspond to options in the configuration file, `electrode_setupsheets.con`, which is located in



`..\powershapeXXXX\file\electrode`

**Name**  
**Suppress**  
**Show holders**  
**Show part**  
**Resize**  
**Show balloon**  
**Balloon font size**  
**Show burn vector**  
**Show dimensions**  
**Dimension font size**  
**Workplane**

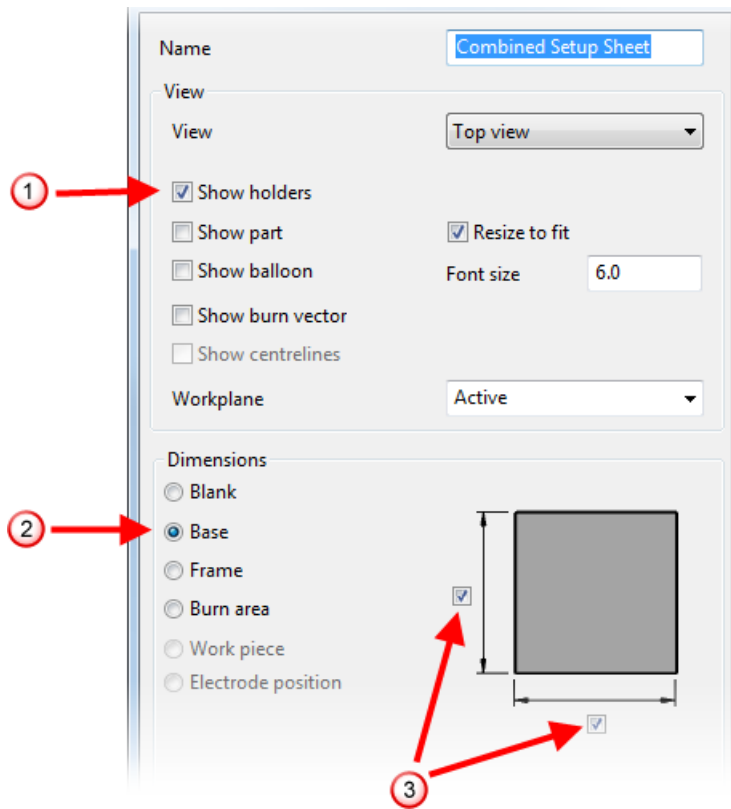
If you make changes to these options, the corresponding change is also made to the configuration file; the **Electrode Setup Sheet Control** dialog (see page 104) controls how this change is applied.

### ***Electrode Setup Sheet Settings - example***

This example uses an electrode template that includes a **View** option called **Top view**.

- 1** In the **General Options** page of the Electrode Wizard, select **Generate Setup Sheet** and click the associated **Ellipsis**  button to display the **Electrode Setup Sheet Control** dialog.
- 2** Select **Combined Setup Sheet** and click the associated **Ellipsis**  button to display the **Electrode Setup Sheet Settings** dialog.
- 3** Select **Top view** from the **View** list. The following **Dimensions** options are available:
  - **Blank**
  - **Base**
  - **Frame**
  - **Burn area**

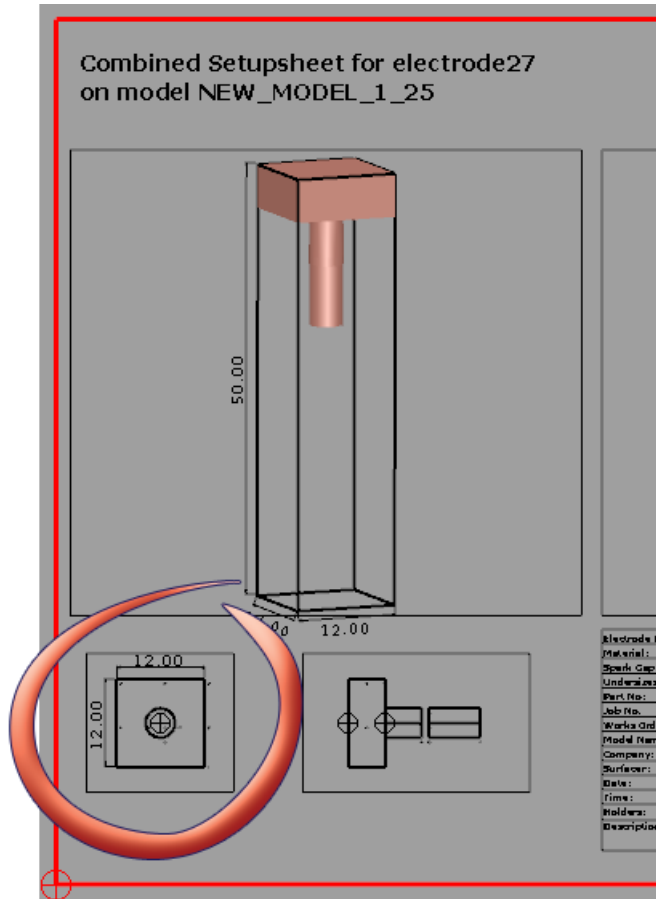
- 4 Select the items to display on the **Setup Sheet** ①.




- 5 Select a **Dimension** option ②.
- 6 Select the dimensions to display ③.
- 7 Click **OK** to close the **Electrode Setup Sheet Settings** dialog.
- 8 Click **OK** to close the **Electrode Setup Sheet Control** dialog.

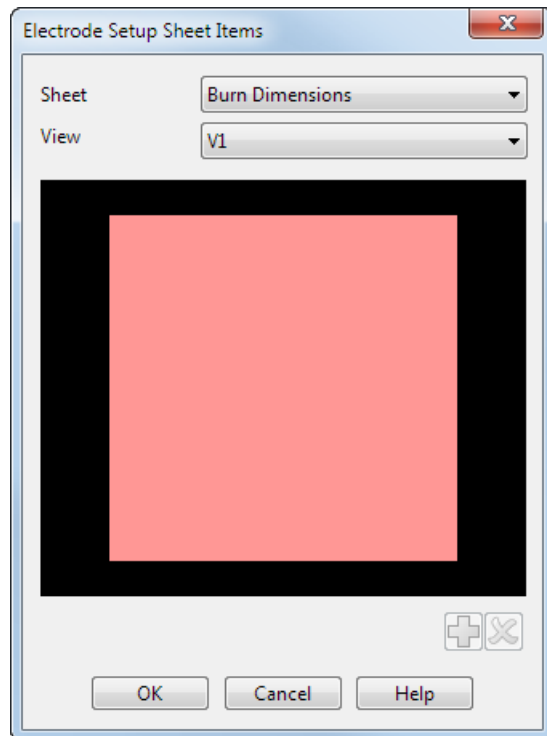


- 9 Click **Next** to proceed to the next step of the **Electrode Wizard**, or **Finish** to complete the wizard. The dimensions you selected are displayed on the **Combined Setup Sheet**.




## Electrode Setup Sheet Items dialog


Use this dialog to manually add further items to an existing electrode drawing. To display this dialog click the **Ellipsis**  button on the **Edit Electrode** dialog.



**Sheet** — Select the setup sheet you want to modify from the list.

**View** — Select the view you want to add the items to from the list.

 — Click this button to add the selected items to the view. The added items appear in the graphics view and are shaded green.

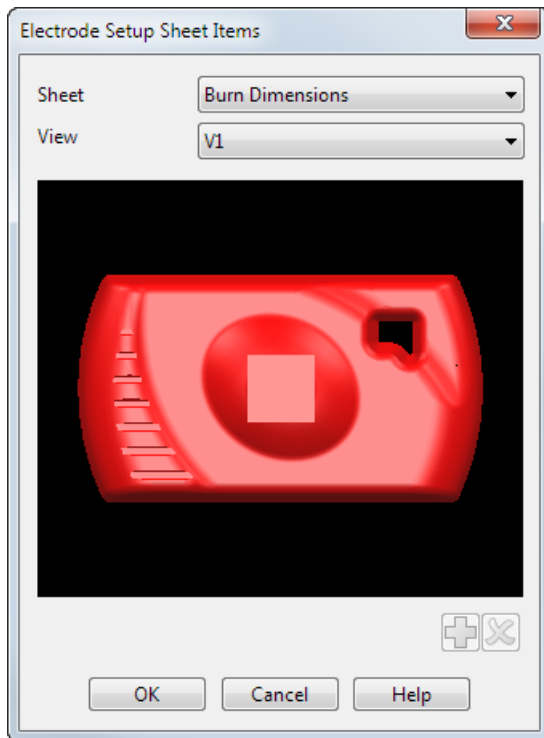
 — Click this button to remove the selected items from the view. You can only remove items that you have manually added.

## Electrode Setup Sheet Items - example

To add items to a drawing view:

- 1 Select an electrode.
- 2 Right-click the electrode.  
The **Electrode** context menu is displayed.
- 3 Select **Modify**.  
The **Edit Electrode** dialog is displayed.
- 4 Select **View Items**.


The **Electrode Setup Sheet Items** dialog is displayed.





You can use the following options on the dialog:

**Sheet** — Select the setup sheet you want to modify from the list.

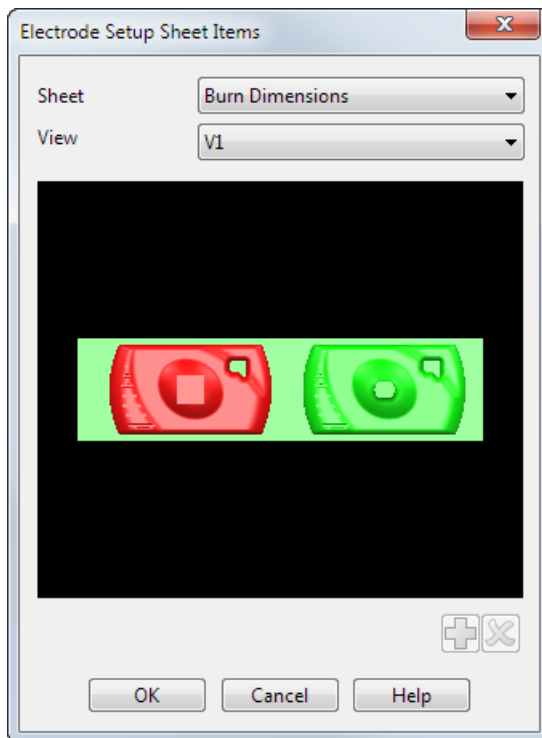
**View** — Select the view you want to add the items to from the list.


 — Click this button to add the selected items to the view. The added items appear in the graphics view and are shaded green.

 — Click this button to remove the selected items from the view. You can only remove items that you have manually added.

- 5 Select the items on the model that you want to add and click the **Add**  button.

The additional items are displayed in the graphics window and are shaded green.



- 6 If you want to remove items from the view, select the items on the model and click the **Remove**  button.

The items disappear from the graphics view.




*Items based on the setup sheet settings are shaded red and cannot be removed from the view.*

- 7 Click **OK** to close the dialog.

The items are added to the setup sheet view.

## Configuring a combined setup sheet

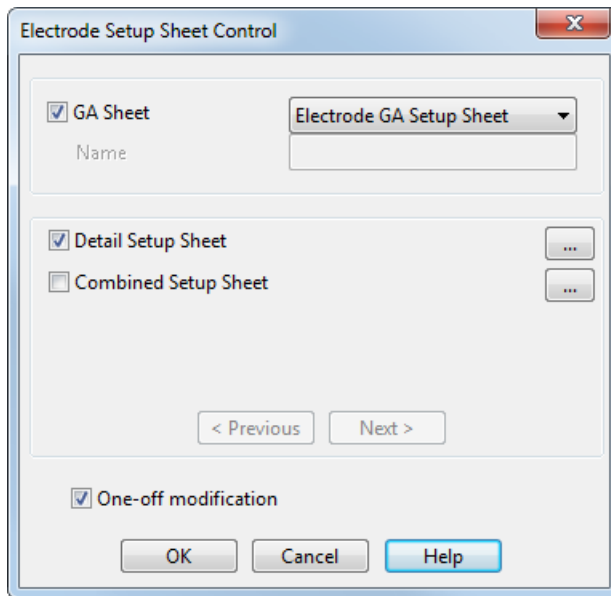
You can create a setup sheet that displays both a Detail and a GA view. You can configure this in the same way as the other setup sheets.

- 1 Click the **Ellipsis**  button on one of the following to display the **Electrode Setup Sheet Control** dialog. (see page 104)

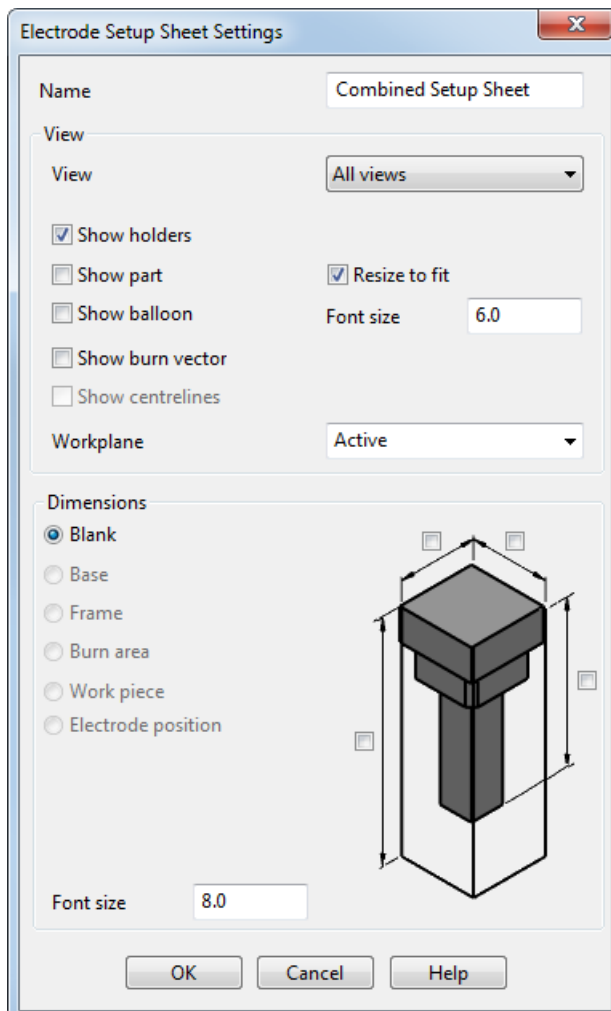
**Copy electrode** dialog

**Edit electrode** dialog

## Electrode wizard



- 2 Select the **Combined Setup Sheet** option. If you want to make changes to the options that are displayed, click the Ellipsis (...) button to display the **Electrode Setup Sheet Settings** dialog (see page 107).







You do not need to re-run the wizard to see the updated sheets.

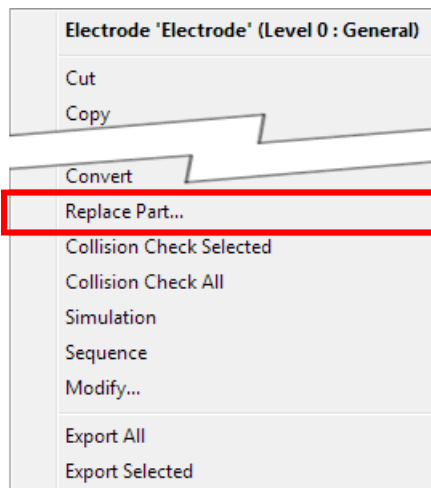
## Updating setup sheets for replaced parts

You can simultaneously update the setup sheets for multiple electrodes when you replace a part, using the **Replace Part** option on the **Electrode** context menu.

To replace a part and update the setup sheets for the selected electrodes:

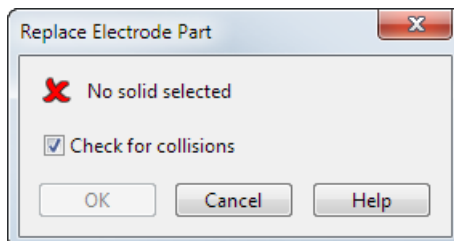
- 1 Align your electrodes to the new part.
- 2 Select the electrodes you want to update.
- 3 Right-click one of the selected electrodes.

The **Electrode** context menu is displayed.



- 4 Select **Replace Part**.

The **Replace Electrode Part** dialog is displayed.

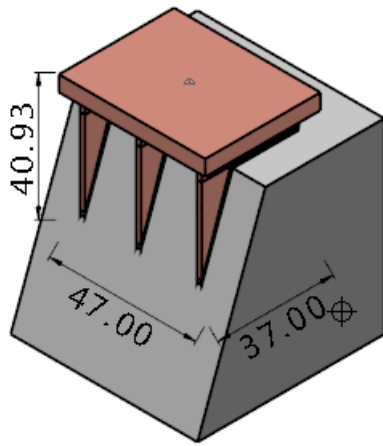


- 5 Select the new part. The **X** changes to a **✓**.
- 6 Click **OK** to replace the part.

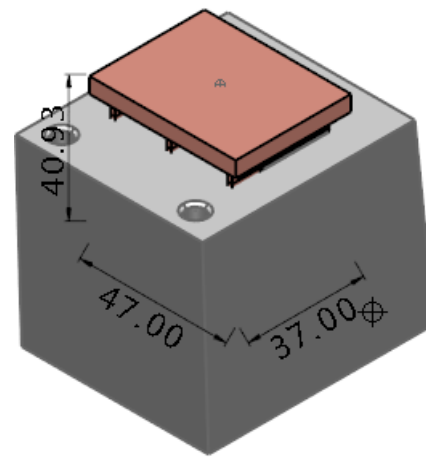
If you leave **Check for collisions** selected the **Electrode Collisions** dialog (see page 84) is displayed. Select **OK** to close the dialog and replace the part.

The example below shows an updated drawing for an electrode with a replaced part:

Old drawing



New drawing



## Electrode setup sheets configuration file

The information below is taken from the configuration file that is stored in `product\powershapeXXXX\file\electrode`.

This file enables you to configure how the electrode detail sheet and additional custom sheets contained in the `electrode_template` file are displayed.

### Options

Option	Description
<code>&lt;drawing name&gt;-name</code>	The name of the sheet
<code>&lt;drawing name&gt;-suppress</code>	Whether to ignore this template
<code>&lt;drawing name&gt;-show_holders</code>	Show the electrode holders
<code>&lt;drawing name&gt;-show_part</code>	Show the part (active solid)
<code>&lt;drawing name&gt;-resize</code>	Resize view (if part added)
<code>&lt;drawing name&gt;-show_balloon</code>	Show a coordinate balloon
<code>&lt;drawing name&gt;-balloon_fontsize</code>	Font size to use in balloon (mm height)
<code>&lt;drawing name&gt;-show_burnvector</code>	Annotate burn vector if appropriate



<drawing name>-show_dimensions	Show dimensioned box around electrode
<drawing name>-dimension_fontsize	Font size to use in dimensions (mm ht)
<drawing name>-workplane	Orientation of created view(s)

### Accepted values for workplane option

Value	Description
active	Relative to active workplane [default] Electrode will appear skewed and/or twisted if there is a burn vector and/or rotation of the base
electrode	Relative to electrode. Rotation and burn vectors have no effect on orientation of the electrode in the view
world	Relative to world
machining	Relative to workplane created for machining orientation. This will be similar to <i>electrode</i> but flipped in Z

### Defaults

If any of these values are not specified, then the defaults used are as follows:

Option	Default value
name	Custom Setup Sheet (or translated equivalent)
suppress	false
show_holders	true
show_part	false
resize	true
show_balloon	false
balloon_fontsize	3.0
show_burnvector	false
show_dimensions	false
dimension_fontsize	3.0
workplane	active

### Overriding the options

If the drawing contains more than one view, you can override each option for each of the views. To do this, add `-view<n>` to the end of the option.

For example,

```
my_drawing-resize-view2  do not resize the second
: false                  view in sheet created from
                           my_drawing
```

If you do not want to lose any changes made next time PowerSHAPE is installed, copy the modified file into your `shreddb` directory.

### **Backwards compatibility**

Remove the following line or change to true if you want to customise the drawings generated from `electrode_detail_setup_sheet` template:

```
customise_detail_sheet: false
```

### **Example Custom Sheet: Combined GA/Detail sheet**

To generate a combined setup sheet for each electrode, remove the following option below. Alternatively, you can add `//` at the beginning of the line to comment out the option so that it is ignored.

```
electrode_combined_setup_sheet-suppress: true
```

## **Configuring balloons**

You can configure the balloons on electrode setup sheets using the `electrode_balloons.con` file that is stored in `product\powershapeXXXX\file\electrode`.

`show_name` — Set to `true` to display the name of the electrode in the balloon. If set to `false`, the electrode name is not shown in the balloon.

`show_abc` — Set to `yes` to show A, B, C angles in the balloon. If set to `no`, the angles are not shown. If set to `auto`, the values are shown only for vector-burn electrodes.

`abc_before_xyz` — Set to `true` to display values in top-down order: A,B,C,X,Y,Z. Set to `false` to display values in top-down order: X,Y,Z,A,B,C.

`show_rotation` — Set to `true` to display the rotation value. If set to `false` the rotation value is not displayed.

`rotation_as_c` — Set to `true` to display the rotation as a C-angle with label 'C:'. (The positioning of C angle respects value of `abc_before_xyz`.) Set to `false` to display the rotation with the label 'Rotation:' (This is always displayed before X,Y,Z values.)

`extra_balloon_text: <extra text>` — `<extra text>` may include substitution strings and embedded newlines as `\n\`. For example:

```
extra_balloon_text: Burn Area: %[burn_area] \n\  
Taper Angle: %[taper_angle]
```

---

## Using a materials alias file

You can use the electrode material alias file to associate custom material names with one of the internal materials of Delcam Electrode.

This means that you can use your own product codes for EDM materials and have them displayed in the setup sheets and summary spreadsheets. The electrode will be shaded correctly, the undersizes calculated automatically, and the EDM materials will be exported correctly.

### Adding a material to the Delcam Electrode alias file

- 1 Using a standard text editor (for example Microsoft Notepad), open the file called `electrode_materials_alias.con`

The version of the file that is supplied with PowerSHAPE is in `C:\dcam\product\powershapeXXXX\file\electrode`

where `XXXX` is the version of PowerSHAPE and `C` is the drive where PowerSHAPE is installed.

- 2 For each custom material name add a line using the following syntax:

**custom name: internal name**

For example GRA-1: Graphite-1

The internal name must be one of the following

Graphite-1  
Graphite-2  
Graphite-3  
Copper

If you define a custom name, it is displayed in the **Material** list on the **Specify Electrode Blank** page (see page 45) of the Electrode Wizard, but the default internal names are not displayed. If you want a mixture of custom names and default names, you should define a custom name to match each of the default names.

For example, an alias file containing

```
Fred: Graphite-1  
Graphite-2: Graphite-2  
Graphite-3: Graphite-3  
Copper: Copper
```

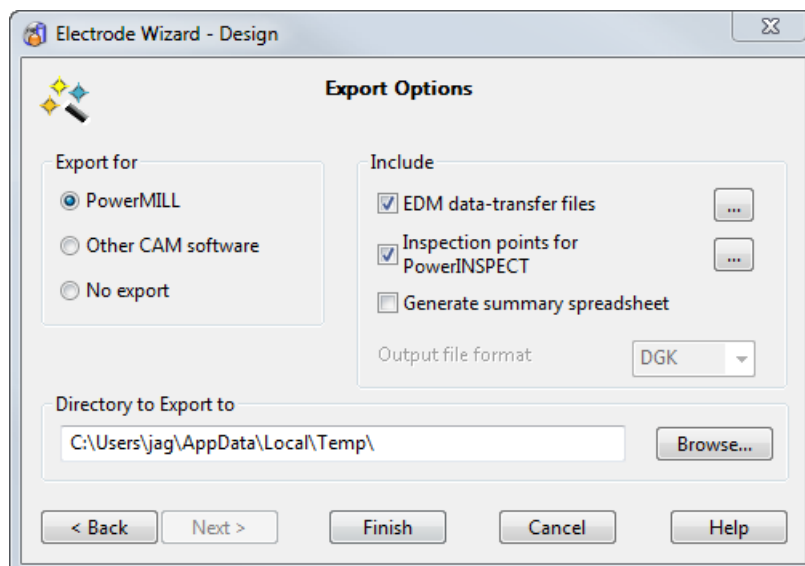
displays the following in the Material list:

**Fred**  
**Graphite-2**  
**Graphite-3**  
**Copper**

- 3 If this file is modified from the default, it should be copied into the [shareddb](#) area, otherwise when PowerSHAPE is updated the changes and additions will be lost.

---

## Generating a summary spreadsheet



**Generate Summary Spreadsheet** — This exports a spreadsheet file containing the details of all the electrodes in the model. An example of the spreadsheet is included.

When creating the last electrode or electrode copy,

- 1 Select **Generate Summary Spreadsheet** from the **Export Options** page.
- 2 Enter the path of the **Directory to Export to** or use **Browse** to locate the folder.
- 3 When you click **Finish** two files are created in this directory:  
[electrode\\_summary.csv](#)  
[electrode\\_summary.html](#)

## CSV file

- 1 Find the file named [electrode\\_summary.csv](#) in the directory you specified as the **Directory to Export to**.
- 2 Double-click the filename to open the spreadsheet. It shows all the details for all the electrodes and electrode copies.  
The layout of the spreadsheet is controlled by the file named [summary\\_template\\_csv.xml](#).

## Configuring the .csv file

- 1 You can configure the layout of the spreadsheet. The template is called  
[summary\\_template\\_csv.xml](#)  
You can find it in  
[C:\dcam\product\powershapeXXXX\file\electrode](#)  
where [XXXX](#) is the version number of PowerSHAPE and [C](#) is the drive where PowerSHAPE is installed.
- 2 Use a standard text editor (for example Notepad) to make the changes to the file. Detailed instructions on editing the template are included as part of the file.
- 3 Save the updated file to your [\dcam\shareddb](#) folder.  
PowerSHAPE uses this file to format the spreadsheet.

## Evaluation of mathematical expressions in substitution strings

You can evaluate mathematical expressions to provide configurable substitution strings anywhere that normal substitution strings can be applied. The expression should take the form:

```
%eval{<expression>}
```

You can use the following in your expression:

**Operators:**     +    -    \*    /    ( )

**Comparison:**    ==    !=    <=    >=    <>

**Constants:**     pi

**Functions:**

**sin()** **cos()** **tan()**

**abs()**            abs(a) returns the absolute value of a

**max(;)**max(a;b) returns the highest value of a or b

**min(;)**            min(a;b) returns the lowest value of a or b

**if(;;)**            if(a;b;c) returns b if a is non-zero/true and c otherwise

### Examples

```
%eval{1+2}            is replaced by 3
```

```
%eval{max(1.2;2.2)}    is replaced by 2.2
```

```
%eval{min(1.2;2.2)}    is replaced by 1.2
```

```
%eval{abs(-5.6)}      is replaced by 5.6
```

```
%eval{if(5>4;10;20)}    is replaced by 10
```

## Editing the .csv template file

The details below are also available in the template file (English only).

- The format of the .csv file is XML.
- The CSV output for Excel or other spreadsheet applications should occur between the <csv> and </csv> tags. These should occur only once.
- Any output enclosed between <electrode> and </electrode> tags is repeated for each electrode in the model.
- The electrode start tag may also specify a type, where type is one of "originals", "copies", or "all" (the default).

The type is specified by adding `type="..."` after `<electrode` and before the `>` in the opening tag. For example,

```
<electrode type="originals">
```

If the type is "originals" then the output between this and the `</electrode>` tag is repeated only for each original electrode (one that is not a copy) in the model.

If the type is "copies" then the output between this and the `</electrode>` tag is repeated only for the electrodes that are copies.



*Electrode tags may not contain other electrode tags, but may include "copies" tags (see below).*

- Within the electrode tags there may also be `<copies>` `</copies>` tags. This is different from `<electrode type="copies"> </electrode>` because it repeats only for the copies of the current electrode being processed by the parent electrode tags. That is, the electrode tags repeat for each electrode and if there is an enclosed `copies` tag, then output for each of the copies of this electrode is also output. If there are no copies of a given electrode then the output between the `copies` tags is ignored. This feature is most useful within `<electrode type="original"> </electrode>` tags, because it prevents the copies being repeated.
- You can use substitution strings (see page 102) within any of the output sections. These are expanded when Electrode processes this file. They start with `%[` and end with `]`.

For safety, the special strings have been enclosed in double quotes; if the expansions contain commas they do not break the layout of the `.csv` file.

- If this file is modified from the default it should be copied into the `shareddb` area. Otherwise when PowerSHAPE is updated the changes are lost.

## HTML file

This HTML file contains Excel data that is invisible when the HTML file is displayed normally, but that can be read and understood by Microsoft Excel. Using this template enables you to enhance the appearance of the spreadsheet and means that the file can be viewed using any web browser.

## Using the HTML file

- 1 Find the file called `electrode_summary.html` in the directory you specified as the **Directory to Export to**.

You can view this file in one of the following ways:

- Open `electrode_summary.html` with Excel. You can then edit, save, or print the formatted spreadsheet like any other Excel spreadsheet.
- Double-click `electrode_summary.html` to open the file in your web browser. Because it is an HTML document, you can view it in a web browser without any need to have Microsoft Excel installed. This shows the data in an HTML table.



*You may get a warning when you open the spreadsheet that some content is in an unexpected location - this is caused by the images for the spreadsheet. Ignore the warning, and click **Yes** to include the images.*

## Configuring the HTML file

You can control the layout of the spreadsheet using the template `summary_template_html.xml`.

You can configure this template in the same way as the `.csv` template file, using the same substitution strings. However, a large amount of extra information is held in the HTML, so it is more complex to configure.

One common customised file is provided. This is a version of the standard template with the Delcam images removed.

The template is called:

`summary_template_html_no_image.xml`

You can find it in:

`C:\dcam\product\powershapeXXXX\file\electrode`

where XXXX is the version number of PowerSHAPE and C is the drive where PowerSHAPE is installed.

## Using the alternative template

Rename the existing file `summary_template_html.xml` to `summary_template_html.xml.safe`.

Rename `summary_template_html_no_image.xml` as `summary_template_html.xml`.



## Adding more Additional detail fields

There is no limit to the number of these fields that you can define and use in the setup sheets or summary spreadsheets.

- 1 Using a standard text editor (for example Notepad), open the file named `electrode_additional_details.con`.

The version of the file that is supplied with PowerSHAPE is in:

```
C:\dcam\product\powershapeXXXX\file\electrode
```

where `XXXX` is the version of PowerSHAPE and `C` is the drive where PowerSHAPE is installed.

- 2 For each new field, add a line in the following syntax

```
detail<n>: <detail name>
```

For example, `detail4: ID No.`

You must add new fields sequentially; `detail5` is ignored unless you have defined `detail4`.

- 3 For each new field, the corresponding `remember` value may also be set using the following syntax

```
remember<n>: <yes>/<no>
```

For example, `remember4:yes`

The default is `no`, so if a `remember` value is not set for a new field the `detail` is not remembered between electrodes. Unlike the `detail` fields, the `remember` values need not be sequential. So, `remember4` does not have to exist in order to define `remember5` but `detail5` must exist.

- 4 If this file is modified from the default, it should be copied into the **shareddb** area, otherwise when PowerSHAPE is updated the changes and additions are lost.



*If you define more than five fields, the **Next** button on the form becomes active. Click **Next** to show the next five fields. If you then wish to view the first five fields, click the **Previous** button.*

## Holder definitions

Holder definitions use an XML format to describe holder definitions in a logical way.

The holder definition files are in:

```
.....\powershape152XX\file\electrode
```

The following xml files are included in PowerSHAPE 2015 R2:

[PSEH\\_Erowa.xml](#)

[PSEH\\_Hirschmann.xml](#)

[PSEH\\_System\\_3R.xml](#)

You can define your own electrode holders; these must be in the format that is described in

[.....\powershape152XX\file\electrode\holder\\_xml\\_syntax.html](#)