
Autodesk® PowerMill®

Reference Help

Electrode Machining Wizard



Contents

Electrode Machining Wizard	1
Installing the Electrode Machining Wizard	4
Installing Electrode Machining Wizard examples	5
Using the Electrode Machining Wizard	6
Step 1 — Block Setup	9
Step 2 — Analysis	10
Using PowerMill interactively with the Electrode Machining Wizard	11
Step 3 — Machining Strategies	12
Tooling	13
Step 4 — Final Tasks	14
PowerMill Project Server	15
PowerMill Project Server Options dialog	18
Configuring the Electrode Machining Wizard	19
Creating machine tools for the Electrode Machining Wizard	20
Creating machining strategies for the Electrode Machining Wizard	20
Changing the Electrode Machining Wizard options	22
Autodesk Legal Notice	24
Index	41

Electrode Machining Wizard

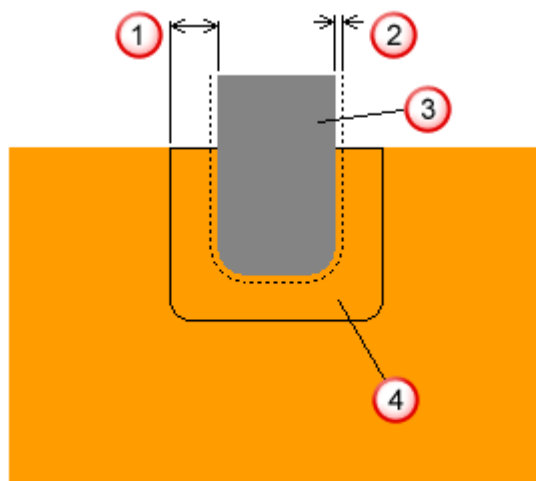
The Electrode Machining Wizard is a PowerMill plugin.

You can use the wizard to extract the information from a `.trode` file and select the tooling and toolpaths to machine the electrode. You can then reuse the settings to automate future electrode machining projects.

The Electrode Machining Wizard automatically detects the electrodes to machine and applies the correct undersizes to the toolpaths.

Electrodes are machined undersize to make allowance for an appropriate spark gap and orbit on the Electric discharge machine (EDM).

In the EDM industry, the terms *spark gap* and *overburn* are often used interchangeably with undersize.



- ① Undersize
- ② Spark gap
- ③ Electrode

④ The material to be removed

To calculate thicknesses, the undersize is subtracted from the machining allowance.

So, $\text{Thickness} = \text{Machining Allowance} - \text{Undersize}$.

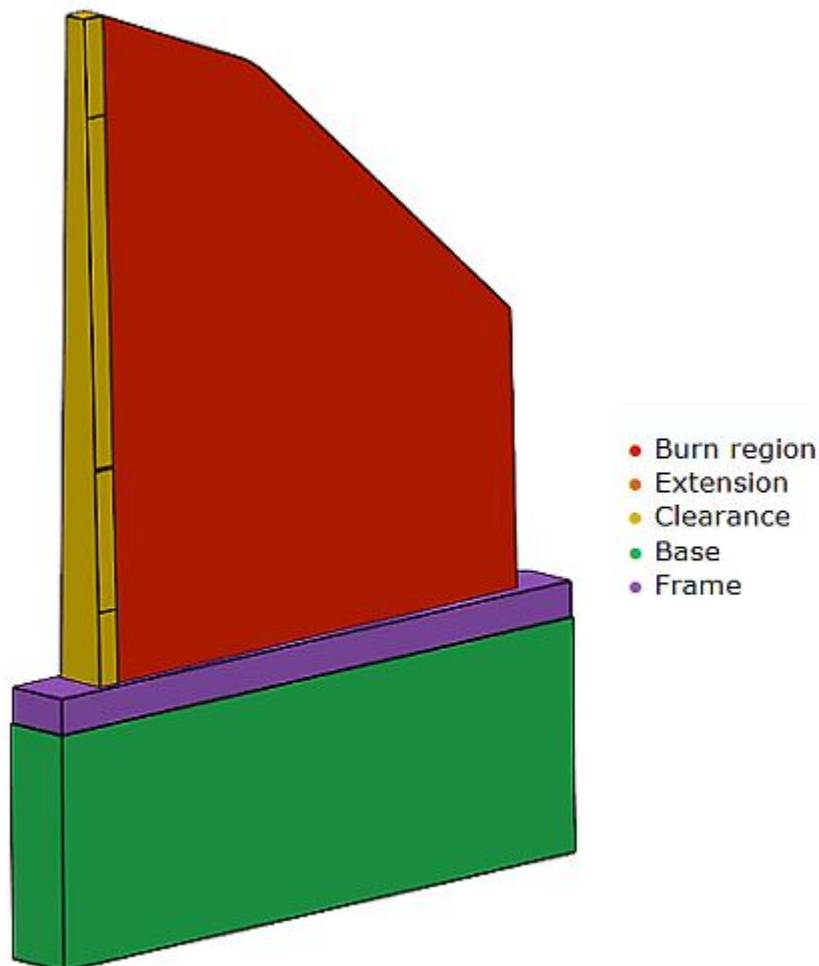
When creating toolpath templates, only include machining allowances in your calculations as the appropriate undersize is applied by the Electrode Machining Wizard and is different for each electrode.

A `.trode` file exported from PowerShape's Electrode Design Wizard contains the following information:

- The geometry for the electrode.
- The material type and block size.
- The spark gaps/undersizes.

The Electrode Machining Wizard analyses this information and displays the geometry in various colours.

Regions are represented as:



See also

Installing the Electrode Machining Wizard (see page 4)

Installing the Electrode Machining Wizard examples (see page 5)

Using the Electrode Machining Wizard (see page 6)

Configuring the Electrode Machining Wizard (see page 19)

Electrode Machining Wizard options (see page 22)

Installing the Electrode Machining Wizard

The default installation folder is:

C:\Program Files\Autodesk\ElectrodeMachiningWizardxxxxx

Within the installation folder, the **Data** folder contains:

- **Tools** — This folder contains the default machine tools available with the wizard.
- **Strategies** — The folder contains the default strategies available with the wizard.

Use the options available under **PowerMill > File tab > Options > Manage Installed Plugins > Electrode Wizard > Options** (see page 22) to change the default data folder.



*If you install Electrode Machining Wizard Examples, the default **Data** folder path changes to the folder available in the Electrode Machining Wizard Examples install folder.*

Installing Electrode Machining Wizard examples

The default folder where Electrode Machining Wizard examples are installed is:

C:\Program Files\Autodesk\ElectrodeMachiningExamplesxxxxx

xxxxx denotes the Electrode Machining Wizard examples version number.

The folders within the Electrode Machining Wizard examples installation folder are:

- **Data** — This folder contains the example **Tools** and **Strategies** under their respective folders.

See Using the Electrode Machining Wizard (see page 6), Tooling (see page 13), and Step 3 — Machining Strategies (see page 12) for examples of how they are used.

- **Models** — This folder contains sample `.trode` and `.psmodel` files of the electrodes.
- **Videos** — This folder contains videos, which demonstrate how to use the Electrode Machining Wizard.

Using the Electrode Machining Wizard

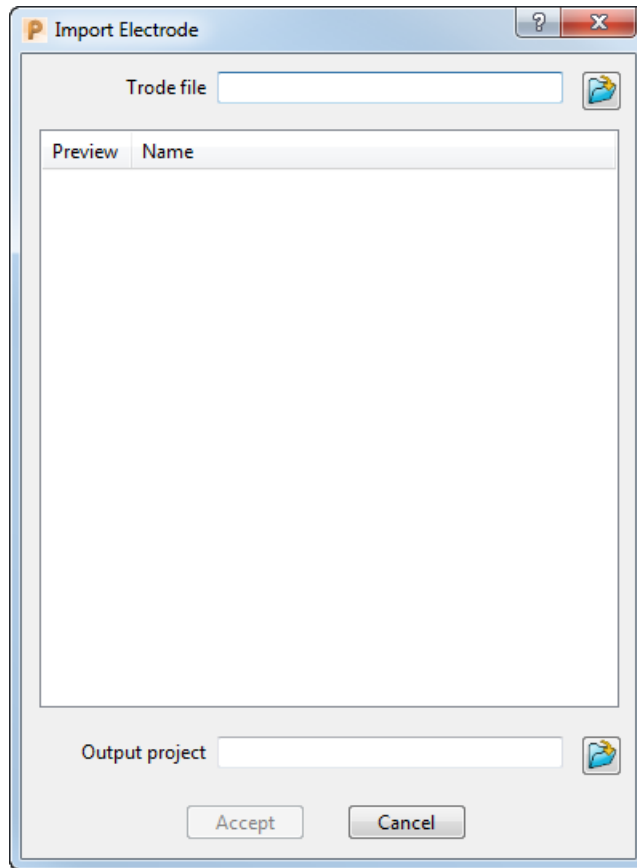
The Electrode Machining Wizard guides you through the process of creating electrodes. It includes several steps that:


- Set up the block (see page 9).
- Analyse and modify (see page 10) the **Minimum radius** and **Draft angle**.
- Select from the previously created machining strategies (see page 12).
- Select the machine tool (see page 13), if necessary.
- Perform final tasks (see page 14).
- Organise and process projects (see page 15) queued to the PowerMill Project Server.

The following steps use the **ForgingConnector** example from Electrode Machining Wizard examples (see page 5), and assumes you have installed the file in the default installation location.

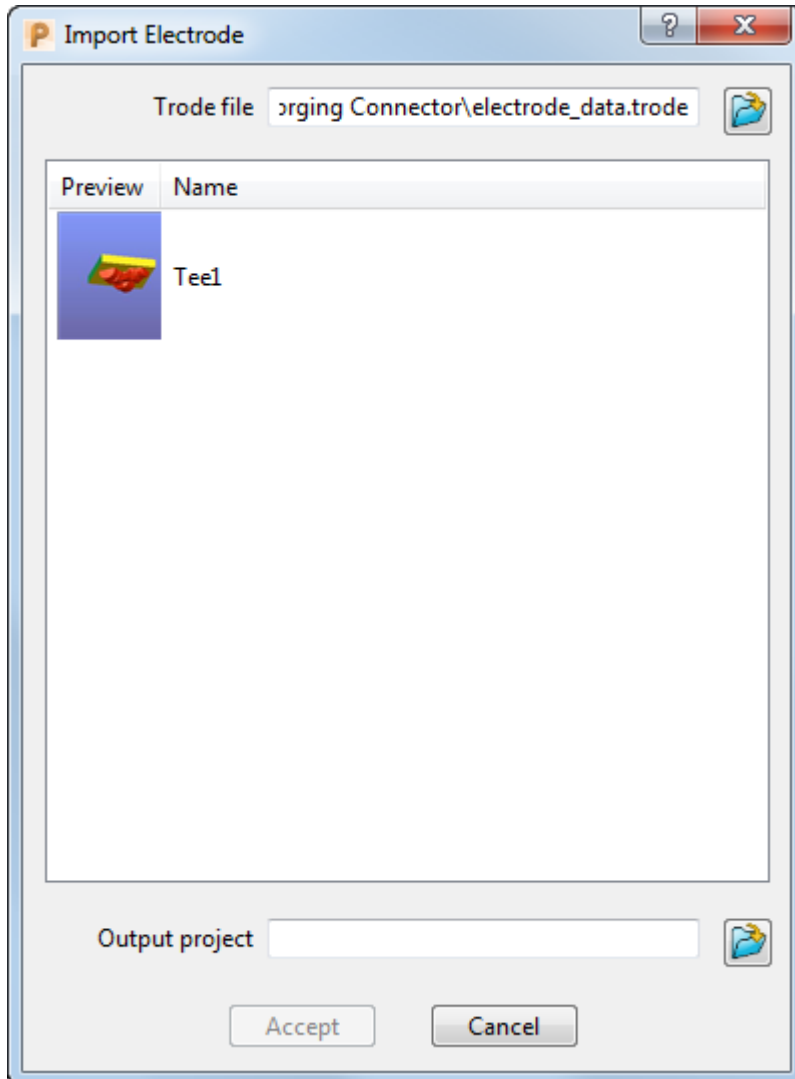
To start the Electrode Machining Wizard, in PowerMill:


- 1 Click File tab > Import > Import Electrode. This displays the **Import Electrode** dialog.



- 2 In the **Trode File** area, click  to display the **Select Trode Archive** dialog.
- 3 Browse to `C:\Program Files\Autodesk\ElectrodeMachiningExamples13100\Models\Forging Connector` and select the `electrode_data.trode` file and click **Open**.

The available electrodes are listed in the **Import Electrode** dialog. In this case, **Tee1**.



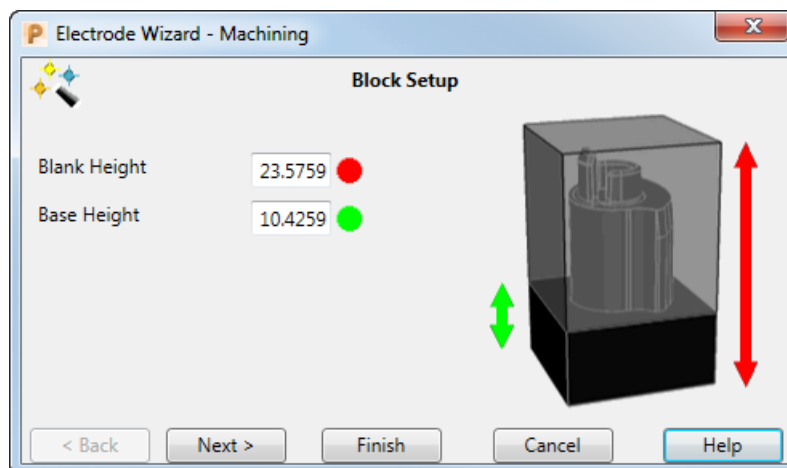
- 4 Select the electrode **Tee 1**.
- 5 In the **Output project** area, click  and enter a new project name and select the folder where you want to store the project.
- 6 Click **Accept**.

This imports the selected electrode into PowerMill with the HTML tab displaying the electrode details.

This starts the Electrode Machining Wizard and takes you to the Block Setup (see page 9) step of the wizard.

Step 1 — Block Setup

Use the **Block Setup** page to define the size of the block that the electrode is to be machined from.



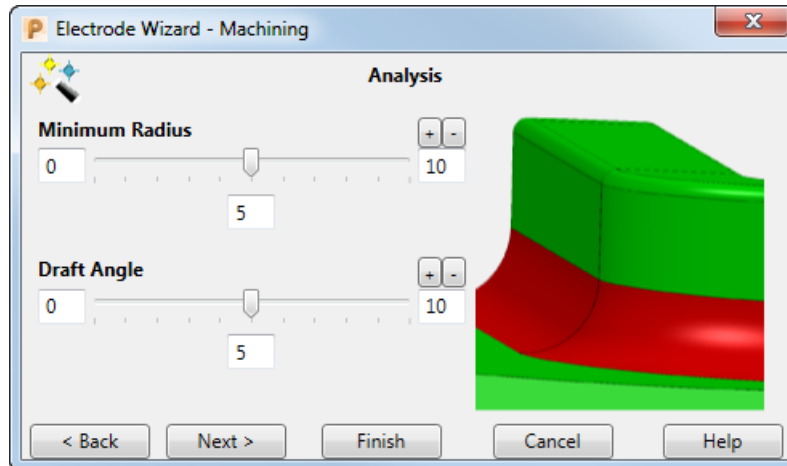
Blank height — The height of the electrode machining material.

Base height — The height of the part base.

When you have made the necessary changes, click **Next** to go to the **Analysis** (see page 10) page of the wizard. Click **Finish** if you want to end the wizard after generating the electrode machining material.

Step 2 — Analysis

Use the **Analysis** page to analyse and modify the **Minimum radius** and **Draft angle**. The colours used to display the model represent the radius and available draft angles.



Use the sliders to increase or decrease the values. To make finer adjustments, click **+** to increase or click **-** to decrease the slider factor.

After the initial analysis, click **Next** to go to the **Machining Strategies** (see page 12) page. Click **Finish** if you want to end the wizard after analysing the **Minimum Radius** and **Draft Angle**.

See also

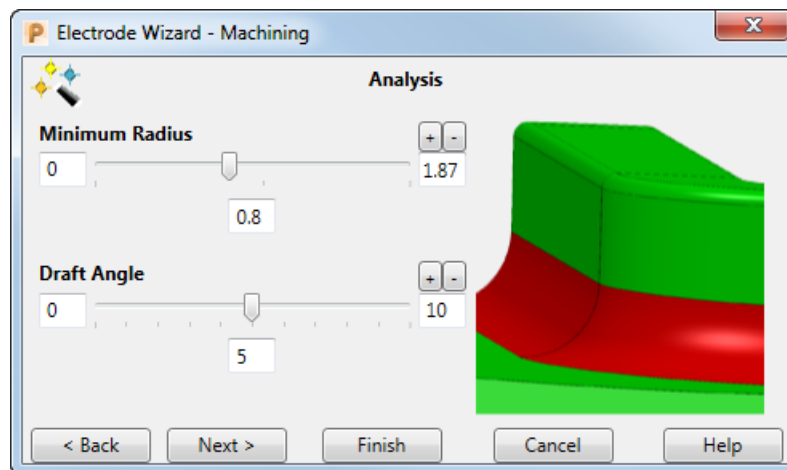
Using PowerMill interactively with the Electrode Machining Wizard (see page 11)




Using PowerMill interactively with the Electrode Machining Wizard


You can use PowerMill at the same time as you are using the wizard.

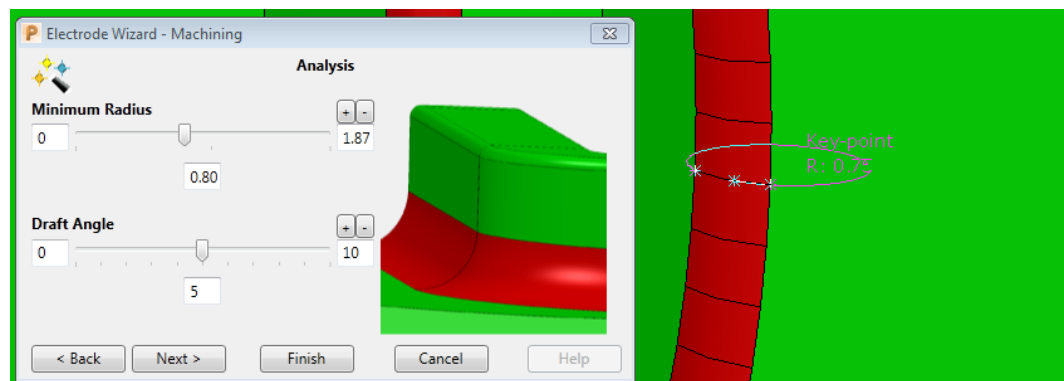
For example, to find and measure an area on the model with a minimum radius of less than **0.80** mm:

- 1 Move the **Minimum Radius** slider to display **0.80**. This displays areas on the model which have a minimum radius equal to or below **0.80** mm.



 Use  to increase or  to decrease the slider measurement granularity.

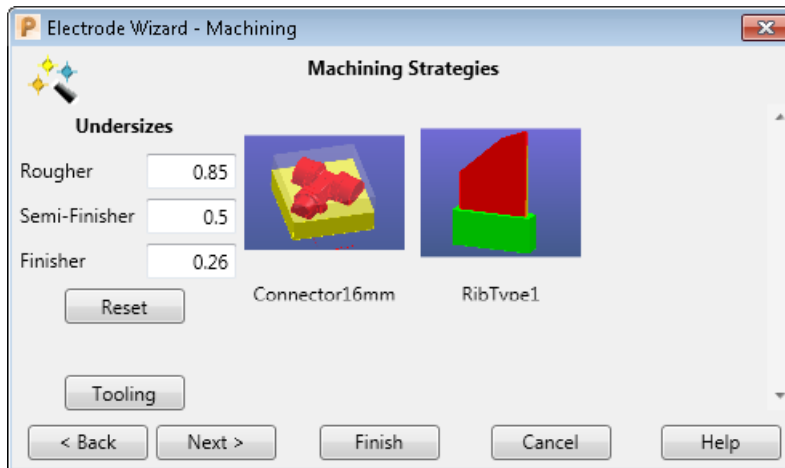
- 2 In PowerMill click Home tab > Utilities panel > Measurer to display the **Measure** dialog.
- 3 On the **Measure** dialog, click  to measure a **Radius from Three Points**. In the below example, this shows that the exact radius in this region is **0.75** mm.



Step 3 — Machining Strategies

Use the **Machining Strategies** page to select the strategy used to machine the electrode. You can also modify the undersizes loaded from the `.trode` file.

In this example, **Connector 16mm** and **RibType1** are previously created **Machining Strategies**. When a previously created strategy is selected, it imports the associated tools and toolpaths into the current PowerMill session.



Use **Rougher**, **Semi-finisher**, and **Finisher** fields to make changes to **Undersizes**.

Click **Reset** to revert all values to their default.

Click **Tooling** to display the **Tooling** (see page 13) step. The step enables you to load additional tools to the electrode project so a tooling gap within the machining strategy can be filled. (A tooling gap may occur if you are using a machining strategy to machine an electrode that the strategy was not designed for.)

Click **Next** to move to the **Final Tasks** (see page 14) page of the wizard. Click **Finish** if you want to end the wizard at loading the machining strategies step.

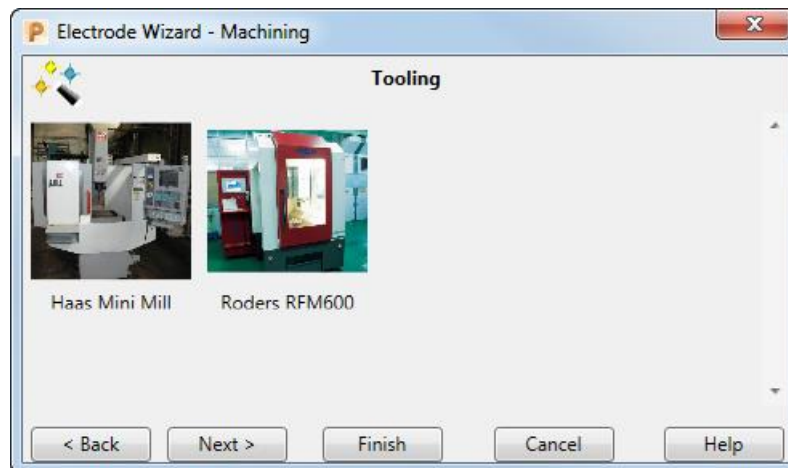
See also

Configuring the Electrode Machining Wizard (see page 19)


Tooling

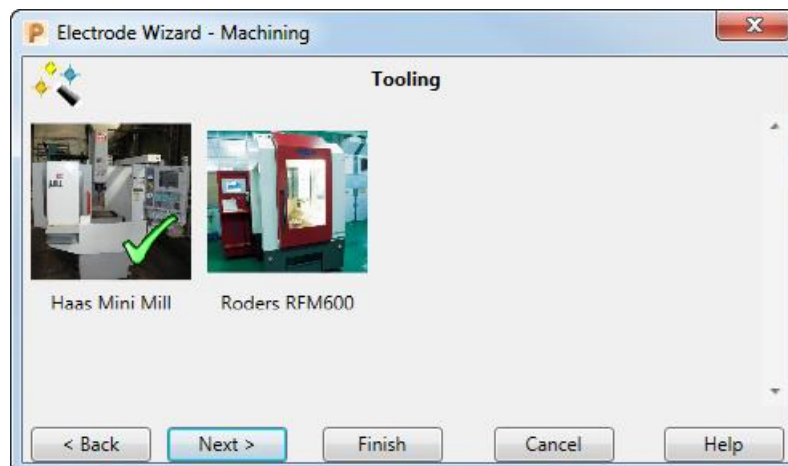
Use the **Tooling** page to load additional tools to the electrode project so a tooling gap within the machining strategy can be filled. (A tooling gap may occur if you are using a machining strategy to machine an electrode that the strategy was not designed for.)

To display the **Tooling** page, click the **Tooling** button on the **Machining Strategies** page.



The displayed machine tools are dependent on your machine tool installations.

Select the machine tool you want. The machine tool is displayed with a .



Selecting a machine tool loads the associated tools into the PowerMill session.



*If you want to just import the tools saved with the toolpath templates, click **Next** without selecting a machine tool.*

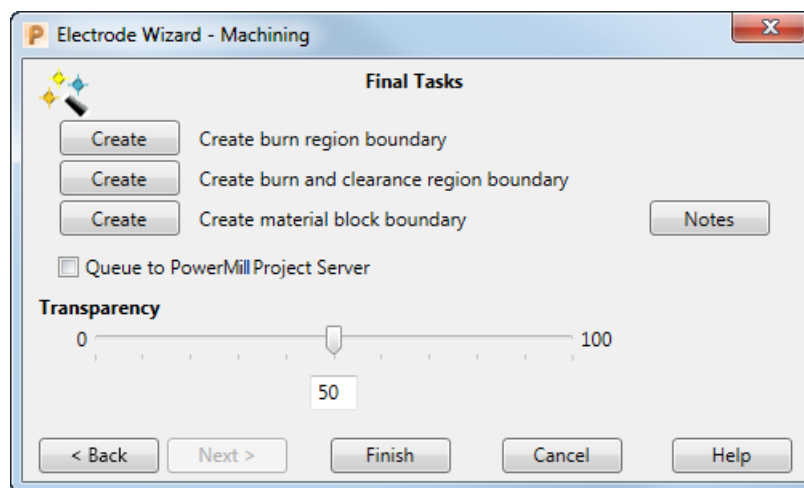
After selecting the machine tool, click **Next** to open the **Machining Strategies** (see page 12) page of the wizard. Click **Finish** if you want to end the wizard after importing the tools into the current PowerMill session.

See also

Configuring the Electrode Machining Wizard (see page 19)

Step 4 — Final Tasks

Use the **Final Tasks** page to create boundaries for the electrode regions, to make or read notes about the machining strategy, and to specify when the project is to be processed.



Create burn region boundary — Click to create a boundary around the burn region (displayed in red).

Create burn and clearance region boundary — Click to create a boundary around the burn and clearance regions (displayed in red and green respectively).

Create material block boundary — Click to create a boundary around the block region (displayed in green).

Transparency — Move the slider to adjust the transparency of the electrode.

Notes — Click to open WordPad. The function provides an easy method to record information about the strategy setup for future use. The file is saved in the relevant machining strategy folder and can be viewed and updated by clicking **Notes**.

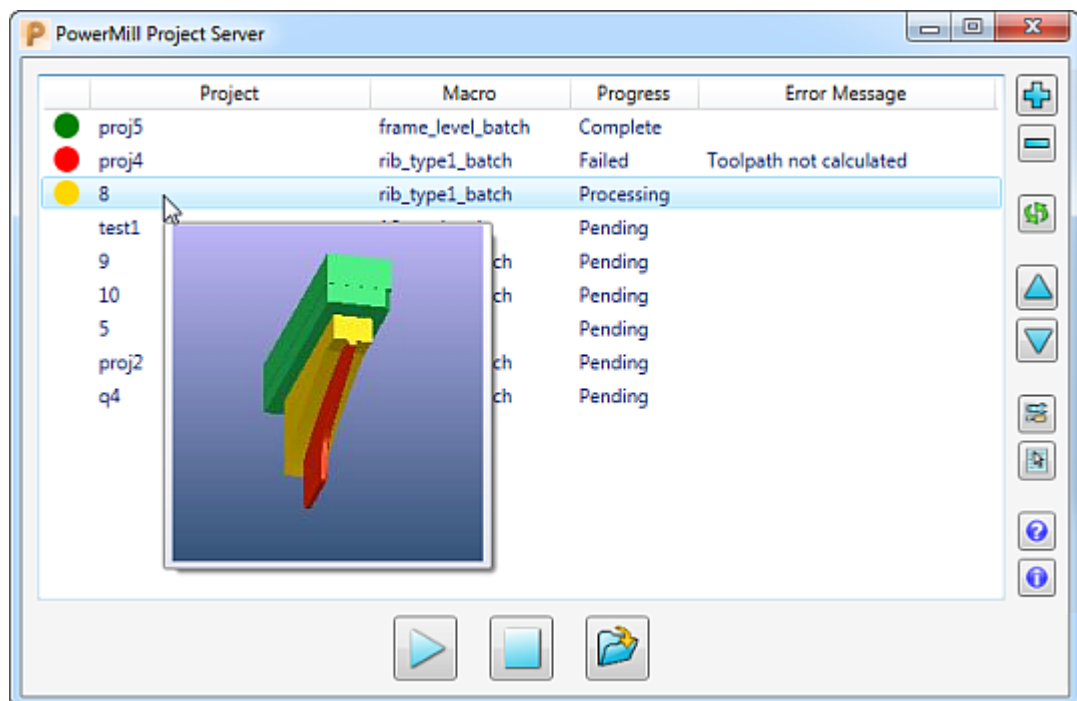
Queue to PowerMill Project Server — Select and then click **Finish** to add the project to the PowerMill Project Server. This enables you to calculate the project, and any other queued projects, using a second session of PowerMill so you can continue to work in PowerMill uninterrupted. Using the server also enables you to process the projects at a more convenient time, such as during the evening, when CPU performance is not such a concern.

Finish — Click to calculate the project. To calculate the project at a later time, select the **Queue to PowerMill Project Server** option.

PowerMill Project Server

Use the PowerMill Project Server to organise and process queued projects.

To display the server, select the **Queue to PowerMill Project Server** option on the **Final Tasks** (see page 14) page of the wizard and click **Finish**, or double-click the server's desktop icon.












The server has these main features:

- As well as adding projects to the server using the wizard, you can also add projects directly to the server from your PC or network.
- Projects are listed in the order they are queued to the server but you can reorder the projects.
- The server enables you to assign or change a project's macro (machining strategy).

- To process the projects, the server uses its own PowerMill session so you can continue to work in your current PowerMill session without interruption.
- The project server shows the status of a project:
 - — Project currently being processed.
 - — Project successfully processed.
 - — Project unsuccessfully processed.
- If a project fails to be processed, the cause of the failure is displayed in the **Error** column and the server continues to process the next project. If you want to correct the error immediately, you can stop the server and open the project in PowerMill. You can then refresh the project and reprocess it.
- When you stop the processing of projects, the server maintains its position so, when restarted, processing continues from where it was stopped. The queue and the server position are also maintained across sessions.
- For a project to be processed successfully, the toolpaths must be free of collisions and gouges, and the project must be processed fully. If necessary, you can load a custom validation macro with different and/or extra criteria to check the projects against. For more information about validation macros, see Options (see page 18).

The server features the following options:

-  **Add** — Click to add a project or a folder of projects to the queue. The server ignores any duplicates.
-  **Remove** — Click to remove selected projects from the queue.
-  **Refresh** — Click to update the project after making changes to it in PowerMill.
-  **Move up** — Click to move the selected project up in the queue.
-  **Move down** — Click to move the selected project down in the queue.
-  **Options** — Click to display the **PowerMill Project Server Options** (see page 18) dialog.
-  **Set macro** — Click to display the macro file that is assigned to the selected project. This enables you to change or specify the macro (machining strategy) for a project.
-  **Display help** — Click to display help.
-  **About** — Click to display version information.



Start — Click to start calculating projects.




Stop — Click to stop calculating projects. The server maintains its position and restarts in the same place. The queue and the server position are maintained across sessions.

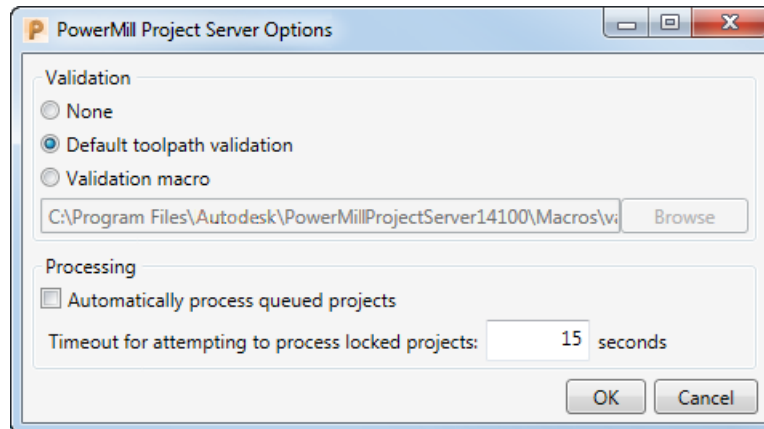


Open — Click to open the selected project in PowerMill. This is useful if you need to fix an error that caused the processing of project to fail.

PowerMill Project Server Options dialog

Use the **PowerMill Project Server Options** dialog to customise the server.

To display the dialog, click **Options**  on the **PowerMill Project Server** dialog.



The validation options enable you to set the criteria used to assess whether a project is considered safe to be machined and, therefore, if the project is processed successfully or not.

- **None** — Select this option if you do not want to check projects.
- **Default toolpath validation** — Select this option to use the server's default validation criteria, which checks that toolpaths are free from collisions and gouges and the project has been processed fully.
- **Validation macro** — Select this option to use your own validation macro.
- **Automatically process queued projects** — Select this option to automatically process projects that are queued to the server.
- **Timeout for attempting to process locked projects** — Specify how long the server waits before trying to process the project again. This enables you to close the project in PowerMill because if the project is open then it cannot be processed.

Configuring the Electrode Machining Wizard

The tools and strategies available on the **Tooling** and **Machining Strategies** steps of the Electrode Machining Wizard are available in their respective folders under the **Data** folder as specified in **File tab > Options > Manage Installed Plugins > Electrode Wizard > Options** (see page 22).

To create machine tools, see [Creating machine tools for the Electrode Machining Wizard](#) (see page 20).

To create machining strategies, see [Creating machining strategies for the Electrode Machining Wizard](#) (see page 20).

Creating machine tools for the Electrode Machining Wizard

To define the tools available at the **Tooling** (see page 13) stage of the wizard:

- 1 In an empty PowerMill project, create the tools available in your machine tool carousel.
- 2 Click File tab > Save As > Template objects to create a PowerMill template (.ptf) file and name it appropriately.
- 3 Create an image of your machine tool in a .png format file and name it appropriately.



You can also use a .jpg format image file as the machine tool image.

- 4 Create a folder in the name of your machine tool under the **Tools** folder defined in the Electrode Machining Wizard Options (see page 22) dialog.
- 5 Copy both the .ptf and .png files to the machine tool folder.

You can view these machine tools in the **Tooling** (see page 13) step of the wizard.

Creating machining strategies for the Electrode Machining Wizard

The main points to remember while creating machining strategies for Electrode Machining Wizard are:

- Remove any undersizes. Toolpaths must only have the machining allowances applied to them.
- You must save any surfaces, which must be selected before the toolpath is calculated, on the toolpath component thickness set 7.
- Toolpaths cannot be calculated if the spark gaps of the electrode plus the machining tolerance is greater than the tool radius. However, for toolpaths using end mills and slot drills, toolpaths are calculated but require visual verification.
- If you need a boundary for your toolpath, create an empty boundary and save the required parameters to a macro. Then, run the `xxx_batch.mac` to automatically apply these parameters.



*You can give the macro any name you want, but the file name has to end with `_batch.mac`. For example, if you want to name your macro *Fred*, then the complete file name must be *Fred_batch.mac*.*

- 1 Create a PowerMill toolpath for the electrode you want to machine.
- 2 Right-click the toolpath and select **Save as template**.
- 3 In the **Template Parameter Saving** dialog, enter the toolpath name and select the folder where you want to save the template.



You can control the order in which the toolpath templates are imported by adding a numeric value at the beginning of the template name. For example, `01_firsttoolpath.ptf`, `02_secondtoolpath.ptf`.

- 1 Click **Save**. This saves a PowerMill template file (`.ptf`) with the toolpath details.
- 2 Create an image of your electrode in a `.png` format file and name it appropriately. Save the image in the same folder as the PowerMill template.



You can also use a `.jpg` format file.

- 3 Copy the `xxx_batch.mac` file from the install directory and copy it into the same folder as the template.

The macro checks the model for surfaces to be selected. These are surfaces which are defined at the component thickness set 7.

When you prepare the electrode to be machined, using the **Component Thickness** dialog, place the surfaces you need to select in component thickness set 7. If there are no surfaces to select, then the levels are ignored and the macro machines the whole model.



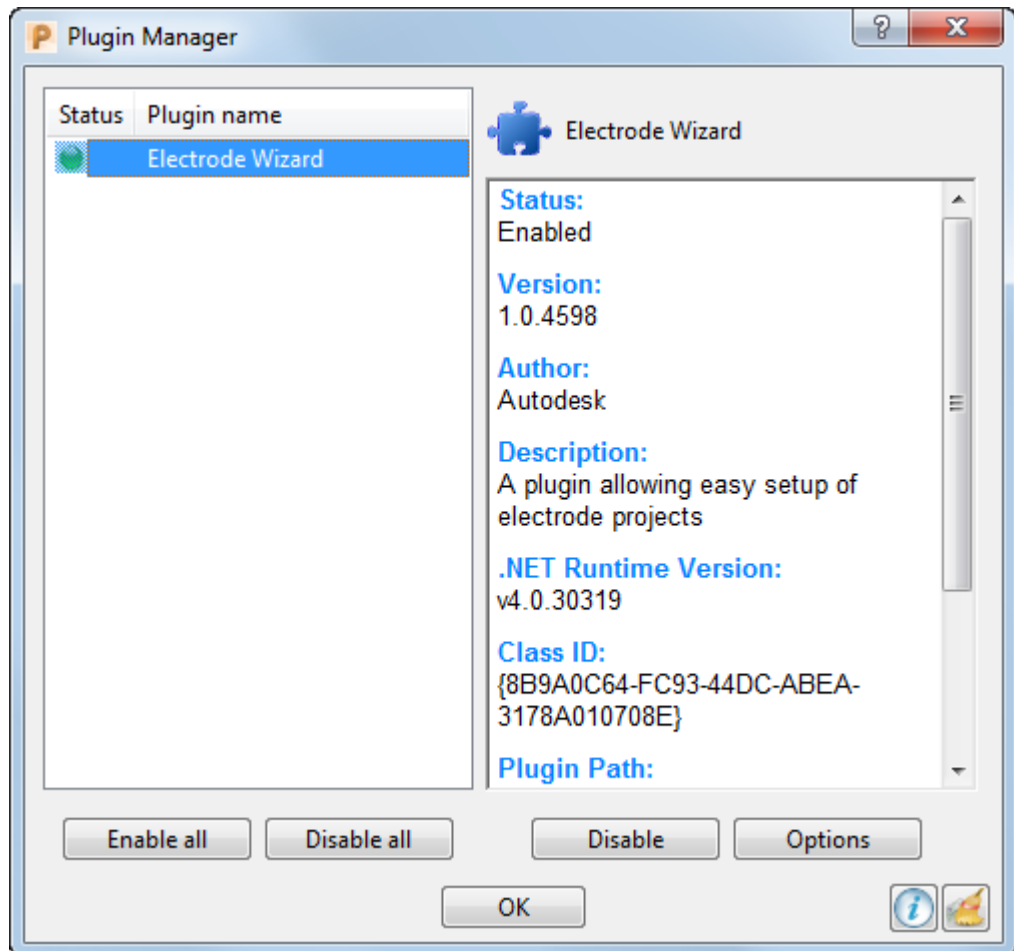
The `xxx_batch.mac` file contains commands in the PowerMill macro programming language; therefore, you can add additional commands to customise the macro for each individual electrode. Refer to the PowerMill Macro guide for more details.



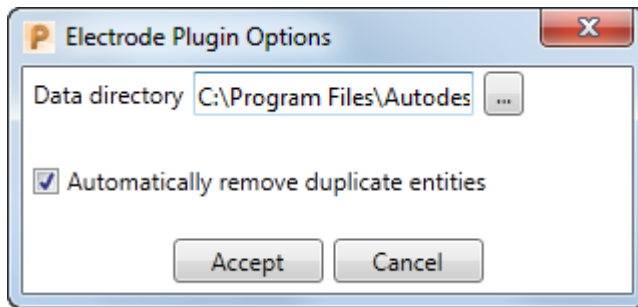
For more details on adding surfaces to a particular component thickness set, see the 'Assigning thickness values' topic in the PowerMill help file.

Changing the Electrode Machining Wizard options

- 1 In PowerMill, click File tab > Options > Manage Installed Plugins to display the **Plugin Manager**.
- 2 Select **Electrode Wizard**.



- 3 Click **Options** to display the **Electrode Plugin Options** dialog.



- **Data directory** — Specifies where the data (the tools and strategies) are stored. By default, this is the plugin installation directory:
`C:\Program Files\Autodesk\ElectrodeMachiningWizardxxxxx\Data`
where `xxxxx` is the Electrode Machining Wizard version number.
 - **Automatically remove duplicate entries** — When this check box is selected, duplicate tooling is removed from imported strategies. Deselect the check box to retain duplicate tooling.
- 4 When you have made the changes, click **Accept** on the **Electrode Plugin Options** dialog to apply them.
 - 5 On the **Plugin Manager**, click **OK** to close it.

Autodesk Legal Notice

© 2021 Autodesk, Inc. All Rights Reserved. Except where otherwise noted, this work is licensed under a Creative Commons Attribution-NonCommercial-ShareAlike 3.0 Unported License that can be viewed online at <http://creativecommons.org/licenses/by-nc-sa/3.0/>. This license content, applicable as of 16 December 2014 to this software product, is reproduced here for offline users:

CREATIVE COMMONS CORPORATION IS NOT A LAW FIRM AND DOES NOT PROVIDE LEGAL SERVICES. DISTRIBUTION OF THIS LICENSE DOES NOT CREATE AN ATTORNEY-CLIENT RELATIONSHIP. CREATIVE COMMONS PROVIDES THIS INFORMATION ON AN "AS-IS" BASIS. CREATIVE COMMONS MAKES NO WARRANTIES REGARDING THE INFORMATION PROVIDED, AND DISCLAIMS LIABILITY FOR DAMAGES RESULTING FROM ITS USE.

License

THE WORK (AS DEFINED BELOW) IS PROVIDED UNDER THE TERMS OF THIS CREATIVE COMMONS PUBLIC LICENSE ("CCPL" OR "LICENSE"). THE WORK IS PROTECTED BY COPYRIGHT AND/OR OTHER APPLICABLE LAW. ANY USE OF THE WORK OTHER THAN AS AUTHORIZED UNDER THIS LICENSE OR COPYRIGHT LAW IS PROHIBITED.

BY EXERCISING ANY RIGHTS TO THE WORK PROVIDED HERE, YOU ACCEPT AND AGREE TO BE BOUND BY THE TERMS OF THIS LICENSE. TO THE EXTENT THIS LICENSE MAY BE CONSIDERED TO BE A CONTRACT, THE LICENSOR GRANTS YOU THE RIGHTS CONTAINED HERE IN CONSIDERATION OF YOUR ACCEPTANCE OF SUCH TERMS AND CONDITIONS.

1. Definitions

- a. "**Adaptation**" means a work based upon the Work, or upon the Work and other pre-existing works, such as a translation, adaptation, derivative work, arrangement of music or other alterations of a literary or artistic work, or phonogram or performance and includes cinematographic adaptations or any other form in which the Work may be recast, transformed, or adapted including in any form recognizably derived from the original, except that a work that constitutes a Collection will not be considered an Adaptation for the purpose of this License. For the avoidance of doubt, where the Work is a musical work, performance or phonogram, the synchronization of the Work in timed-relation with a moving image ("synching") will be considered an Adaptation for the purpose of this License.
- b. "**Collection**" means a collection of literary or artistic works, such as encyclopedias and anthologies, or performances, phonograms or broadcasts, or other works or subject matter other than works listed in Section 1(g) below, which, by reason of the selection and arrangement of their contents, constitute intellectual creations, in which the Work is included in its entirety in unmodified form along with one or more other contributions, each constituting separate and independent works in themselves, which together are assembled into a collective whole. A work that constitutes a Collection will not be considered an Adaptation (as defined above) for the purposes of this License.
- c. "**Distribute**" means to make available to the public the original and copies of the Work or Adaptation, as appropriate, through sale or other transfer of ownership.
- d. "**License Elements**" means the following high-level license attributes as selected by Licensor and indicated in the title of this License: Attribution, Noncommercial, ShareAlike.
- e. "**Licensor**" means the individual, individuals, entity or entities that offer(s) the Work under the terms of this License.
- f. "**Original Author**" means, in the case of a literary or artistic work, the individual, individuals, entity or entities who created the Work or if no individual or entity can be identified, the publisher; and in addition (i) in the case of a performance the actors, singers, musicians, dancers, and other persons who act, sing, deliver, declaim, play in, interpret or otherwise perform literary or artistic works or expressions of folklore; (ii) in the case of a phonogram the producer being the person or legal entity who first fixes the sounds of a performance or other sounds; and, (iii) in the case of broadcasts, the organization that transmits the broadcast.

g. **"Work"** means the literary and/or artistic work offered under the terms of this License including without limitation any production in the literary, scientific and artistic domain, whatever may be the mode or form of its expression including digital form, such as a book, pamphlet and other writing; a lecture, address, sermon or other work of the same nature; a dramatic or dramatico-musical work; a choreographic work or entertainment in dumb show; a musical composition with or without words; a cinematographic work to which are assimilated works expressed by a process analogous to cinematography; a work of drawing, painting, architecture, sculpture, engraving or lithography; a photographic work to which are assimilated works expressed by a process analogous to photography; a work of applied art; an illustration, map, plan, sketch or three-dimensional work relative to geography, topography, architecture or science; a performance; a broadcast; a phonogram; a compilation of data to the extent it is protected as a copyrightable work; or a work performed by a variety or circus performer to the extent it is not otherwise considered a literary or artistic work.

h. **"You"** means an individual or entity exercising rights under this License who has not previously violated the terms of this License with respect to the Work, or who has received express permission from the Licensor to exercise rights under this License despite a previous violation.

i. **"Publicly Perform"** means to perform public recitations of the Work and to communicate to the public those public recitations, by any means or process, including by wire or wireless means or public digital performances; to make available to the public Works in such a way that members of the public may access these Works from a place and at a place individually chosen by them; to perform the Work to the public by any means or process and the communication to the public of the performances of the Work, including by public digital performance; to broadcast and rebroadcast the Work by any means including signs, sounds or images.

j. **"Reproduce"** means to make copies of the Work by any means including without limitation by sound or visual recordings and the right of fixation and reproducing fixations of the Work, including storage of a protected performance or phonogram in digital form or other electronic medium.

2. Fair Dealing Rights. Nothing in this License is intended to reduce, limit, or restrict any uses free from copyright or rights arising from limitations or exceptions that are provided for in connection with the copyright protection under copyright law or other applicable laws.

3. License Grant. Subject to the terms and conditions of this License, Licensor hereby grants You a worldwide, royalty-free, non-exclusive, perpetual (for the duration of the applicable copyright) license to exercise the rights in the Work as stated below:

- a. to Reproduce the Work, to incorporate the Work into one or more Collections, and to Reproduce the Work as incorporated in the Collections;
- b. to create and Reproduce Adaptations provided that any such Adaptation, including any translation in any medium, takes reasonable steps to clearly label, demarcate or otherwise identify that changes were made to the original Work. For example, a translation could be marked "The original work was translated from English to Spanish," or a modification could indicate "The original work has been modified.";
- c. to Distribute and Publicly Perform the Work including as incorporated in Collections; and,
- d. to Distribute and Publicly Perform Adaptations.

The above rights may be exercised in all media and formats whether now known or hereafter devised. The above rights include the right to make such modifications as are technically necessary to exercise the rights in other media and formats. Subject to Section 8(f), all rights not expressly granted by Licensor are hereby reserved, including but not limited to the rights described in Section 4(e).

4. Restrictions. The license granted in Section 3 above is expressly made subject to and limited by the following restrictions:

a. You may Distribute or Publicly Perform the Work only under the terms of this License. You must include a copy of, or the Uniform Resource Identifier (URI) for, this License with every copy of the Work You Distribute or Publicly Perform. You may not offer or impose any terms on the Work that restrict the terms of this License or the ability of the recipient of the Work to exercise the rights granted to that recipient under the terms of the License. You may not sublicense the Work. You must keep intact all notices that refer to this License and to the disclaimer of warranties with every copy of the Work You Distribute or Publicly Perform. When You Distribute or Publicly Perform the Work, You may not impose any effective technological measures on the Work that restrict the ability of a recipient of the Work from You to exercise the rights granted to that recipient under the terms of the License. This Section 4(a) applies to the Work as incorporated in a Collection, but this does not require the Collection apart from the Work itself to be made subject to the terms of this License. If You create a Collection, upon notice from any Licensor You must, to the extent practicable, remove from the Collection any credit as required by Section 4(d), as requested. If You create an Adaptation, upon notice from any Licensor You must, to the extent practicable, remove from the Adaptation any credit as required by Section 4(d), as requested.

b. You may Distribute or Publicly Perform an Adaptation only under: (i) the terms of this License; (ii) a later version of this License with the same License Elements as this License; (iii) a Creative Commons jurisdiction license (either this or a later license version) that contains the same License Elements as this License (e.g., Attribution-NonCommercial-ShareAlike 3.0 US) ("Applicable License"). You must include a copy of, or the URI, for Applicable License with every copy of each Adaptation You Distribute or Publicly Perform. You may not offer or impose any terms on the Adaptation that restrict the terms of the Applicable License or the ability of the recipient of the Adaptation to exercise the rights granted to that recipient under the terms of the Applicable License. You must keep intact all notices that refer to the Applicable License and to the disclaimer of warranties with every copy of the Work as included in the Adaptation You Distribute or Publicly Perform. When You Distribute or Publicly Perform the Adaptation, You may not impose any effective technological measures on the Adaptation that restrict the ability of a recipient of the Adaptation from You to exercise the rights granted to that recipient under the terms of the Applicable License. This Section 4(b) applies to the Adaptation as incorporated in a Collection, but this does not require the Collection apart from the Adaptation itself to be made subject to the terms of the Applicable License.

c. You may not exercise any of the rights granted to You in Section 3 above in any manner that is primarily intended for or directed toward commercial advantage or private monetary compensation. The exchange of the Work for other copyrighted works by means of digital file-sharing or otherwise shall not be considered to be intended for or directed toward commercial advantage or private monetary compensation, provided there is no payment of any monetary compensation in connection with the exchange of copyrighted works.

d. If You Distribute, or Publicly Perform the Work or any Adaptations or Collections, You must, unless a request has been made pursuant to Section 4(a), keep intact all copyright notices for the Work and provide, reasonable to the medium or means You are utilizing: (i) the name of the Original Author (or pseudonym, if applicable) if supplied, and/or if the Original Author and/or Licensor designate another party or parties (e.g., a sponsor institute, publishing entity, journal) for attribution ("Attribution Parties") in Licensor's copyright notice, terms of service or by other reasonable means, the name of such party or parties; (ii) the title of the Work if supplied; (iii) to the extent reasonably practicable, the URI, if any, that Licensor specifies to be associated with the Work, unless such URI does not refer to the copyright notice or licensing information for the Work; and, (iv) consistent with Section 3(b), in the case of an Adaptation, a credit identifying the use of the Work in the Adaptation (e.g., "French translation of the Work by Original Author," or "Screenplay based on original Work by Original Author"). The credit required by this Section 4(d) may be implemented in any reasonable manner; provided, however, that in the case of a Adaptation or Collection, at a minimum such credit will appear, if a credit for all contributing authors of the Adaptation or Collection appears, then as part of these credits and in a manner at least as prominent as the credits for the other contributing authors. For the avoidance of doubt, You may only use the credit required by this Section for the purpose of attribution in the manner set out above and, by exercising Your rights under this License, You may not implicitly or explicitly assert or imply any connection with, sponsorship or endorsement by the Original Author, Licensor and/or Attribution Parties, as appropriate, of You or Your use of the Work, without the separate, express prior written permission of the Original Author, Licensor and/or Attribution Parties.

e. For the avoidance of doubt:

i. Non-waivable Compulsory License Schemes. In those jurisdictions in which the right to collect royalties through any statutory or compulsory licensing scheme cannot be waived, the Licensor reserves the exclusive right to collect such royalties for any exercise by You of the rights granted under this License;

ii. Waivable Compulsory License Schemes. In those jurisdictions in which the right to collect royalties through any statutory or compulsory licensing scheme can be waived, the Licensor reserves the exclusive right to collect such royalties for any exercise by You of the rights granted under this License if Your exercise of such rights is for a purpose or use which is otherwise than noncommercial as permitted under Section 4(c) and otherwise waives the right to collect royalties through any statutory or compulsory licensing scheme; and,

iii. Voluntary License Schemes. The Licensor reserves the right to collect royalties, whether individually or, in the event that the Licensor is a member of a collecting society that administers voluntary licensing schemes, via that society, from any exercise by You of the rights granted under this License that is for a purpose or use which is otherwise than noncommercial as permitted under Section 4(c).

f. Except as otherwise agreed in writing by the Licensor or as may be otherwise permitted by applicable law, if You Reproduce, Distribute or Publicly Perform the Work either by itself or as part of any Adaptations or Collections, You must not distort, mutilate, modify or take other derogatory action in relation to the Work which would be prejudicial to the Original Author's honor or reputation. Licensor agrees that in those jurisdictions (e.g. Japan), in which any exercise of the right granted in Section 3(b) of this License (the right to make Adaptations) would be deemed to be a distortion, mutilation, modification or other derogatory action prejudicial to the Original Author's honor and reputation, the Licensor will waive or not assert, as appropriate, this Section, to the fullest extent permitted by the applicable national law, to enable You to reasonably exercise Your right under Section 3(b) of this License (right to make Adaptations) but not otherwise.

5. Representations, Warranties and Disclaimer

UNLESS OTHERWISE MUTUALLY AGREED TO BY THE PARTIES IN WRITING AND TO THE FULLEST EXTENT PERMITTED BY APPLICABLE LAW, LICENSOR OFFERS THE WORK AS-IS AND MAKES NO REPRESENTATIONS OR WARRANTIES OF ANY KIND CONCERNING THE WORK, EXPRESS, IMPLIED, STATUTORY OR OTHERWISE, INCLUDING, WITHOUT LIMITATION, WARRANTIES OF TITLE, MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, NONINFRINGEMENT, OR THE ABSENCE OF LATENT OR OTHER DEFECTS, ACCURACY, OR THE PRESENCE OF ABSENCE OF ERRORS, WHETHER OR NOT DISCOVERABLE. SOME JURISDICTIONS DO NOT ALLOW THE EXCLUSION OF IMPLIED WARRANTIES, SO THIS EXCLUSION MAY NOT APPLY TO YOU.

6. Limitation on Liability. EXCEPT TO THE EXTENT REQUIRED BY APPLICABLE LAW, IN NO EVENT WILL LICENSOR BE LIABLE TO YOU ON ANY LEGAL THEORY FOR ANY SPECIAL, INCIDENTAL, CONSEQUENTIAL, PUNITIVE OR EXEMPLARY DAMAGES ARISING OUT OF THIS LICENSE OR THE USE OF THE WORK, EVEN IF LICENSOR HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.

7. Termination

a. This License and the rights granted hereunder will terminate automatically upon any breach by You of the terms of this License. Individuals or entities who have received Adaptations or Collections from You under this License, however, will not have their licenses terminated provided such individuals or entities remain in full compliance with those licenses. Sections 1, 2, 5, 6, 7, and 8 will survive any termination of this License.

b. Subject to the above terms and conditions, the license granted here is perpetual (for the duration of the applicable copyright in the Work). Notwithstanding the above, Licensor reserves the right to release the Work under different license terms or to stop distributing the Work at any time; provided, however that any such election will not serve to withdraw this License (or any other license that has been, or is required to be, granted under the terms of this License), and this License will continue in full force and effect unless terminated as stated above.

8. Miscellaneous

a. Each time You Distribute or Publicly Perform the Work or a Collection, the Licensor offers to the recipient a license to the Work on the same terms and conditions as the license granted to You under this License.

b. Each time You Distribute or Publicly Perform an Adaptation, Licensor offers to the recipient a license to the original Work on the same terms and conditions as the license granted to You under this License.

c. If any provision of this License is invalid or unenforceable under applicable law, it shall not affect the validity or enforceability of the remainder of the terms of this License, and without further action by the parties to this agreement, such provision shall be reformed to the minimum extent necessary to make such provision valid and enforceable.

d. No term or provision of this License shall be deemed waived and no breach consented to unless such waiver or consent shall be in writing and signed by the party to be charged with such waiver or consent.

e. This License constitutes the entire agreement between the parties with respect to the Work licensed here. There are no understandings, agreements or representations with respect to the Work not specified here. Licensor shall not be bound by any additional provisions that may appear in any communication from You. This License may not be modified without the mutual written agreement of the Licensor and You.

f. The rights granted under, and the subject matter referenced, in this License were drafted utilizing the terminology of the Berne Convention for the Protection of Literary and Artistic Works (as amended on September 28, 1979), the Rome Convention of 1961, the WIPO Copyright Treaty of 1996, the WIPO Performances and Phonograms Treaty of 1996 and the Universal Copyright Convention (as revised on July 24, 1971). These rights and subject matter take effect in the relevant jurisdiction in which the License terms are sought to be enforced according to the corresponding provisions of the implementation of those treaty provisions in the applicable national law. If the standard suite of rights granted under applicable copyright law includes additional rights not granted under this License, such additional rights are deemed to be included in the License; this License is not intended to restrict the license of any rights under applicable law.

Creative Commons Notice

Creative Commons is not a party to this License, and makes no warranty whatsoever in connection with the Work. Creative Commons will not be liable to You or any party on any legal theory for any damages whatsoever, including without limitation any general, special, incidental or consequential damages arising in connection to this license. Notwithstanding the foregoing two (2) sentences, if Creative Commons has expressly identified itself as the Licensor hereunder, it shall have all rights and obligations of Licensor.

Except for the limited purpose of indicating to the public that the Work is licensed under the CCPL, Creative Commons does not authorize the use by either party of the trademark "Creative Commons" or any related trademark or logo of Creative Commons without the prior written consent of Creative Commons. Any permitted use will be in compliance with Creative Commons' then-current trademark usage guidelines, as may be published on its website or otherwise made available upon request from time to time. For the avoidance of doubt, this trademark restriction does not form part of this License.

Creative Commons may be contacted at <http://creativecommons.org/>.

Certain materials included in this publication are reprinted with the permission of the copyright holder.

Creative Commons FAQ

Autodesk's Creative Commons FAQ can be viewed online at <https://knowledge.autodesk.com/customer-service/share-the-knowledge>, and is reproduced here for offline users.

Creative Commons is a simple, open licensing model which allows individuals to freely modify, remix, and share digital content created for learning and support.

Borrow from the Autodesk Learning, Support and Video libraries to build a new learning experience for anyone with any particular need or interest. It's out there. You can use it. It's yours.

In collaboration with Creative Commons, Autodesk invites you to share your knowledge with the rest of the world, inspiring others to learn, achieve goals, and ignite creativity.

What is Creative Commons?

Creative Commons (CC) is a nonprofit organization that offers a simple licensing model that frees digital content to enable anyone to modify, remix, and share creative works.

How do I know if Autodesk learning content and Autodesk University content is available under Creative Commons?

All Autodesk learning content and Autodesk University content released under Creative Commons is explicitly marked with a Creative Commons icon specifying what you can and cannot do. Always follow the terms of the stated license.

What Autodesk learning content is currently available under Creative Commons?

Over time, Autodesk will release more and more learning content under the Creative Commons licenses.

Currently available learning content:

- Autodesk online help-Online help for many Autodesk products, including its embedded media such as images and help movies.
- Autodesk Learning Videos-A range of video-based learning content, including the video tutorials on the Autodesk YouTube™ Learning Channels and their associated iTunes® podcasts.
- Autodesk downloadable materials-Downloadable 3D assets, digital footage, and other files you can use to follow along on your own time.

Is Autodesk learning and support content copyrighted?

Yes. Creative Commons licensing does not replace copyright. Copyright remains with Autodesk or its suppliers, as applicable. But it makes the terms of use much more flexible.

What do the Autodesk Creative Commons licenses allow?

Autodesk makes some of its learning and support content available under two distinct Creative Commons licenses. The learning content is clearly marked with the applicable Creative Commons license. You must comply with the following conditions:

- **Attribution-NonCommercial-ShareAlike (CC BY-NC-SA)** This license lets you copy, distribute, display, remix, tweak, and build upon our work noncommercially, as long as you credit Autodesk and license your new creations under the identical terms. Terms of this license can be viewed online at <https://creativecommons.org/licenses/by-nc-sa/3.0/us/>
- **Attribution-NonCommercial-No Derivative Works (CC BY-NC-ND)** This license lets you copy, distribute, and display only verbatim copies of our work as long as you credit us, but you cannot alter the learning content in any way or use it commercially. Terms of this license can be viewed online at https://creativecommons.org/licenses/by-nc-nd/3.0/us/deed.en_US
- **Special permissions on content marked as No Derivative Works** For video-based learning content marked as No Derivative Works (ND), Autodesk grants you special permission to make modifications but only for the purpose of translating the video content into another language.

These conditions can be modified only by explicit permission of Autodesk, Inc. Send requests for modifications outside of these license terms to creativecommons@autodesk.com.

Can I get special permission to do something different with the learning content?

Unless otherwise stated, our Creative Commons conditions can be modified only by explicit permission of Autodesk, Inc. If you have any questions or requests for modifications outside of these license terms, email us at creativecommons@autodesk.com.

How do I attribute Autodesk learning content?

You must explicitly credit Autodesk, Inc., as the original source of the materials. This is a standard requirement of the Attribution (BY) term in all Creative Commons licenses. In some cases, such as for the Autodesk video learning content, we specify exactly how we would like to be attributed.

This is usually described on the video's end-plate. For the most part providing the title of the work, the URL where the work is hosted, and a credit to Autodesk, Inc., is quite acceptable. Also, remember to keep intact any copyright notice associated with the work. This may sound like a lot of information, but there is flexibility in the way you present it.

Here are some examples:

"This document contains content adapted from the Autodesk® Maya® Help, available under a Creative Commons Attribution-NonCommercial-Share Alike license. Copyright © Autodesk, Inc."

"This is a Finnish translation of a video created by the Autodesk Maya Learning Channel @ www.youtube.com/mayahowtos. Copyright © Autodesk, Inc."

"Special thanks to the Autodesk® 3ds Max® Learning Channel @ www.youtube.com/3dsmaxhowtos. Copyright © Autodesk, Inc."

Do I follow YouTube's standard license or Autodesk's Creative Commons license?

The videos of the Autodesk Learning Channels on YouTube are uploaded under YouTube's standard license policy. Nonetheless, these videos are released by Autodesk as Creative Commons Attribution-NonCommercial-No Derivative Works (CC BY-NC-ND) and are marked as such.

You are free to use our video learning content according to the Creative Commons license under which they are released.

Where can I easily download Autodesk learning videos?

Most of the Autodesk Learning Channels have an associated iTunes podcast from where you can download the same videos and watch them offline. When translating Autodesk learning videos, we recommend downloading the videos from the iTunes podcasts.

Can I translate Autodesk learning videos?

Yes. Even though our learning videos are licensed as No Derivative Works (ND), we grant everyone permission to translate the audio and subtitles into other languages. In fact, if you want to recapture the video tutorial as-is but show the user interface in another language, you are free to do so. Be sure to give proper attribution as indicated on the video's Creative Commons end-plate. This special permission only applies to translation projects. Requests for modifications outside of these license terms can be directed to creativecommons@autodesk.com.

How do I let others know that I have translated Autodesk learning content into another language?

Autodesk is happy to see its learning content translated into as many different languages as possible. If you translate our videos or any of our learning content into other languages, let us know. We can help promote your contributions to our growing multilingual community. In fact, we encourage you to find creative ways to share our learning content with your friends, family, students, colleagues, and communities around the world. Contact us at creativecommons@autodesk.com.

I have translated Autodesk learning videos into other languages. Can I upload them to my own YouTube channel?

Yes, please do and let us know where to find them so that we can help promote your contributions to our growing multilingual Autodesk community. Contact us at creativecommons@autodesk.com.

Can I repost or republish Autodesk learning content on my site or blog?

Yes, you can make Autodesk learning material available on your site or blog as long as you follow the terms of the Creative Commons license under which the learning content is released. If you are simply referencing the learning content as-is, then we recommend that you link to it or embed it from where it is hosted by Autodesk. That way the content will always be fresh. If you have translated or remixed our learning content, then by all means you can host it yourself. Let us know about it, and we can help promote your contributions to our global learning community. Contact us at creativecommons@autodesk.com.

Can I show Autodesk learning content during my conference?

Yes, as long as it's within the scope of a noncommercial event, and as long as you comply with the terms of the Creative Commons license outlined above. In particular, the videos must be shown unedited with the exception of modifications for the purpose of translation. If you wish to use Autodesk learning content in a commercial context, contact us with a request for permission at creativecommons@autodesk.com.

Can I use Autodesk learning content in my classroom?

Yes, as long as you comply with the terms of the Creative Commons license under which the learning material is released. Many teachers use Autodesk learning content to stimulate discussions with students or to complement course materials, and we encourage you to do so as well.

Can I re-edit and remix Autodesk video learning content?

No, but for one exception. Our Creative Commons BY-NC-ND license clearly states that "derivative works" of any kind (edits, cuts, remixes, mashups, and so on) are not allowed without explicit permission from Autodesk. This is essential for preserving the integrity of our instructors' ideas. However, we do give you permission to modify our videos for the purpose of translating them into other languages.

Can I re-edit and remix Autodesk downloadable 3D assets and footage?

Yes. The Autodesk Learning Channels on YouTube provide downloadable 3D assets, footage, and other files for you to follow along with the video tutorials on your own time. This downloadable material is made available under a Creative Commons Attribution-NonCommercial-ShareAlike (CC BY-NC-SA) license. You can download these materials and experiment with them, but your remixes must give us credit as the original source of the content and be shared under the identical license terms.

Can I use content from Autodesk online help to create new materials for a specific audience?

Yes, if you want to help a specific audience learn how to optimize the use of their Autodesk software, there is no need to start from scratch. You can use, remix, or enrich the relevant help content and include it in your book, instructions, examples, or workflows you create, then Share-Alike with the community. Always be sure to comply with the terms of the Creative Commons license under which the learning content is released.

What are the best practices for marking content with Creative Commons Licenses?

When reusing a CC-licensed work (by sharing the original or a derivative based on the original), it is important to keep intact any copyright notice associated with the work, including the Creative Commons license being used. Make sure you abide by the license conditions provided by the licensor, in this case Autodesk, Inc.

Trademarks

The following are registered trademarks or trademarks of Autodesk, Inc., and/or its subsidiaries and/or affiliates in the USA and other countries: 123D, 3ds Max, ADSK, Alias, ArtCAM, ATC, AutoCAD LT, AutoCAD, Autodesk, the Autodesk logo, Autodesk 123D, Autodesk Alias, Autodesk Forge, Autodesk Fusion, Autodesk Inventor, AutoSnap, BIM 360, Buzzsaw, CADmep, CAMduct, Civil 3D, Configurator 360, Dancing Baby (image), DWF, DWG, DWG (design/logo), DWG Extreme, DWG TrueConvert, DWG TrueView, DWGX, DXF, Eagle, ESTmep, FBX, FeatureCAM, Flame, FormIt 360, Fusion 360, The Future of Making Things, Glue, Green Building Studio, InfraWorks, Instructables, Instructables (stylized robot design/logo), Inventor, Inventor HSM, Inventor LT, Make Anything, Maya, Maya LT, Moldflow, MotionBuilder, Mudbox, Navisworks, Netfabb, Opticore, PartMaker, Pier 9, PowerInspect, PowerMill, PowerShape, Publisher 360, RasterDWG, RealDWG, ReCap, ReCap 360, Remake, Revit LT, Revit, Scaleform, Shotgun, Showcase, Showcase 360, SketchBook, Softimage, Tinkercad, TrustedDWG, VRED.

All other brand names, product names or trademarks belong to their respective holders.

Disclaimer

THIS PUBLICATION AND THE INFORMATION CONTAINED HEREIN IS MADE AVAILABLE BY AUTODESK, INC. "AS IS." AUTODESK, INC. DISCLAIMS ALL WARRANTIES, EITHER EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE REGARDING THESE MATERIALS.



Except where otherwise noted, this work is licensed under a Creative Commons Attribution-NonCommercial-ShareAlike 3.0 Unported License. Please see the Autodesk Creative Commons FAQ for more information.

Index

A

Autodesk Legal Notice • 24

C

Changing the Electrode Machining Wizard options • 22
Configuring the Electrode Machining Wizard • 19
Creating machine tools for the Electrode Machining Wizard • 20
Creating machining strategies for the Electrode Machining Wizard • 20

E

Electrode Machining Wizard • 1

I

Installing Electrode Machining Wizard examples • 5
Installing the Electrode Machining Wizard • 4

P

PowerMill Project Server • 15
PowerMill Project Server Options dialog • 18

S

Step 1 — Block Setup • 9
Step 2 — Analysis • 10
Step 3 — Machining Strategies • 12
Step 4 — Final Tasks • 14

T

Tooling • 13

U

Using PowerMill interactively with the Electrode Machining Wizard • 11
Using the Electrode Machining Wizard • 6