Autodesk® PowerMill®

User Guide

Toolpath Point Parameters

AUTODESK

Contents

Overview

Toolpath point parameters are user-defined attributes, with associated values, attached to individual points along a toolpath. They enable you to apply custom instructions to individual points along a toolpath, to control different types of machines, such as:

- Laser cutters
- Water jet cutters
- Paint sprayers
- Additive machines

If you add parameters to toolpath points, you must update your postprocessor to process these parameters (see page 10).

For example, when using a laser cutter you may need to vary the intensity of the beam at certain points in the toolpath:
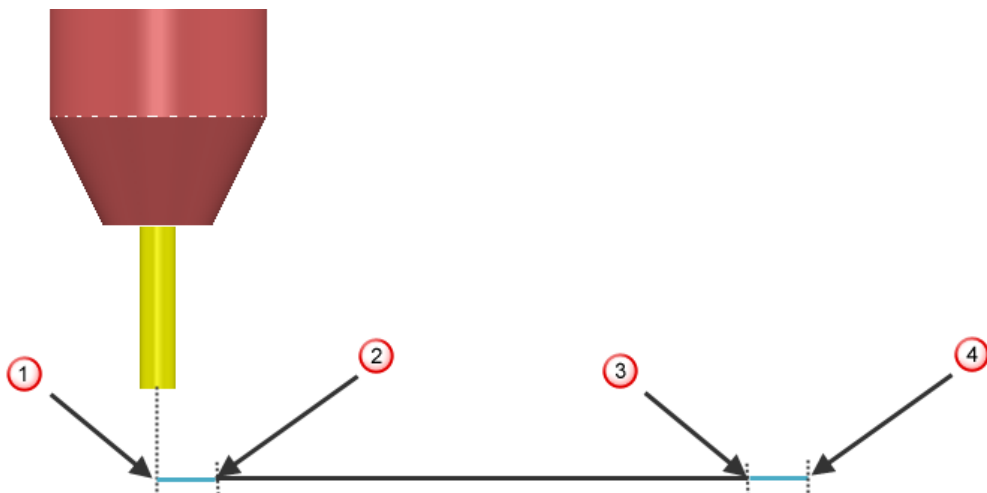
① — At the start, turn on the laser to a power of 90%.

② — 10mm from the start, turn the laser power to 100%.

③ — 10mm from the end, turn the laser power to 90%.

④ — At the end, turn the laser off.

Toolpath point parameter functions

You can use the following toolpath point parameter functions in a macro, or by typing them into a command window:

Description	Function
Returns the number of segments on the referenced toolpath.	`int toolpath_segment_count( entity ref)`
Returns the number of points on the n'th segment of the referenced toolpath.	`int segment_point_count( entity ref, int n)`
Returns the length of the n'th segment of the referenced toolpath.	`real segment_get_length( entity ref, int n)`
Returns the id of the point distance ± tolerance from the start of the n'th segment on the referenced toolpath.	`int segment_get_point_at_distance( entity ref, int n, real distance, real tolerance)`
Creates a point at distance from the start of the n'th segment on the referenced toolpath. If there is an existing point within tolerance of this point then no new point is created. Returns the id of the newly created or existing point.	`int segment_create_point_at_distance( entity ref, int n, real distance, real tolerance)`

Returns a map of parameters on the m'th point on the n'th segment of the referenced toolpath, or if component-type is specified as such, to the lead connected to that segment or the link that precedes it. Component-type is an optional argument for adding parameters to a component other than a segment. When omitted, segment is assumed.	`int point_parameters( entity ref, int n, int m, string component-type)`
Adds a parameter named key with value value to the m'th point on the n'th segment of the referenced toolpath, or if component-type is specified as such, to the lead connected to that segment or the link that precedes it. Component-type is an optional argument for adding parameters to a component other than a segment. When omitted, segment is assumed.	`int point_add_parameter( entity ref, int n, int m, string key, string value, string component-type)`
Remove parameter named key from the m'th point on the n'th segment of the referenced toolpath, or if component-type is specified as such, to the lead connected to that segment or the link that precedes it. Component-type is an optional argument for adding parameters to a component other than a segment. When omitted, segment is assumed.	`int point_remove_parameter( entity ref, int n, int m, string key, string component-type)`

Remove all parameters from the m'th point on the n'th segment of the referenced toolpath.	`int point_remove_parameters( entity ref, int n, int m)`
Returns the geometric point on a toolpath which is closest to a given point in space.	`OBJECT closest_point_on_toolpath(ENTITY toolpath, POINT point)`

Sample macros

This example adds a parameter called **laser** to every toolpath point and the parameter's value increases by ten, from one point to the next.

Points can have more than one parameter, or they can have no parameters at all.

```
int segments = toolpath_segment_count("toolpath", "1")
int segment = 0
int error = 0

while $segment < $segments {
  int points = segment_point_count("toolpath", "1",
  $segment)
  int point = 0
  int power = 0

  while $point < $points {
    $error = point_add_parameter("toolpath", "1",
    $segment, $point, "laser", $power)
    $point = $point + 1
    $power = $power + 10
  }

  $segment = $segment + 1
}
```

Using Toolpath Point Parameters mode

The toolpath point parameter functionality is mainly macro-driven. However, you can enter the following command to start the Toolpath Point Parameters mode to work with toolpath point parameters interactively:

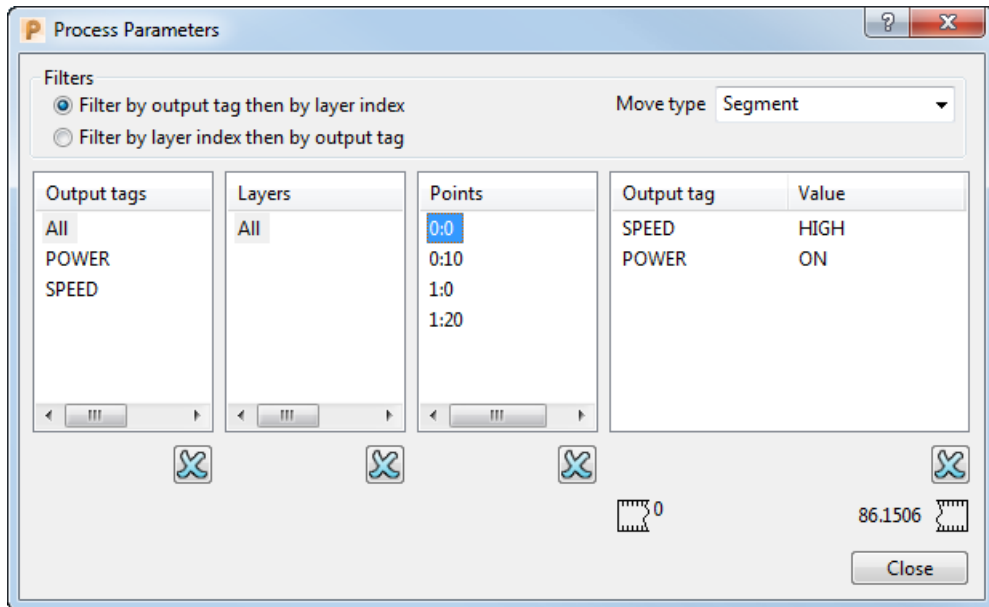**EDIT TOOLPATH POINT_PARAMETERS DISPLAY**

You must have an active toolpath to enter this mode.

When in Toolpath Process Parameters mode, you can use the Toolpath Process Parameters tab.
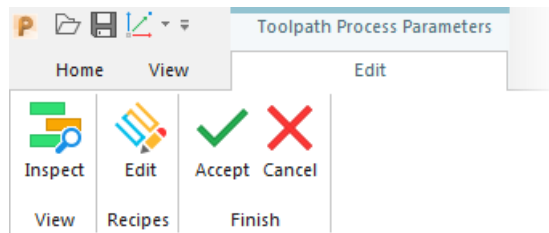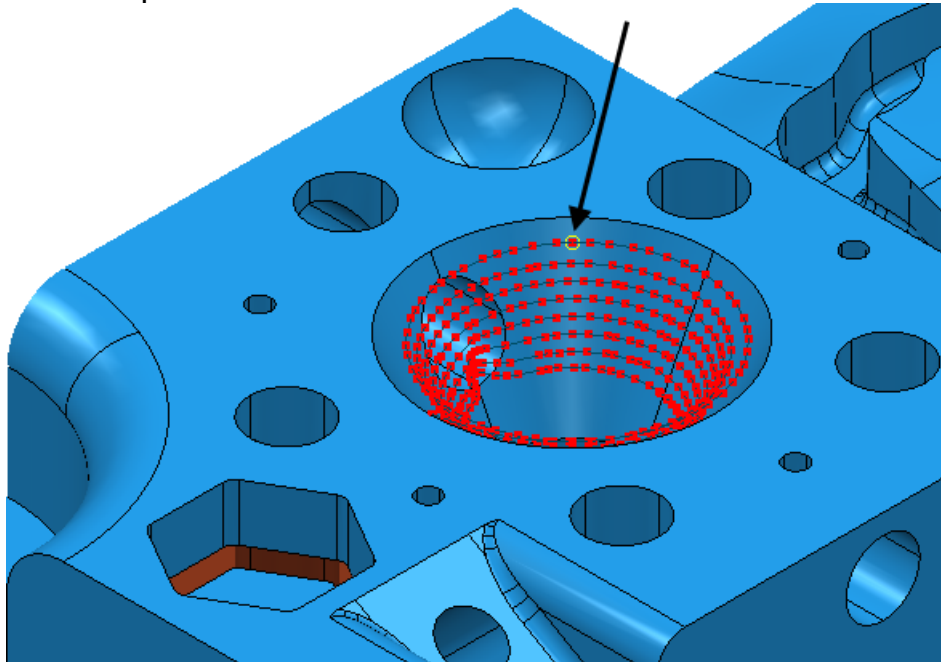
The **Process Parameters** dialog is also available:

![note icon] *The **Filters** area and **Layers** list is only used for strategies calculated from the PowerMill Additive plugin.*

The **Process Parameters** dialog enables you to select a point and view its parameters.

Points with parameters are red and points with no parameters are blue. The selected point is surrounded by a yellow circle. For example, **0:10** where the first number (**0**) is the segment number and the second (**10**) the point number.

![ruler icon] — Displays the distance of the selected point from the start of the toolpath segment.

⬚ — Displays the distance of the selected point from the end of the toolpath segment.

To view process parameters:

1 Select an **Output Tag** from the list. The **Points** list displays all the points that have the selected Tag applied to it.

2 Click ⬚ under a column to delete the process parameters from the points in your selection from that column.
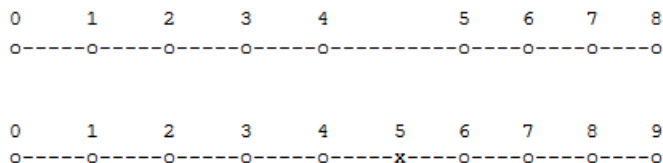
Click Toolpath Point Parameters tab > Finish panel >Accept to exit the Toolpath Point Parameters mode.

Segment and point identifiers

When using toolpath point parameters, it is important to understand how segment and point identifiers work:

- Segment and point identifiers use zero-based indexing. This means the first point or segment has a value of **0**. If a toolpath has 10 segments, then the segment identifiers are 0 to 9 inclusive. Similarly, if a segment has 8 points then the point identifiers are in the range 0 to 7 inclusive.

- Segment and point identifiers are transitory, not fixed. So, if you create a new point, all the points after the additional point are renumbered.

  In this example, a new point is inserted between points 4 and 5. In the updated toolpath segment, all points after point 4 have new identifiers. Because the number of points has also changed, a cached value from `segment_point_count()` is no longer correct.

```
0     1     2     3     4          5    6    7    8
o-----o-----o-----o-----o----------o----o----o----o


0     1     2     3     4     5     6     7    8    9
o-----o-----o-----o-----o-----x----o----o----o----o
```

Do not use any previously stored point identifiers or point counts after inserting a new point.

Postprocessor requirements

To use the parameters added to a toolpath point, you must update your postprocessor option file.

For example, if you create a parameter **laser,** you must modify your option file to include **udp_laser**.

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