



## USERS OF FASTCAM® CNC PROFILING SOFTWARE

### RE: HI-DEF & FINE BEAM PLASMA TORCHES – PROBLEMS CUTTING SMALL HOLES

The new 'Hi-definition' torches are having a huge impact on plasma cut quality which has improved out of sight compared to a decade ago.

However small hole cutting continues to be an issue. Essentially, as hole size diminishes there is a tendency for “Coning” where the sides taper inwards. The issue is exaggerated the smaller the hole and the thicker the material. Slowing the torch speed automatically with FastCAM® software improves small hole cut quality back to the level of straight cutting.

The following tips will help.

**If you are using new hi-definition torches with your FastCAM® Software we recommend you control the feedrate explicitly.**

For EIA code machines, this looks like F363 for 363 mm/minute. For ESSI machines, this looks like 39+3630. In EIA Inch, it looks like F14.3 for 14.3 inches per minute.

There are TWO modifications needed for optimum performance.

1. Reduce the feedrate using FXX or 39+NN in your control file.
2. Turn off the AVC for small holes.

#### 1. Feedrate Reduction.

Reduction of feedrate is quite simple with FastCAM® and has always been available. However you need to introduce the whole business of including feedrate into your NC output and there may be procedural changes for operators who are used to typing in both feedrate and kerf. Traditionally feedrate and kerf were not available in many NC languages such as ESSI. They have become available and are now necessary for the newer plasma torches. Reduced feedrate in holes may have benefit for other cutting technologies as well.

Incidentally, you can also automate the kerf settings and introduce other parameters to optimize your cutting.

Note that there are other techniques for handling small holes, such as the introduction of separate inside to outside processes, small holes processes and the like. These can avoid the creation of tables. However as new cutting technologies become more specific to materials and contour sizes, the introduction of programmable functions like feedrate and kerf are now recommended.

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## **2. Feedrate tables**

The tables are all plain text, comma delimited. You can have as much or as little information as you required.

The three tables which control feedrate are

MATERIAL.DAT            which contains at a minimum a list of various materials such as Mild Steel, Hardox, Stainless, Aluminum, etc. You need a minimum of one material.

CONTROL.DAT\*            which lists the processes available such as Oxy, Plasma, Laser, WaterJet, Marking, Drilling, Text etc. You need a minimum of one cutting process

And the work together for the feedrate table which refers to both the material and process.

FEEDS.DAT                which lists up to 100 parameters on material and thickness and machine process.

**\*The CONTROL.DAT is not always named the same. Look for an equivalent file.**

The first two columns are always feedrate and kerf. Columns after column 5 are user definable. The tables may be edited with Notepad. Be careful not to use a word processor when editing tables as they can leave dangerous but invisible characters in the file which can upset the interpretation.

## **3. Set feedrate reduction**

1. Indicate the feedrate reduction for small holes in the following form. In the example below, a feedrate reduction of 50% has been requested for a hole under 30mm in diameter. This hole does not have to be circular.

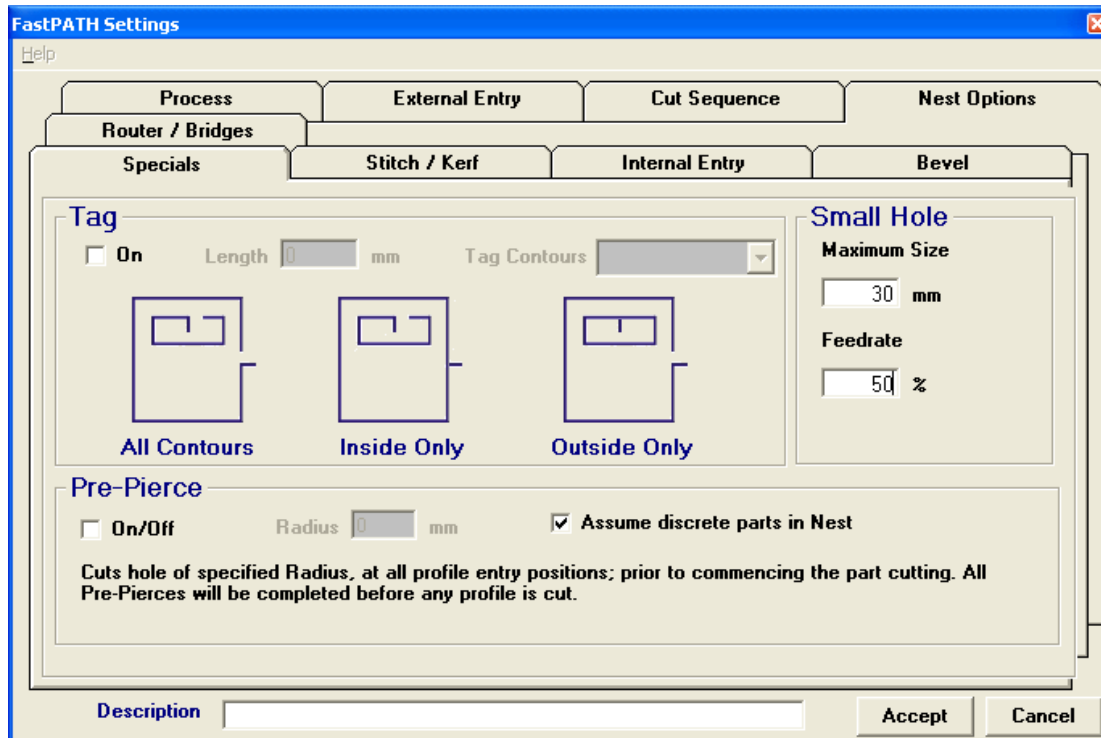
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2. Add the FXX code to your CONTROL.DAT or equivalent control file.

In ESSI, you will need 39+NN to generate feedrate.

Be aware that if you do not add the feeds.dat file, the software will prompt for feedrate on every output.

## 2. Turn off the AVC

In some cases, it will pay to turn off the AVC on small holes.

You can put any code you like in the CONTROL.DAT file or equivalent control file.

FastCAM® automatically classes contours as small holes, large holes, slits and outside contours.



The useful key phrases are as follows:

/SMALL HOLE/  
M14

/LARGE HOLE/

/OUTSIDE/

In this example, M14 is used to the AVC is turned off after a small hole.

You can use these phrases to set quite different conditions for small holes, large holes and outside cutter paths.

#### 4. Sample files

For consistency, the tables are always in metric. Output will be converted to inch where required. Tables which are all linearly interpolated on material thickness. This means the exact point between two values is calculated and used.

##### 4.1 MATERIAL.DAT

( Density is 7875 kg/m3 for steel, 2700 kg/m3 for Aluminium)

Stainless,AKCR12,8200,3.90,3CR  
Stainless,304,8200,3.90,S304  
Stainless,304L,8200,3.90,S34L  
Stainless,316,8200,3.90,S316  
Stainless,316L,8200,3.90,S36L  
Stainless,310,8200,3.90,S310  
Stainless,321,8200,3.90,S321  
Stainless,Duplex 2205,8200,3.90,DPX  
Stainless,253MA,8200,3.90,253MA  
Mild-Steel-250,GR250,7850,.90,GR25  
Mild-Steel-300,GR300,7850,.90,GR30  
Mild-Steel-350,GR350,7850,.90,GR35  
Aluminium,AL,2700,-90,AL

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#### 4.2 CONTROL.DAT

/OPERATIONS/

PLASMA, 2, -1, 10, 1, 1, M3\M77\FXX,M79\M4,T0101  
OXY, 2, -1, 10, 1, 1, M0\FXX,M0,T0303  
MARKER, 1, 0, 13, 2, 1, M3\M77\F9000.,M79\M4,T0202  
TEXT, 6, 0, 13, 2, 1, M3\M77\F9000.,M79\M4,T0202

#### 4.3 FEEDS.DAT

( Material number from MATERIAL.DAT shown as {1,2,3,4}

( assumes that material grouped

( assumptions

( 1. Sorted by operation number from control file e.g. CONTROL.DAT, BURNY.CON

( 2. Sorted by Material sequence as in MATERIAL.DAT

( 3. Sorted by thickness

( 4. All sorts increase numerically.

(Note that individual materials may be given but that

(materials may be grouped by type for easier data entry, location etc.

\1,PLASMA\

( FEEDRATE TABLE. EACH TABLE HAS A DESCRIPTION AND A REFERENCE #

( CUTTING TECHNIQUE, MATERIAL, TABLE NUMBER)

( thickness (sec), feedrate (mm/sec), kerf(mm), KERF NUMBER (Hxx)

{1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17} (Materials 1 through 14 in MATERIAL.DAT

3,2500,,1

5,2500,,1

6,2250,,1

8,1500,,1

\2,OXY\

{1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17}

10,800,,3

40,400,,3

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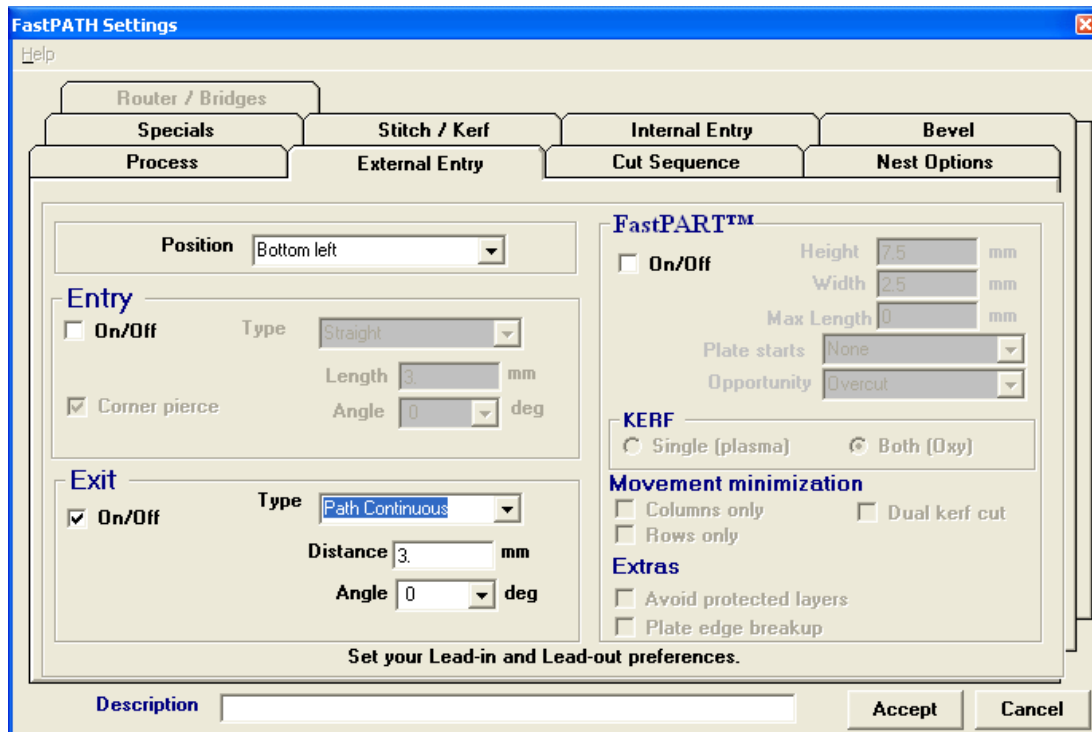
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For torch manufacturers that recommend an 'overburn', in FastCAM® we do this by selecting 'path continuous' for the end of the hole, rather than a lead out. See picture below.



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