

Mach3 Turn CSS

I've read a few forum topics that indicate that Constant Surface Speed (CSS) does not work with Mach3. CSS is definitely not covered in the Mach3 Turn Manual. Indeed, there is no reference at all to the CSS Fanuc commands G96 (Activate CSS) and G97 (Deactivate CSS). For some reason, CSS works fine on my CNC lathe.

I thought I'd give others the benefit of my experience. I did a bit of reading and it appears that Mach 3 emulates the Fanuc control system, with most of the G and M commands being basically the same. I can't recall how I got started experimenting with CSS and Mach3. I suspect I must have read on the forum somewhere that others had successfully tried.

Anyhow, CSS has always worked for me, but careful adherence to programming rules must be applied.

Below are some rules I have to follow to ensure correct operation. These rules are covered vaguely in Peter Smid's CNC Programming Handbook.

Following are my simplified set of rules:

1. The G96 (Activate CSS) command MUST be in the following format:

G96 S50 M3 (The M3 (or M4) Spindle On command MUST accompany the G96 with a specified surface speed, in this case 50m/min). The M3 or M4 command must be applied regardless of whether it was called previously.

2. The G97 (Deactivate CSS) command does not have to have the accompanying Spindle On M3 or M4. For example:

G97 S1000 (Deactivate CSS and set the spindle speed to 1000RPM) works fine.

Why the G96 needs an accompanying M3 or M4 and the cancelling G97 does not; appears to be a Fanuc idiosyncrasy. The examples in Peter Smid's Handbook reflect this.

3. When using G52 temporary offsets (as I do with my gang tool setup), it is best to select G96 mode at the beginning of each cutting action requiring CSS, and to deactivate CSS with G97 at the end, before cancelling the G52 offset. For each **G52 offset tool position**, activate CSS or simple RPM as applicable. For example:

G52 X242.7 Z-4.5 (Select Temporary Parting Tool Fixture Offset)

G96 S95 M3 (CSS Mode 95m/min)

G95 (Set Feed/Rev Mode)

G00 Z0.5 (Go to Groove 1 Position)

G00 X-39

(Groove 1 Cut)

G01 X-25.1 F0.05 (Feed @ 0.05mm/rev)

G01 Z1 (Move away from face of last cut)

G00 X-39 (Withdraw to Safe X Position)

G00 Z-1.5 (Go to Groove 2 Position)

G00 X-38.5

Continue Action until finished then:

(Groove 6 Cut)

G01 X-25.1 F0.05 (Feed @ 0.05mm/rev)

G01 X-25 Z-7.5 (Move away from face of last cut)

G00 X-39 Z20 (Rapid out to Safe XZ Position)

G97 S900 (Cancel CSS and set Spindle to 900RPM)

G52 X0 Z0 (Cancel Temporary Tool Offset)

G00 X42 Z20 (Safe XZ Position before moving to Finish Tool Position)

(OD Finish Cut)

G00 Z-20.5 X42.

X40.

G96 S95 M3 (CSS Mode 95m/min)

Continue Finish Cut, then:

G97 S900 (Cancel CSS and set Spindle to 900RPM)

Perform subsequent actions at each G52 gang tool offset, following the above format.

4. Each G52 Offset Tool Position must have a cancelling **G52 X0 Z0** at the end of each turning operation as shown in the above example.

There is one thing that annoys me because I don't understand. That is, whenever I run a program for the first time in a day and I call CSS, the spindle speed drops to some ridiculously low speed and I have to abort the program and rewind. However, it always works correctly the second time I run the program; and will continue to run correctly all day, even if I switch programs to another completely different part. I've simply learned to expect and live with, this behaviour.