

Belt reduction vs. direct drive for Precision Plasma Gantry kits

Precision Plasma LLC sells both direct drive and belt reduction gantry kits.

Which is more accurate?

You would think that the belt reduction is more accurate, but not in all situations. Here is why.

The geckodrives used in the candcnc.com electronics morph from 1/10th microstepping to full step when a motor turns faster than 4 rev/sec.

<http://www.geckodrive.com/how-morphing-works>

Direct Drive:

Precision Plasma LLC uses a .65 pitch diameter gear on direct drive gantry kits. While in microstepping mode, the resolution of the table is $.65 \times \pi / 2000$ steps / revolution of the stepper motor. (200 full steps \times 1/10th step microstepping = 2000 microsteps) The resolution is .001" or a thousandth of an inch.

Since the drive morphs at 4 rev/sec, that equates to 4 rev/sec \times 60 sec/min \times .65" PD \times π = 490 ipm. Since the fastest cutting speed is 350 ipm, **the gantry will always be in microstepping mode when cutting and have a resolution of .001"**. Since you will use 500ipm as a rapid speed, the drive will be running in full steps mode. This allows the motor to have 100% of its available torque where it only has 70% in microstepping mode.

Belt Reduction:

Precision Plasma LLC uses a 1" pitch diameter gear and 3.5:1 reduction on belt reduction gantry kits. While in microstepping mode, the resolution of the table is $1 \times \pi / 3.5 / 2000$ steps / revolution of the stepper motor. (200 full steps \times 1/10th step microstepping = 2000 microsteps) The resolution is .00045" or about a half a thousandth of an inch.

Since the drive morphs at 4 rev/sec, that equates to 4 rev/sec \times 60 sec/min \times 1" PD \times π / 3.5 = 215 ipm. At cutting speeds above 215 ipm, the drive will have morphed into full step mode which will give a resolution of .0045".

Belt reduction cutting below 215 ipm will have a resolution of .00045" and cutting speeds above 215 ipm will have a resolution of .0045".

The belt reduction units do have a benefit of adding much more force to move the gantry which is a benefit when routing. As shown in the 620 motor article, the 620 in-oz motor direct drive will provide 112 pounds of force while the belt reduction with 620 in-oz motor will provide 254 pounds of force.