

## OVERDRIVING YOUR STEPPER MOTOR

Have you noticed how the name plate on your stepper motor says 2V or perhaps 4V and yet when you run the motor with your GeckoDrive you usually use about 10 to 20 times that value? Seems strange doesn't it? In your mind you are thinking but surely it will burn out? The simple answer-"No, it won't burn out!" I'll explain.

Now to get back to our first question, why doesn't the smoke come out of the motor when I 'overdrive' it by 10 or 20 times? Perhaps first we should ask the question why overdrive the motor by these ratios in the first place?

The coils in a stepper motor are simple inductors, coils of copper wire wrapped around a steel lamination. Inductors 'resist' a change in the current flow, think of a flywheel on a motor, a certain amount of energy is required to speed it up and once turning it resists any attempt to slow it down. Think of the turning of the flywheel as the current flowing through our coil and the torque the motor turns it with as applied voltage. We need to speed it up as quickly as we can if we want our motor to turn faster and then stop it as quickly as we can so that the armature will move to the next step. How do we make it stop and start quickly? We turn it 'harder' (more torque - higher voltage) of course, this is why we drive the coils with these high voltages, to start and stop the current flow as quickly as possible. I know this is a real simple way of looking at it but I am sure that you can see the picture in your mind.

So, we overdrive the motor to get much higher speeds, why do we want higher speeds? Because we are men!

To move at a higher velocity requires more power, remember that power is the product of force and velocity, or the torque multiplied by the angular velocity. A more powerful system is more attractive in any man's eyes, better the V8 than the scooter! More seriously if we can improve the power from our motor we are able to improve our power density. What's that? Power density is the amount of useful energy we can extract from the motor for the given volume, if we can extract 100W from a small motor why spend your money on a bigger motor and more expensive motor. Makes sense doesn't it?

Electrical power is the product of the applied voltage and the current flowing, however as our motor is inductive it is not simply a matter of measuring the current to know how much power we are deriving from our system, it is far more complex than that. It is beyond the scope of this manual to discuss this.

We see that we are able to improve our speed that we can obtain from the motor by increasing the voltage that we drive it with, not only will the speed be improved but we will benefit from improved torque at higher speeds, all round everybody wins!

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