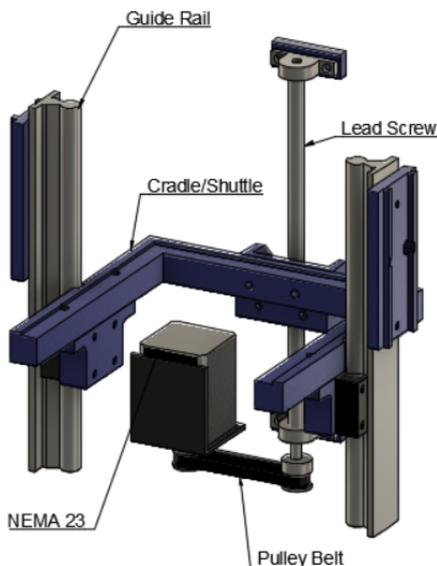


## Router Lift Test Report

09/05/2022

Testing operators : Juan, Alex, Rainer

Test	Pass/Fail	Notes
Range of motion test	Pass	At all speeds and a <b>2:1</b> and <b>1:1</b> belt ratio, the lift exhibited full range of motion and could reach repeatable positions Cradle exhibited asymmetrical rising, one side would raise then the other would lag behind/
2.5KG lift test	Pass	At lower speeds on <b>2:1</b> ratio and mid range speeds at <b>1:1</b> ratio, cradle could lift <b>2.5kg</b> of mass (with asymmetrical rising)
5 KG lift test	Pass	At lower speeds on <b>2:1</b> ratio and mid range speeds at <b>1:1</b> ratio, cradle could lift <b>5kg</b> of mass (with asymmetrical rising)
7.5 KG lift test	Pass	At lower speeds speeds at <b>1:1</b> ratio, cradle could lift <b>7.5kg</b> of mass (with asymmetrical rising)
10 KG lift test	Pass	At <b>112.5 RPM</b> at <b>1:1</b> a <b>10 kg</b> load can be fully raised and lowered without incidence



### Fault summary :

- Grub screw bored channel into leadscrew shaft
- Higher than 112.5 rpm motor fails to lift load
- Continuous operation at 24 volts caused overheating of motor and controller

## Troubleshoot plan

### Grub screw bored channel into lead screw



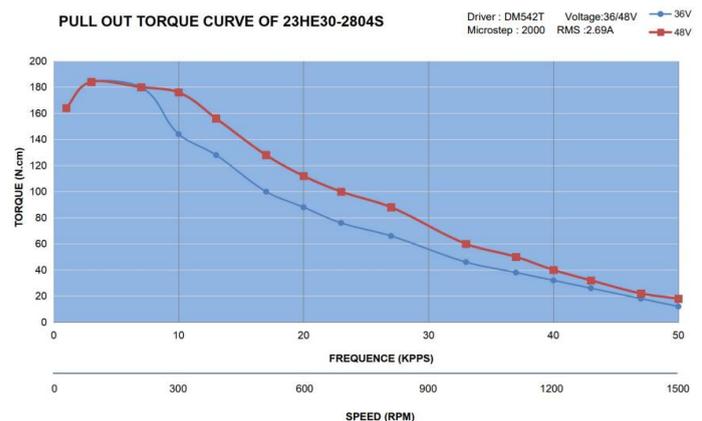
- Any slippage of the pulley wheel caused the grub screw to dig a groove into the coupling shaft of the lead screw
- This caused the pulley wheel to be locked onto the lead screw

### Troubleshooting 10/05/2022

- Use a dremel to remove a small amount of material from the lead screw coupling shaft to allow for pulley wheel change to be easier
- Drilling of seating position hole for grub screw to ensure this doesn't reoccur

### Higher than 112.5 rpm motor fails to lift load

- This is to be expected, based on *Variable\_Calculator.ipynb*, the lifting torque required is 0.322 NM or 32.3 Ncm
- Based on the Torque curves for the 23HE30-2804S Nema 23 stepper motor, at around 112.5RPM, the torque is around 180 Ncm so this should not be a problem for the Nema



### Troubleshooting 10/05/2022

- Try an alternative nema 23 to see if it is a unit failure
- Increase voltage input to 36V to see if this will improve lift at higher RPM
- Cap RPM to 112.5 until new Nema is ordered (conduct reliability testing to ensure this RPM is consistent in lift performance)

### **Continuous operation at 24 volts caused overheating of motor and controller**

- At 24 volts with continuous testing, the motor started to get warmer, this led to unreliable performance, failing to lift loads at 1500 RPM where previously it had been successful
- The controller also seemed to have performance problems causing error signs

### **Troubleshooting 10/05/2022**

- Ensure there is a limit to how frequently the motor can be operated in a given time period
- Modify controller activity when not in use
- Use lower voltages (12v)
  - **Conflict, lower voltage will decrease motor electrical noise and overheating but may reduce torque**