

3D Printing on the cheap(ish)!

A DIY approach to 3D printing

Background

- As a confirmed gadget freak I've wanted a 3D printer ever since I first heard of them
- I'd been spending money on laser-cut robot chassis so I felt I could justify the cost of a 3D printer instead!
- Ready-built 3D printers can be very expensive
 - £600 - £2000+ when I looked last November
 - Low end ones are limited in printing materials and build volume
- I decided on the Velleman K8200 kit, on offer at £360 from CPC last Nov (now £396, £600 from Maplin)

Velleman K8200



Velleman K8200

- Open source design and software
- 200mm x 200mm x 200mm build volume
- PLA, ABS materials
 - More exotic materials with different hot-end
- Assembly instructions online
 - Very comprehensive photos
- Good forum for online help
- Kit of 700+ parts packed in numerous plastic bags
 - Took me 5 working days to complete and get working
- DIY = intimate knowledge of your printer
- DIY = no real warranty!

K8200 weak points - hot end

- Nozzle must be accurately torqued down to a low value
- No hot end cooling
- Internal step diameter changes cause filament distortion
- I trashed mine on my first filament change!



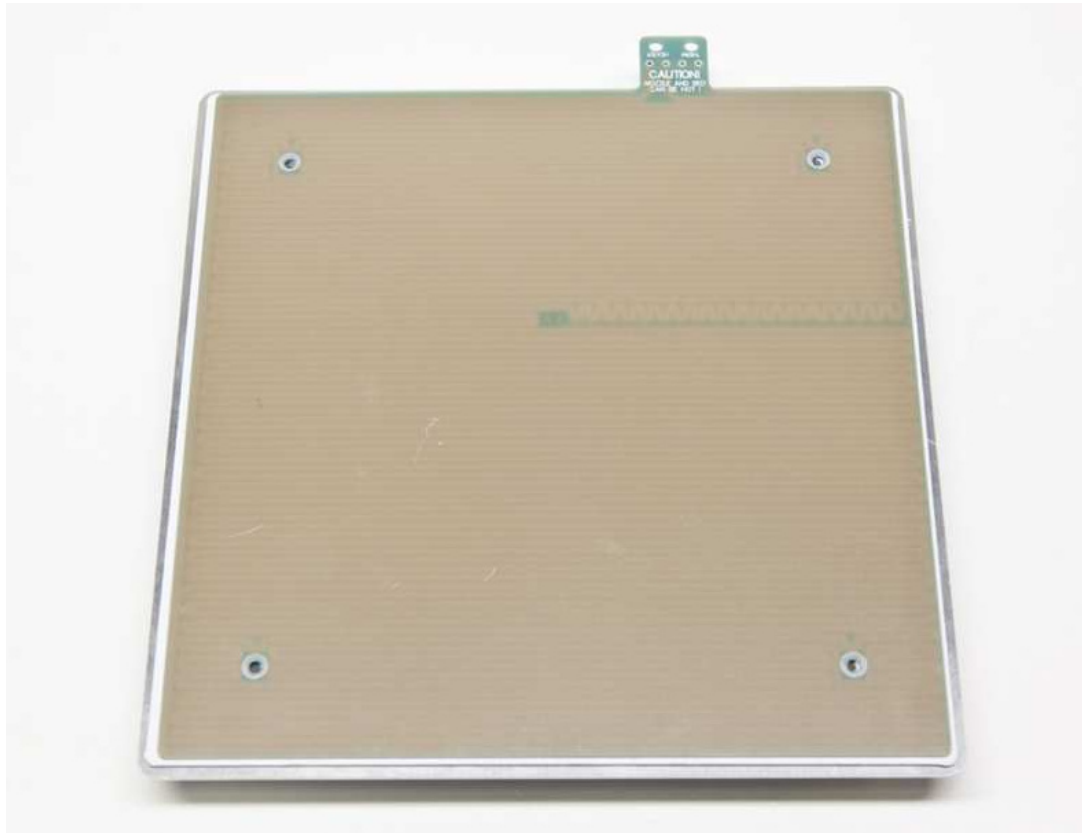
K8200 hot end solution - third party E3D v6

- Good price and performance
- Cooling fan to stop filament melting prematurely
- Full spare parts availability
- New even lower cost version recently introduced



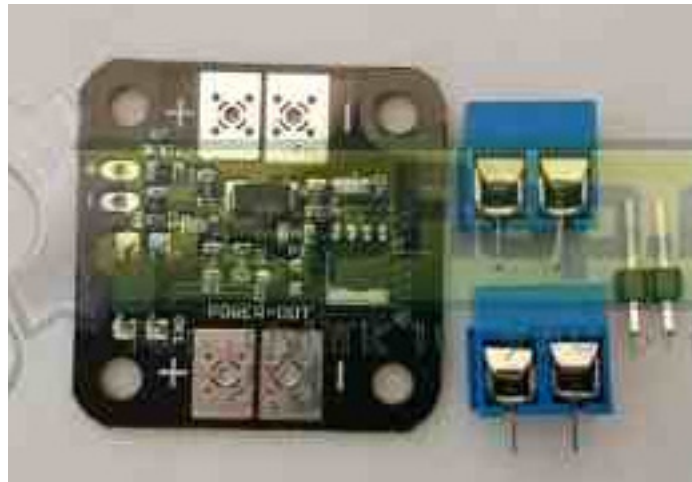
K8200 weak points - heated bed

- PCB, not flat, needs glass or mirror
- Heater under-powered for glass plate
- ~ 40 min to heat bed to 60 degC for PLA with glass plate!



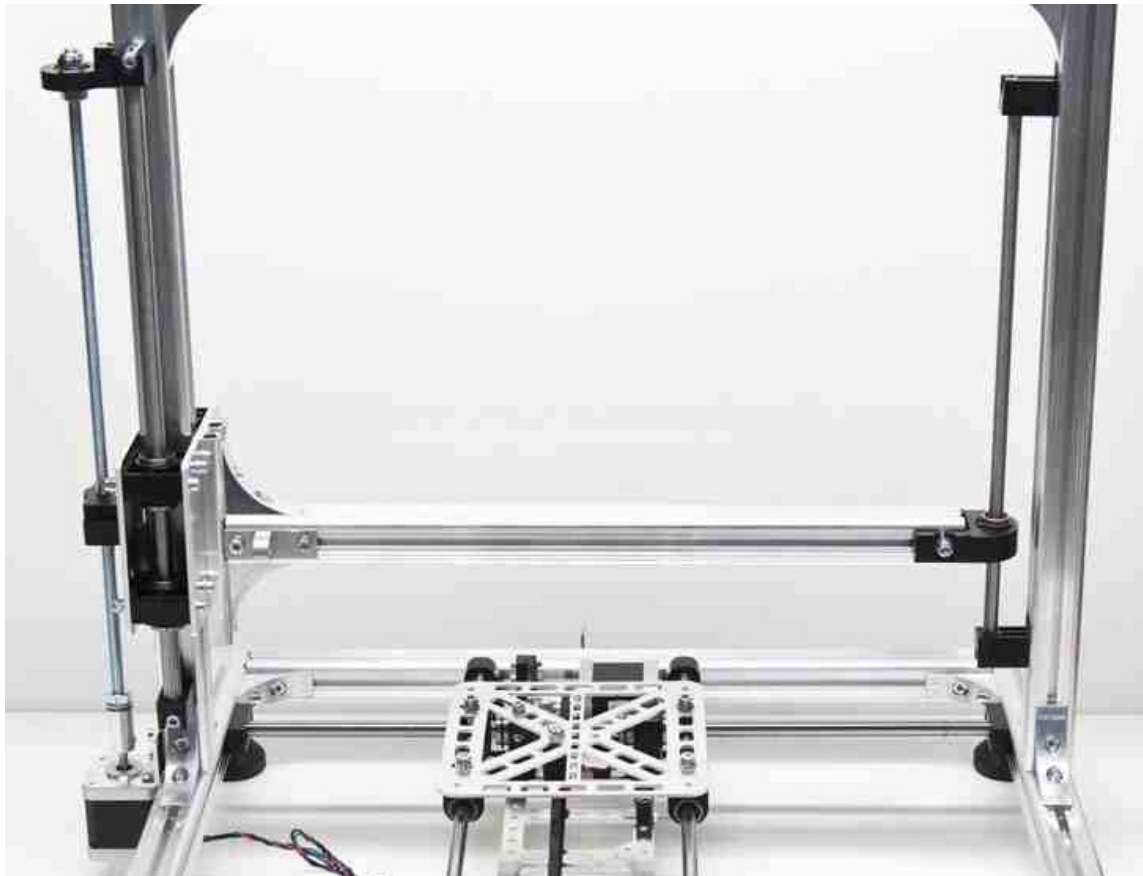
K8200 - Heated bed solution

- Glass + more power
- Velleman glass plate + bulldog clips (NOT printed parts!)
- eBay 24V 5A power supply dedicated to heated bed
- DIY optically-isolated MOSFET switch or Power Expander from www.reprap.me



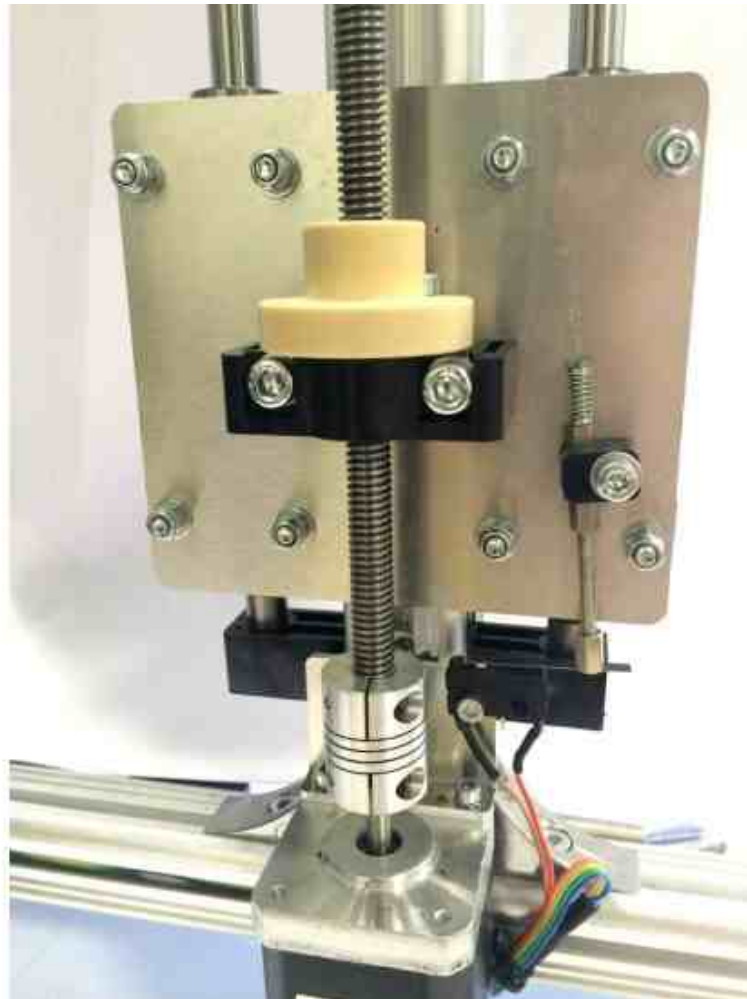
K8200 weak points - Z-axis

- Allegedly erratic due to poor quality threaded rod
- I assembled mine carefully and have no problems



K8200 solution - Z-axis

- Velleman upgrade
 - New precision screwed rod, captive nut and flexible coupler



3D printing issues

- Getting the first layer to stick!
 - Level printing surface and optimal nozzle height
 - Print settings
 - Heater bed temperature
 - Blue masking tape (PLA)
 - Kapton tape (ABS)
 - Rubbing alcohol
 - Hair spray
 - Black magic!
- Printing holes
 - Don' t! Leave first layer solid and drill through

3D printing filament: PLA vs ABS

PLA

Good points:

- Easier to get working
- Lower operating temperatures
- Environmentally friendly
- No noxious fumes

Bad points:

- Brittle at room temperature
- Low melting point
- Difficult to tap a thread

ABS

Good points:

- Good quality result when working (Lego)
- Rigid but not brittle
- Higher melting point

Bad points:

- Harder to get right setup
- Petro-chemical
- Noxious fumes (allegedly!)

Next steps

- Get working properly with ABS
 - BuildTak printing base? <http://www.builttak.eu/>
- Add CNC router / milling machine capability!
 - Velleman supported
 - PCB manufacturing

