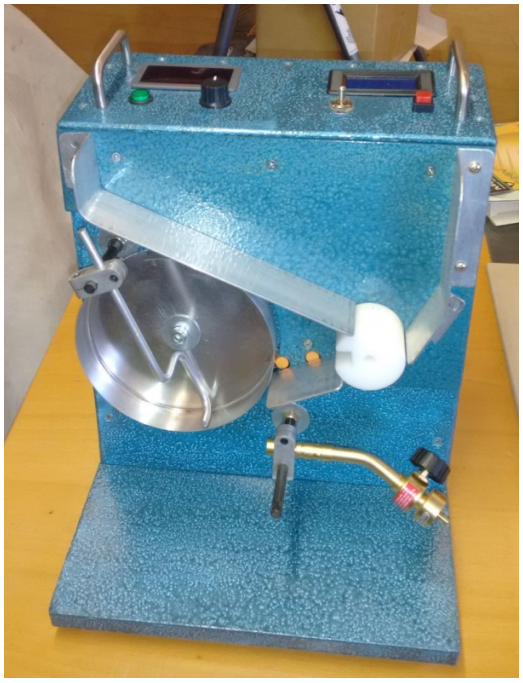
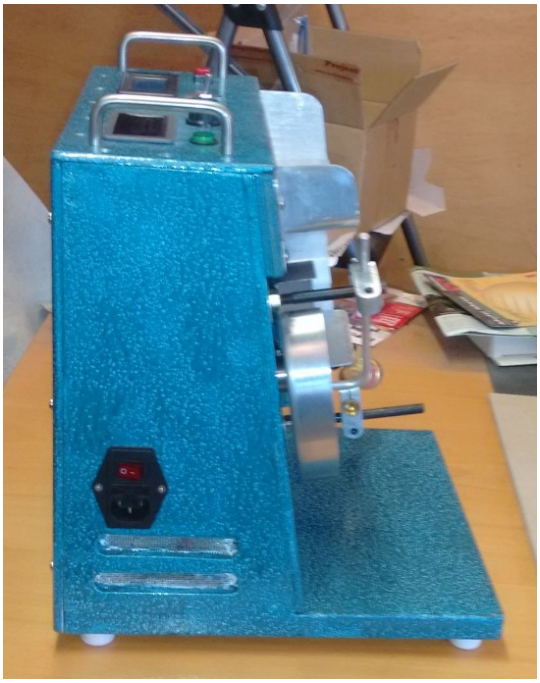
Annealer – Construction notes.

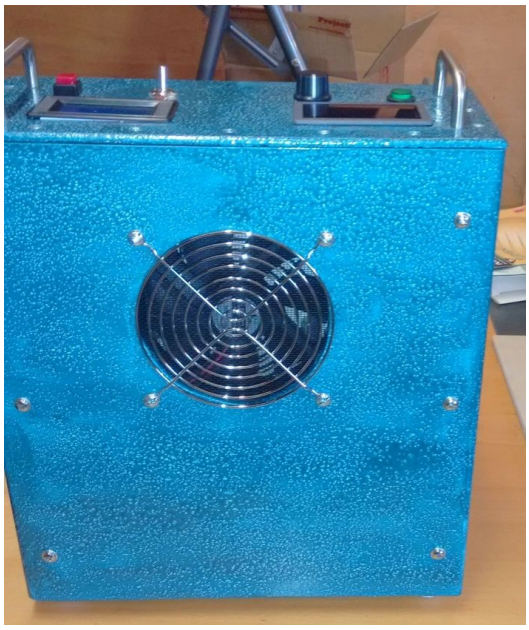
These instructions should be regard as an indicative guide rather than an absolute. Dimensions will vary depending on your materials and needs. Likewise you may have a preferred way of doing things. Enjoy.



Front view

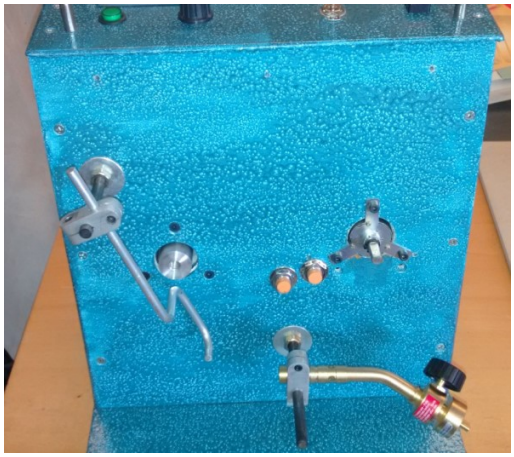


Side view



Back panel

Top panel



Motor mount panel

Hopper panel

Spacer panel viewed from rear

Drums and rotors

Cabinet internals

The Cabinet

The cabinet consists of:

- The base
- Left & right side panels
- The back panel
- The front panels.

The materials were chosen on the basis of what scraps I had lying around.

The base. For the base I used a piece of 300x300x18 chipboard. I chose this so as to have a bit of weight at the bottom for stability.

The side panels. The side panels were made from 7mm ply. They are designed so that the front panels are inclined to the rear so the cases don't slip out of the hopper or drum. Depending on how tapered your cases are, you may want to increase the amount angle. For mine the panel measurements were:
100 (top), 300 vertical and 150 (bottom). To reinforce the joints internally I used 12mm square mouldings and 20x12 mouldings at the back (for the back panel to screw onto). I bought glued and screw the side panels to base to form the main structural frame for the cabinet. Everything else screw on and off. I inletted the left side panel to take the power socket. I also put 2 ventilation inlet slots near the bottom of both panels. I covered the slots with fiberglass flywire to keep out insects, fingers and other objects.

The rear panel. The rear panel measures 300x318mm (the 300x300 internal size plus 18 to overlap the base) and is attached to the side panels via screws. I specifically setup it up to be removable for accessing the internals. I let the panel towards the top to suit the exhaust fan. By having the outlet at the top of the panel and the inlet at the base of the side panels you get cross ventilation through the cabinet.

The top panel. Mine measured 300x130mm. The top panel is inlet for the displays and switches. Be aware that some of the switches may require a maximum panel thickness of 3mm. My panel was approx 5mm and I had to thin out under the switch.

The front panels. The front panel arrangement consists of thee panel: the motor mount panel, the spacer, the hopper panel. In order to ensure alignment, the panels should be screwed or clamped together when drilling the clearance hole for the drum coupling and for drilling a guide hole for the rotor drive. The spacer panel and the motor mount panel should be clamped together when drilling the 35mm clearance hole for the rotor drive. The 16mm hole in the hopper panel, for the rotor drive motor shaft, can be drilled on the guide hole.

The motor mount panel. This is screwed directly to the leading edges of the side panel, or more particularly screwed to the 12x12 mouldings glued to the leading edges of the side panels. The motor mount panel measures 300x a bit over 300 (longer because its at an angle). The panel has the following holes:

- An approx 32-35mm hole for the drum coupling. The centre for hole is located in 80mm from the left hand edge and 165mm down from the top edge. The drum motor will be located on spacers behind the panel and is connected to the drum by a 25mm diameter aluminium coupler. The hole diameter of 32-35mm is to give clearance. The motors I purchased had 3 mounting lugs with a hole to suit M4. Those holes were located at about a 28mm radius from the centre. Yours may be different so measure before drilling.
- A 35mm hole for the rotor drive motor. On my build I mounted the motor on the outside of the motor mount panel so that sufficient shaft would reach the rotor. The hole needs to be at least 35mm so that the motor and wiring can fit through. The center of this hole was positioned 225mm from the left hand edge of the panel and at least 20mm above the hole for the drum. This is so the feed ramp has enough angle for the case to roll down and not be deflected by friction or going over the sensors. (found that out the hard way). The motor lugs are the same as for the drum motor.
- An 8mm holes for each of the mounting studs for the case guide and torch holder.
- A 12mm hole for each of the proximity sensors. The proximity sensor that operates the rotor drive needs to be positioned very close to the outer edge of the drum. The other sensor can be anywhere along the feed ramp.

The hopper panel. The hopper panel sits above the motor mount panel. It holds the hopper and the feed ramp. It has a 35mm hole for the drum coupling and a 16mm hole for the shaft of the motor driving the rotor (needs clearance for the shaft circlip). The hopper panel goes from the top of the motor panel down to just below the feed ramp. It is inlet for the drum which needs to be mounted below the level of the panel so that the case will drop in.

The spacer panel. Depending on your materials, layout and tooling this may or may not be needed. It is located between the motor mount panel and the hopper panel. Mine was made from 4-5mm ply. It has the same external shape as the hopper panel and is inlet to give clearance to all of the components and fixing (shafts, nuts bolts, motor bodies etc).

Parts to be fabricated.

Drum motor coupling. The motor for the drum is mounted on spacers behind the front motor mount panel. The coupling connects the 8mm motor shaft to the drum and allows the drum to be positioned in front of the panel clear of contact with both the panel and the nut/washer for the sensor. At the same time it needs to be lower than the hopper panel so that cases can cleanly drop

into the drum from the feed ramp. Size will be dependent on your construction materials. I made mine from 25mm diameter Aluminium x 40mm. One end of the coupling is drilled 8mm to sufficient depth to accept the motor shaft. The other end is drilled and tapped M8. An 8mm hole is drilled in the drum to allow it to fasten to the coupling with an M8 socket headed cap screw. The drill and tap an M5 hole near the motor end of the coupling to allow a grub screw to fasten coupling to motor shaft.

Drum motor spacers. The drum motor is mounted on 3 spacers behind the motor mount panel. I used 16mm Aluminium rod turned to length. Others have used multiple washers stacked up together. The length is totally dependent of your panel thickness and how far out the drun needs to sit. I had to adjust mine a few times.

The drums. The drums are simply cake tins with the depth cut to suit the cases being annealed. The depth is such that the neck and shoulder of the case is well clear of the drum. An approx 25mm slot is cut in the side to allow the case to enter and leave. Most annealers are made using 5" cake tins due to there being used for .308 & 223 length cases. If your use will include longer cases then I suggest using 6" cake tins (generally able to be bought in up 50mm depth). These can be bought through eBay but I simply went down to the local kitchen supply.

Studs for the guide rod and the torch clamp. I made these from 8mm rod trimmed to length and threaded M8 on one end.

Guide rod and torch clamps. Both made from 16mm square section aluminium solid. Pretty basic concept.

Case guide rod. Made from 6.3mm aluminium rod. Need to make different size for use in short vs long cartridges. Business end should remain in the drum and out of the flame. I will probably be changing the design as I have a couple of issues with smaller cases bouncing on the rod.

Rotor. I made my rotors from 50mm diameter acetal rod (a machinable plastic). Length depends on cartridge but not critical, except for expense ☺. An 8mm hole is drilled longitudinally to admit the motor shaft. An M5 hole is drilled and tapped in one end to lock onto the motor shaft. A longitudinal slot is milled/cut in the rotor. The slot is sized to suit the cartridge being annealed. I found that putting a bevel or similar on the trailing edge of the slot can prevent cartridges jamming in the event of a partial double feed ie it allows the second case to push back into the hopper. If you intend to anneal rimmed cases then simply move the rotor out from the hopper panel enough to clearance the rim.

The hopper and feed ramp. I made these from square edged 50x25x2 aluminium angle. Bend and cut as appropriate. May take some trial and error to get reliable feeding.

Gas torch. Purchased a Tradeflame pinpoint blow torch kit from Bunnings. https://www.bunnings.com.au/tradeflame-propane-handyman-pinpoint-blow-torch-kit_p5910244 The kit was cheaper than the components. The kit uses a disposable propane bottle which is handy and easily portable. However I also bought a Coleman 1.5metre hose (part #R5470-564A) from a camping store. The hose connects from the torch to a standard 3/8 LH LPG connector so that I use a refillable LPG tank.

Electrical.

Power Input. I used an illuminated & fused IEC power socket to connect mains power to an internal power supply. The socket came with a 10amp fuse however I replaced that with a 2amp fast blow fuse bought from Altronics. Other approaches include simply connecting a lead direct to the power supply or using a external power supply (such as a laptop power supply) and appropriate socket. If you go the illuminated & fused IEC power socket you might look at the back of the socket and zero instruction and think WFT. However the following guide shows how to wire up. https://www.instructables.com/id/Wire-Up-a-Fused-AC-Male-Power-Socket/ Note the Americans use the term 'Hot' for Active and their colour code is different to ours. In Australia: Blue = Neutral, Brown = Active, Green/Yellow = Earth.
Power supply. I used a power supply mounted internally to convert from mains voltage down to 12VDC. Although it ha the same "make" and "model" designation it appears to be a generic clone and there appear to very a few variation on themes. Most make reference to have a switch to select between 110 and 220 Volt input. The I got didn't. It either is specifically 220V or electronically adjusts depending on input voltage. Before using I checked it with a multi-meter to confirm it was outputting 12V. The connections on the power supply are simply and clearly marked.

Drum motor and speed controller. This is a very simple connection. The + & - input terminal to the speed controller connected to the power supply. And a + & - wires from the speed controller to the motor. Note: the green on/off switch is connected to the speed controller via a mini connector and this will have to gently disconnected in order to mount on the top panel. Note: the digital display doesn't show the motor rpm, rather it shows the percentage of maximum speed eg 50 is half speed which for a 24 rpm motor is 12 rpm which in turn relates to how long the case is in the flame.

Rotor control sensor. The sensor to control the rotor is a three wire NPN NC sensor with 4 mm range. This means it is normally closed except when a metallic object is above it. In other words it will be supplying power until the case is above it at which time it'll cut power to the motor. The three wires are:
Blue – This is connected to the Negative power supply

Brown – This is connected to the Positive power supply
Black – connects to load ie to the Negative wire on the motor.
The Positive wire on the motor connects to the positive power supply via an on/off switch. I used a toggle switch from Altronics (part #S1040).

Sensor for the case counter. In this case I used athree wire NPN NO sensor with 4mm range. This is a normally open sensor which means that it only sends a signal to the counter when something metallic passes in front of it. The three wires on the sensor are:
Blue – This is connected to the Negative power supply
Brown – This is connected to the Positive power supply
Black – acts as a signal and is connected to the counter.

Digital counter. A case counter is not needed but I find useful. There seems to be a fair amount of variation in counter styles. The one I bought came with a sensor. If I had bothered to read the ad properly I would have realized that the included sensors was of a magnetic type and of no use to me. Hence more delay while I order the right type of sensor. The instructions with the counter were useless. Very brief and in Chinese. Complicating factor was that this counter could be wired to count up and or down. It had 6 wires. There were two wires on a separate connector. These were designed to be connected to a momentary switch which acts as a reset button for the counter. The momentary switch was not included so I bought one from Altronics. The other wires were a red, black, purple and green. The red & black connected respectively to the positive & negative power supply. After a bit of trial and error, I connected the purple wire to the black wire from the sensor. The green was not used. The counter will store the count if switched off, and recommenced when switched on again. To go back to zero, just push the reset button.

Parts sourced from eBay

Sensor for case counter

4mm Inductive Proximity Sensor Switch NPN NO DC 6-36V 200mA 3-wire LJ12A3-4-Z/BX
https://www.ebay.com.au/itm/4mm-Inductive-Proximity-Sensor-Switch-NPN-NO-DC-6-36V-200mA-3-wire-LJ12A3-4-Z-BX/333124620021?ssPageName=STRK%3AMEBIDX%3AIT&_trksid=p2060353.m2749.l2649

Illuminated and fused power socket

(Replaced the supplied fuse with a 2amp fast blow fuse from Altronics)

NEW 3 Pin AC Inlet Male Plug Power Socket With Fuse Switch 10A 250V 3Pin WG
https://www.ebay.com.au/itm/NEW-3-Pin-AC-Inlet-Male-Plug-Power-Socket-With-Fuse-Switch-10A-250V-3Pin-WG/264511393865?ssPageName=STRK%3AMEBIDX%3AIT&_trksid=p2057872.m2749.l2649

Digital Counter
(Note: I incorrectly ordered this one. The Hall Proximity Sensor is a magnetic type ie the wrong type for the annealer. However the counter worked when hooked up to the right sort of sensor.)

DC12V/24V 4 Digital Blue LED Counter Meter Plus Minus+Hall Proximity Sensor NPN
https://www.ebay.com.au/itm/DC12V-24V-4-Digital-Blue-LED-Counter-Meter-Plus-Minus-Hall-Proximity-Sensor-NPN/141351154205?ssPageName=STRK%3AMEBIDX%3AIT&_trksid=p2057872.m2749.l2649

Sensor to control the feed rotor

DC 6V-36V 200mA NPN NC 4mm Inductive Proximity Sensor Switch 3-wire
https://www.ebay.com.au/itm/DC-6V-36V-200mA-NPN-NC-4mm-Inductive-Proximity-Sensor-Switch-3-wire/233173160139?ssPageName=STRK%3AMEBIDX%3AIT&_trksid=p2057872.m2749.l2649

Speed controller for the annealing drum

Motor PWM Speed Controller DC 6-30V 12V 24V Max 8A With Digital Display & Switch
Sold by **kangdigital** (750290)
(Not currently listed by kangdigital but plenty of other suppliers.

Power supply

DC 12V 10A 120W Switching Power Supply Regulated Transformer / Safety Desig T1H2
Sold by **happyleucky** (142458)

https://www.ebay.com.au/itm/DC-12V-10A-120W-Switching-Power-Supply-Regulated-Transformer-Safety-Desig-T1H2-/192974757783

(Currently out of stock but there are other suppliers with equivalent products)

2 x Motors

2Pcs 12V DC 25 RPM High Torque Gear-Box Stabilivolt Electric Motor Replacement
https://www.ebay.com.au/itm/2Pcs-12V-DC-25-RPM-High-Torque-Gear-Box-Stabilivolt-Electric-Motor-Replacement/273808805737?ssPageName=STRK%3AMEBIDX%3AIT&_trksid=p2057872.m2749.l2649

Cooling fan for box

(Somewhat of an overkill. Standard size fan is probably plenty, if needed at all)

DC Brushless Cooling PC Computer Fan 12V 120x120x25mm 0.2A 2 Pin Wire Black

Supplier no longer on ebay.