



**GM3SEK mains filter**

**by**

**GM6DX**

Here is a step by step guide of how to construct a mains filter designed by GM3SEK. Full details of his filter can be found at: <https://gm3sek.com/2019/10/11/clean-up-your-shack-2019/>.

You will need the following:

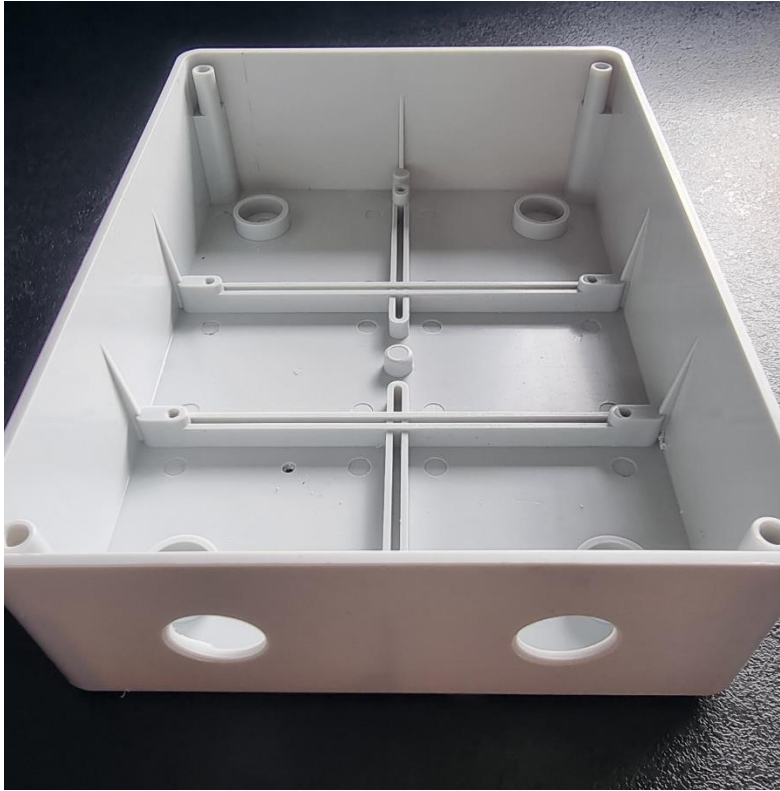
- 1 x 190mmx140mmx70mm SER enclosure box (available on ebay etc)
- 2m of 2.5mm 3 core 3093Y heat resistant flexible cable (available on ebay)
- 2 x 5-10mm cable PG11 waterproof connector glands (available on ebay)
- 5 x full insulated blue spade terminals (available on ebay)
- 2 x self-adhesive cable tie mounts (available on ebay)
- 2 x m4 bolts 25mm long with flange nuts (available on ebay)
- 6 x cable terminal blocks for 2.5mm wire (available on ebay)
- 1x 12mm wide cable tie (at least 300mm long)
- 2 x 6mm cable ties (at least 300mm long)
- 1 x 6 way 13amp extension lead (2m long)
- 1 x 20A emi filter for UK mains voltage/50Hz (available on Ali-express)
- 2 x Fair-Rite oval core 2643167851 (available on ebay, Farnell, mouser)
- 1 x Large Fair-Rite core 0431177081 (available at hamgoodies.co.uk, Farnell, ebay)
- 1 x roll of electrical tape

You will need some tools such as,

- Cordless drill
- Screwdrivers
- Snips
- Pliers
- Hot glue

Let's look at the construction.

The first step is to mark two holes and drill them into the side of the plastic enclosure, this is to hold the cable glands for the electrical socket and plug.



The second step is to sit the EMI filter in the box and drill 2 x 4.5mm holes which will allow the bolts to come through the box and bolt the EMI filter in place



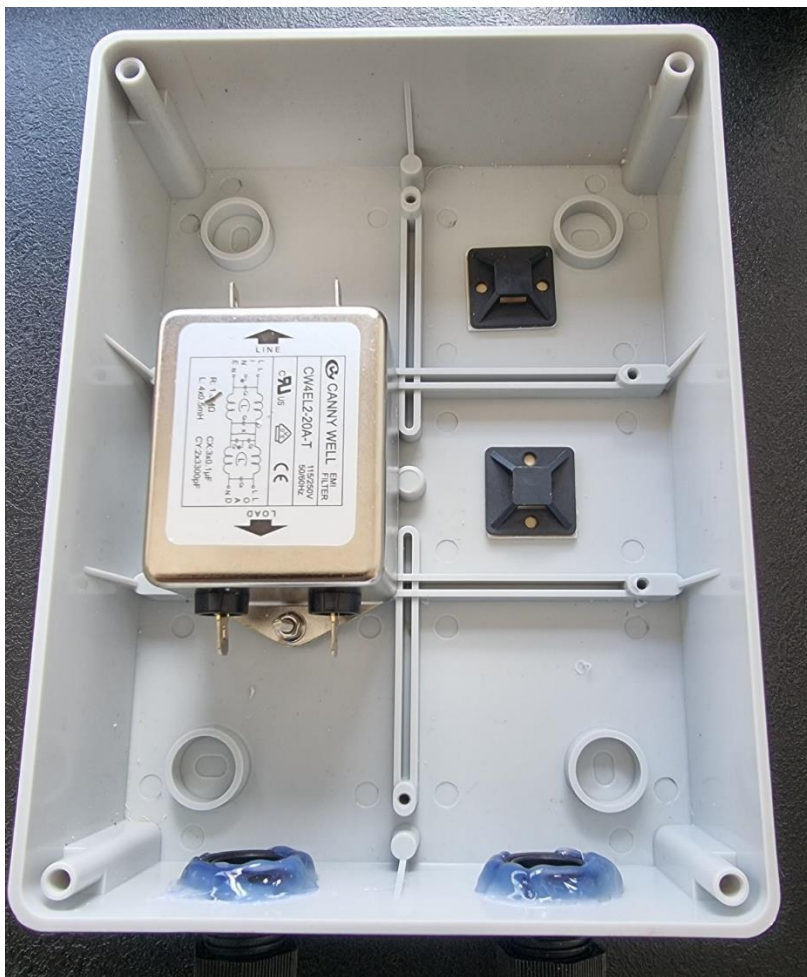


Once you have drilled the holes, place the bolts or machine screws up through the back of the box and bolt the EMI filter in place.

Next, fit the cable glands and put some hot glue on the back of the gland nut to prevent them from slacking off.



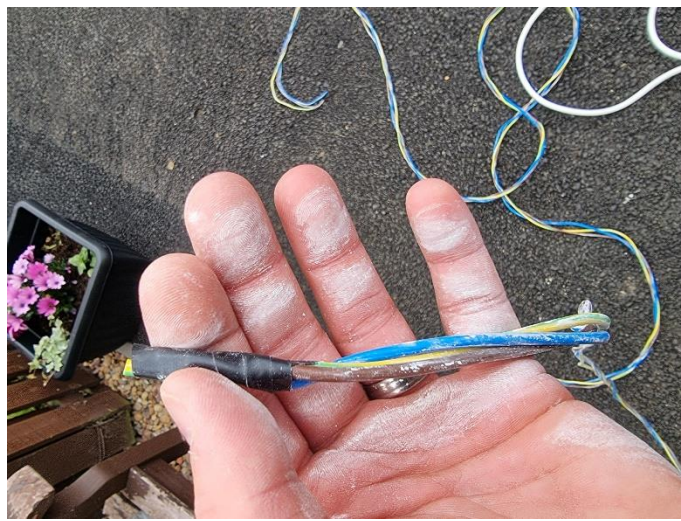
Once the glands are fitted the next step is to fit the 2 x self-adhesive cable tie pads. These allow you to put a cable tie through them which will hold the toroids in the box.



This is the box all ready to receive the wiring. Now we need to get the three core cable out of the heat resistant cable sheath. Run a Stanley blade along the length of the 2m cable, mind and watch your fingers.



Once the cable is removed, tape one end of the cables together.



Wrap the cable around a table leg or garden bench leg to hold the wire in place.



Place the other end of the cable into the cordless drill chuck and slowly turn the drill until the 3 core wire wraps tight around each other.



Place the drill on the ground and tape the three cables together about every 6 inches along the length of the cable, this will hold the cables in a twisted shape to a reasonable degree.



That's the cable done now it's time to prep the toroids. Glue the two oval toroid's together.



Now insert the wire through the 2 oval toroids, **3 times**. The count is from when the first wire passes through one of the toroids.



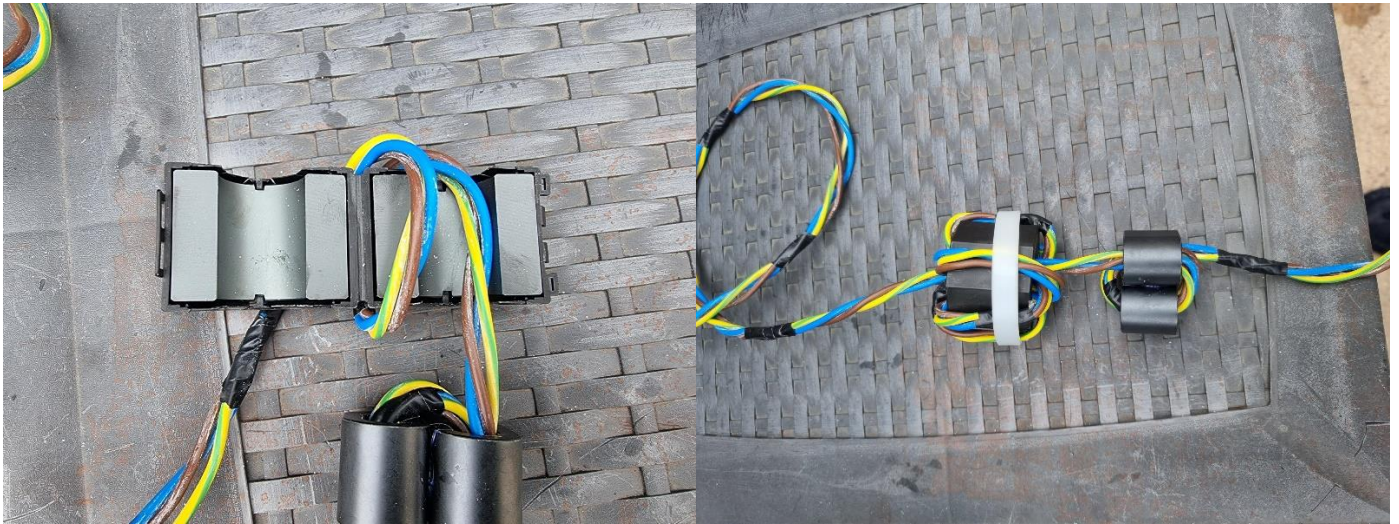
*(STEP 1 leave 10 inch of cable below toroid)*

*(COMPLETE)*

You will see that the cable passes through the hole to the right at the bottom and leaves at the top through the hole to the right.

As the cable leaves the top of the hole to the right, it then goes through the large toroid, **where 7 passes** is needed. Again the number of turns is when it passes through the centre of the toroid. The

key here, is to only leave about 1 inch of wire space between the double oval toroid and the bottom of the large toroid.

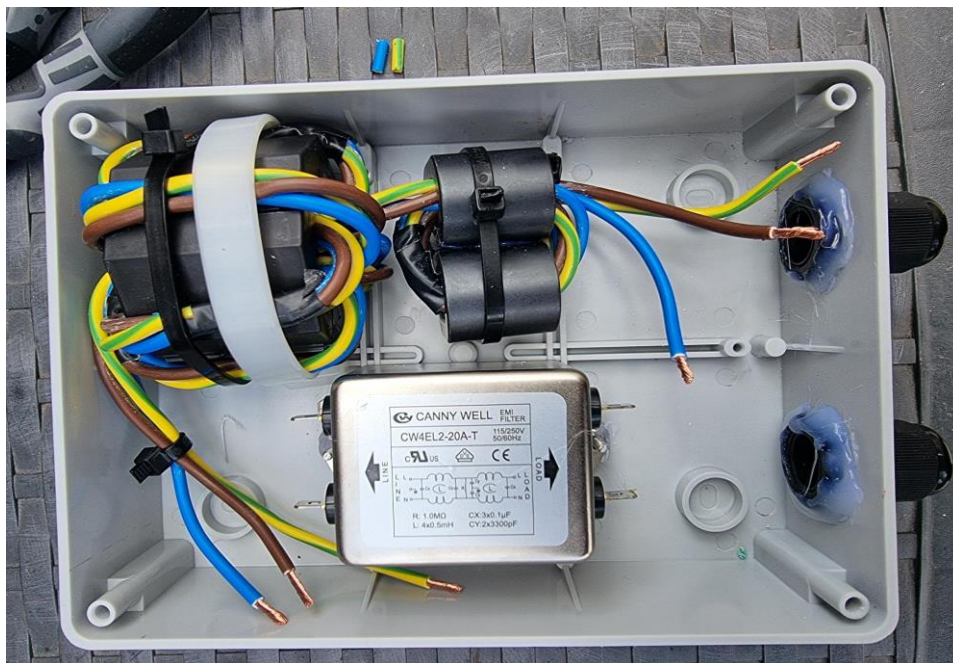


Use the 12mm wide cable tie to hold the wire turns around the large toroid ensuring that the wire turns are spaced evenly around the circumference of the toroid.

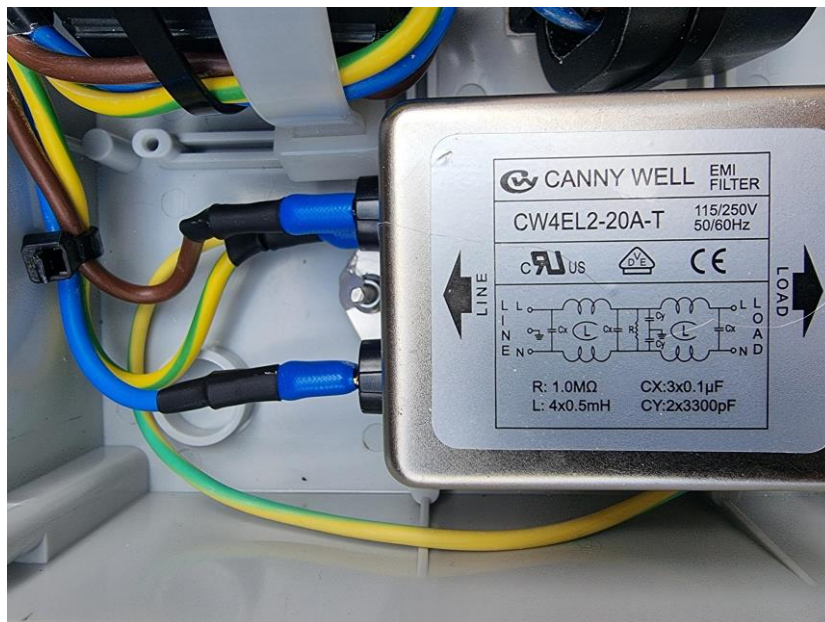
The next step is to place the toroids in the box, cable tie them in place and trim the wire to a workable length ready for the electrical connections.



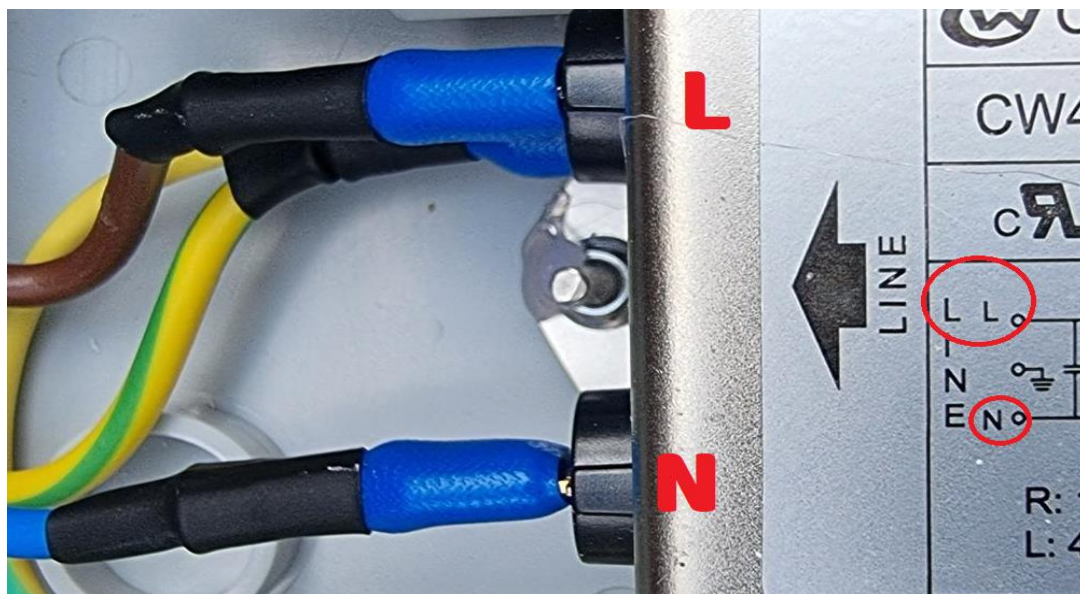
Now trim the wires and prepare them for an electrical connection.



Feed the electrical extension wire with the plug attached through the gland to the left when looking at the filter. The earth wire in this piece of cable gets connected to the earth wire coming from the large toroid. These then get connected to the earth connection on the EMI filter together. Use the blue spade connectors to connect the wires to the EMI filter.

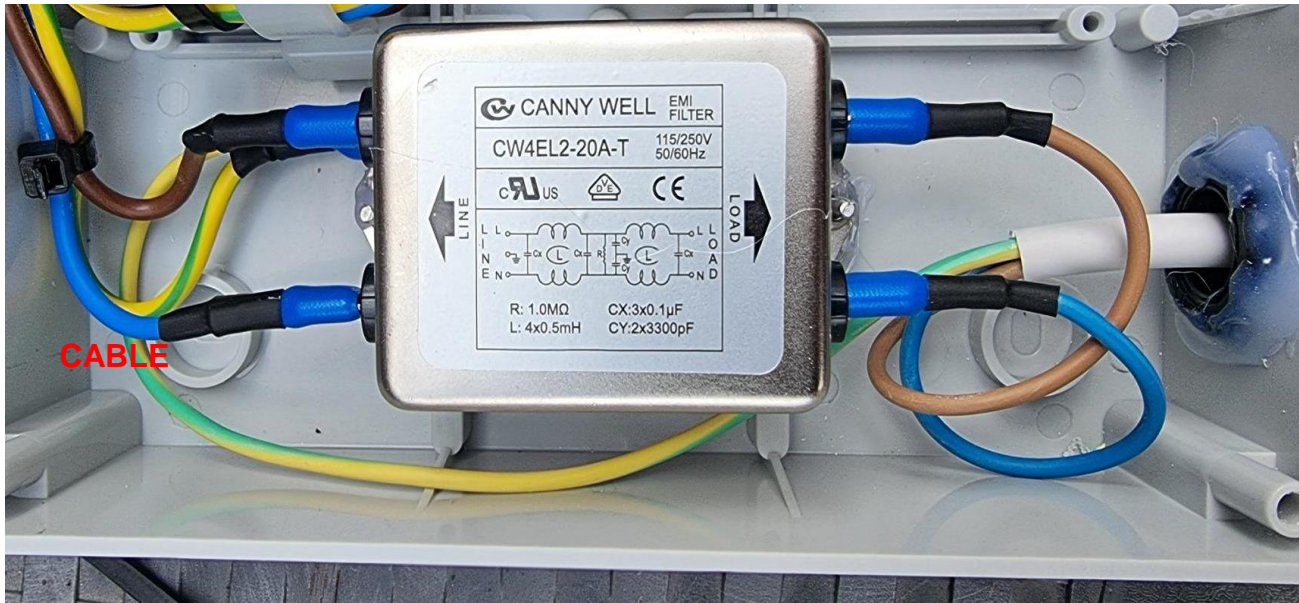


Next, fit blue spade connectors to the Blue (N) and Brown (L) wires and fit them to the EMI filter. You **MUST** ensure these are connected to the EMI filter the correct way around at both ends.

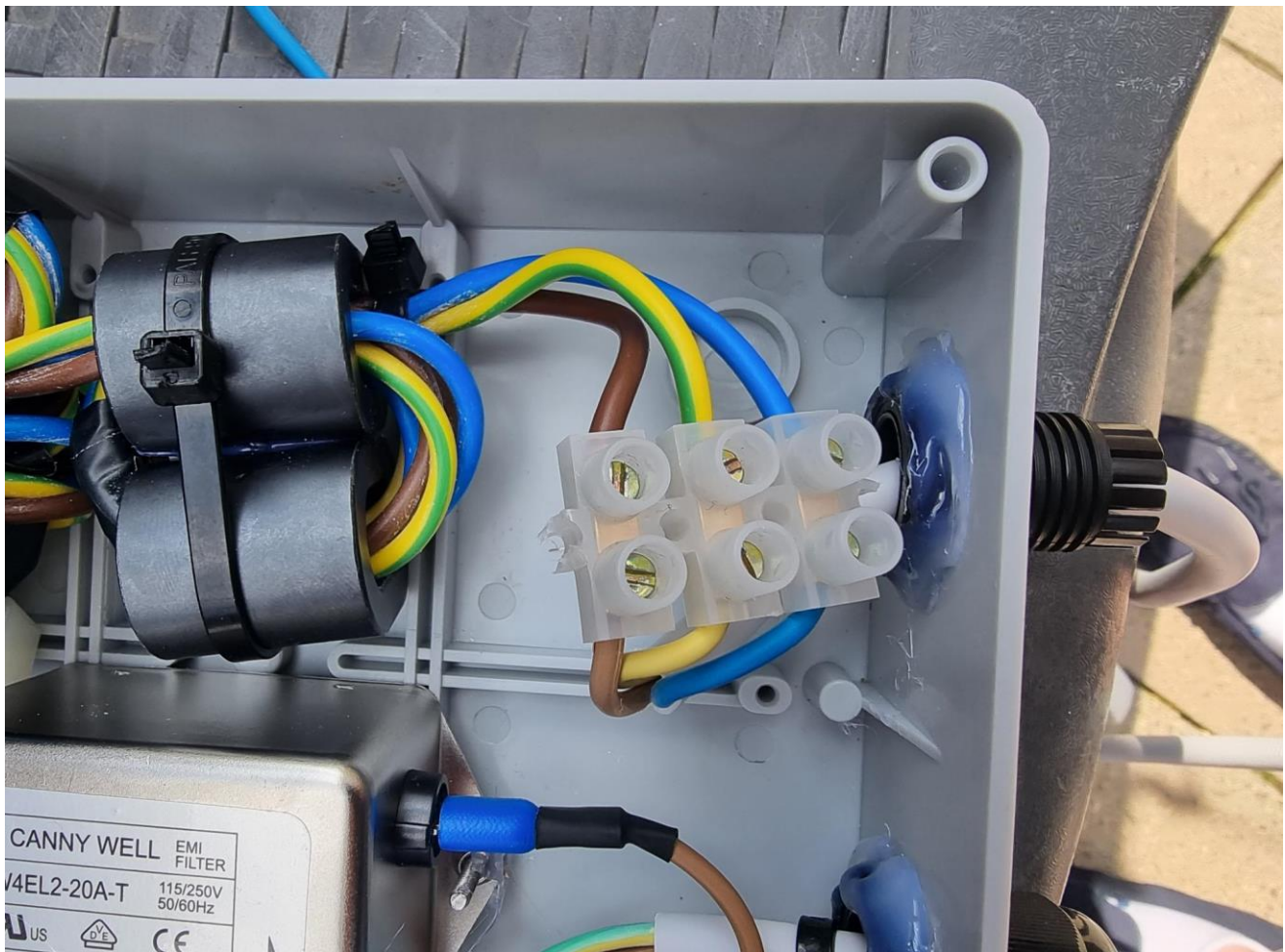




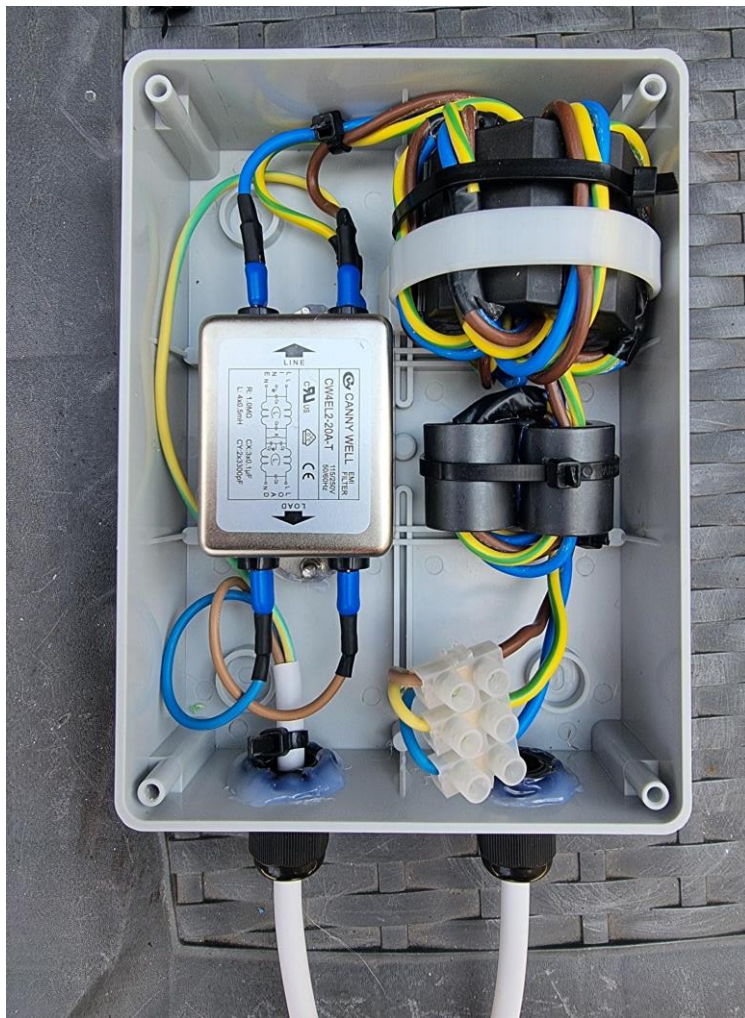
Fit another 2 blue spade connectors the remaining brown and blue wires from the extension lead and connect them to the opposite end of the EMI filter.



Time to wire the other side of the filter. Place the extension cable which has the 6 way socket attached and feed it through the gland to the right. Strip the wires back and connect them to the wires which enter the 2 x oval toroids using a connection block.



You can fit cable ties around the extension cables on the inside to prevent them getting pulled through the gland as an extra measure. Make sure you tighten up all the glands.



Here you can see the finished mains filter with the cover off. If you feel that there is a bit of movement in the components just add a bit of hot glue to help hold them in place.

You can drill a hole through this box if you are mounting it on a wall etc.



**That's it all complete.**

**Any questions drop me an email.**

**73**

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