WARNING

You are dealing with very high energy levels when using this system, which may result in personal injury or fire when handled improperly. Take appropriate safety measures and use this system with great caution. Never leave it unattended while being powered.

This product contains small parts; keep out of reach of children!

This system produces significant magnetic fields, do not use it when you have a cardiac pacemaker!

Always apply appropriate safety precautions when following this guide – they will not be explicitly mentioned in the following. If you are unsure how a specific step is properly and safely executed, don't do it!

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KWELD ASSEMBLY GUIDE

The *kWeld* “Next level” battery spot welder is available in kit form:
https://www.keenlab.de/index.php/product-category/kspot-welder-kit/

This guide refers to kWeld revisions 3 to 3.3, which share the same assembly steps. Revision 2 units (potentiometer instead of the encoder, brass-tube electrode holders) are covered by assembly manual r2.0. The revision number of your system is printed on the main electronic module, below the rotary encoder:

The kit is available in different completion grades. If you have purchased the raw materials from the shop (or have sourced them by yourself from your local hardware store), and wish to build the welder from scratch by yourself using your own tools, then you’ll want to walk through the entire document. All the necessary work steps are described in detail in the following, in an illustrated way that should be easy to follow.

If, on the other hand, you have selected higher completion grades, then you’ll have to check which sections are for you and which sections to skip. For example, if you have ordered a fully pre-assembled kit, then you can directly jump to the *SYSTEM* assembly section at the end of this document. It is important to mention that this last assembly step is always your task – it involves only simple tools and little time. There is no plan to sell fully assembled systems for two reasons:

- I could be made liable for any possible damage to you, others, or your or other’s property that may directly or indirectly result from using this system. I cannot accept this responsibility, especially because the welder deals with very high levels of energy, especially when used with high-discharge batteries like Lipos, and thus is a dangerous product either way. **You are responsible for handling this system safely.**
- As this is a small-volume niche product created for DIYers, it would not be economical to go through tedious multi-national certification processes like CE or FCC. I can only deliver raw parts to you, and it needs to be your task to create a usable product from them – and **you must take full responsibility for using it**.

The guide includes a list of required tools for each work step. Most of the pictures are showing the actual tools that I am using in my workshop, and I can recommend them all. Please only use them as an indication, because of course in many cases there are other possibilities - for example, heat shrink tubing can also be shrunk with a cigarette lighter when dosed carefully, the cable lugs can also be soldered instead of crimping them. There are many other options...

As you are dealing with electronic components when building the kit, this advice is a must as well:

ESD damage is caused by a build-up of static electricity that is released into the circuitry when you accidentally touch a conductor on the circuit board. The build-up can come from either the board, or from you, or both. I package all the kits in an ESD-safe environment and ship all units in metallic ESD safe bags, eliminating static during production. During assembly and open-frame use, please take precautions to reduce ESD:

- Avoid conditions that result in high static electricity. For example, don't unpack or handle the unit while standing on carpet. Cool and dry air is very conducive to ESD. If you're in an area or season with a lot of lightning storms, you're probably more susceptible to ESD and require more caution.
- Ground yourself immediately prior to handling by touching a metal object that is connected to mains earth. Examples of these are desktop computers, all electric devices that have a metal housing, your professional soldering station, and of course the exposed ground contact of your electrical outlet.
- Notice that your body will only sense electrostatic discharge at voltages greater than approximately 1000 volts, but electronic components will already break at voltages well below that. This means that, if you don’t recognize ESD, this doesn’t mean that it does not happen. The mentioned precautions are even more important now!

CABLE AND ELECTRODE HOLDERS

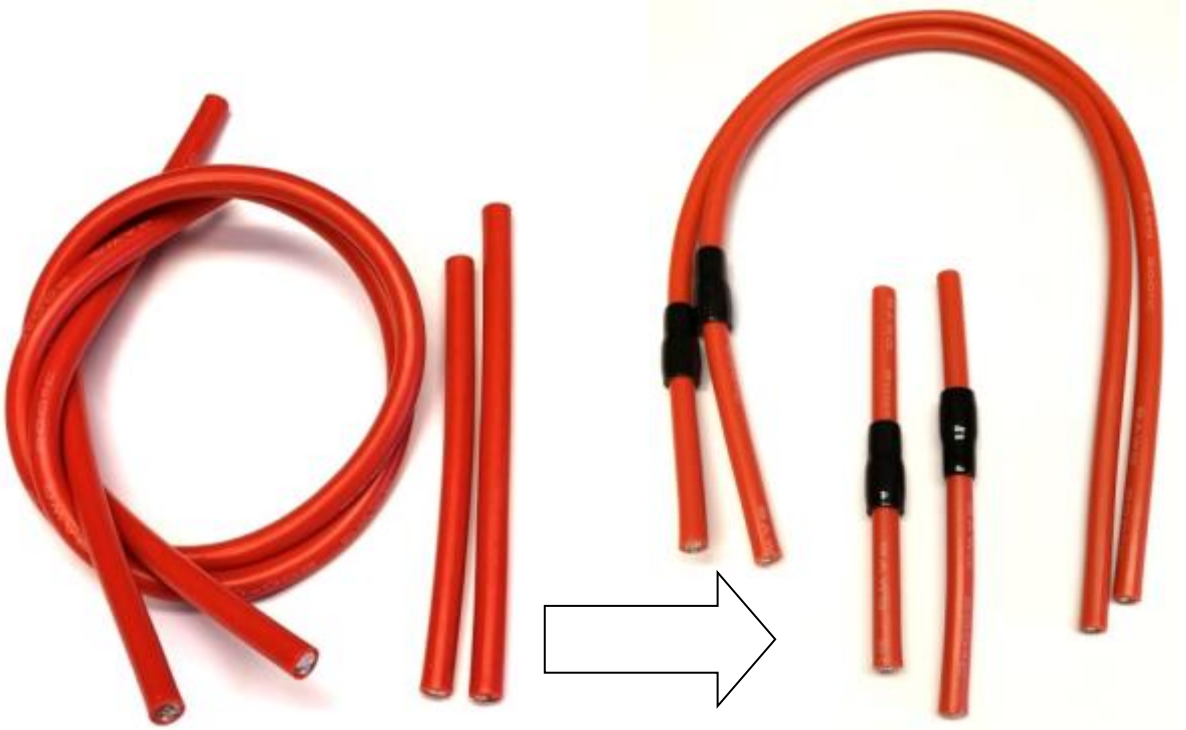
REQUIRED EQUIPMENT

Cable stripper	
Cable lug crimp tool, hexagonal aperture with **5mm** inner diameter (6mm^2 insert)	
Heat gun	

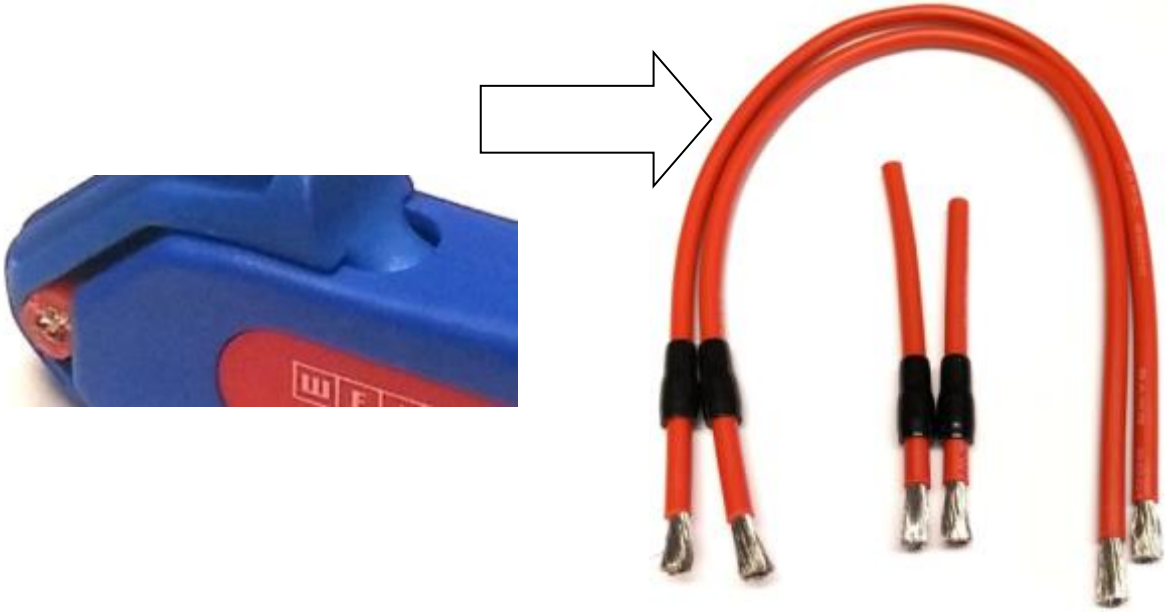
REQUIRED PARTS

1m	Cable, high-flex silicone, AWG8, cut into four pieces: 93mm and 107mm (input cables), 393mm and 407mm (electrode cables)
2	CNC machined electrode system
4	Ring cable shoes, 10mm^2, 6.5mm hole, tinned copper
4	Grommets for ring cable shoe
2x85mm	Transparent heat shrink tubing, 12mm diameter before shrinking

ASSEMBLY STEPS

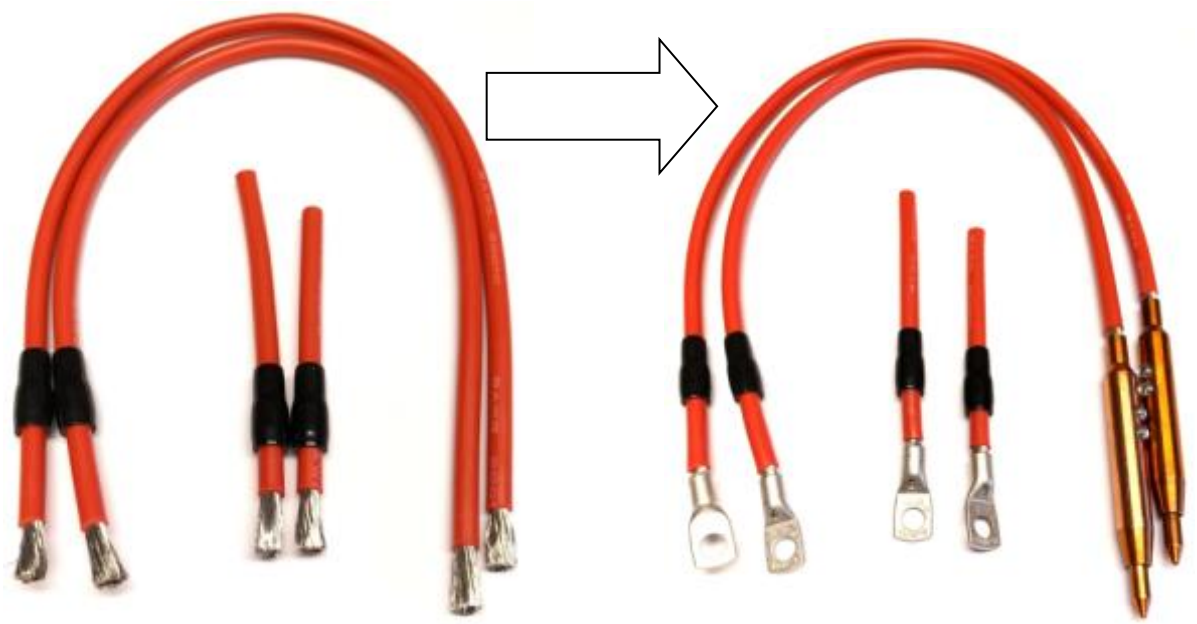


Attach the grommets to the cable sections as shown. Pay attention to their correct orientation.

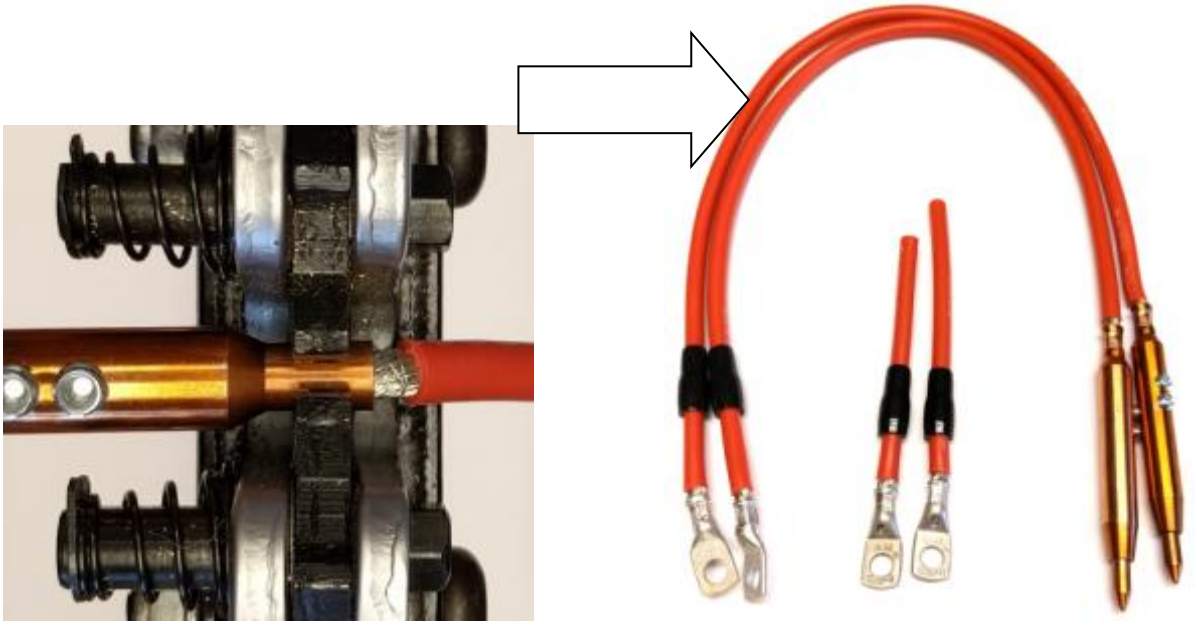


Use the cable stripper to remove the insulation at a length of
- 10mm **at one side** of each of the two short (input) pieces
- 10mm at both sides of each of the two long (electrode) pieces

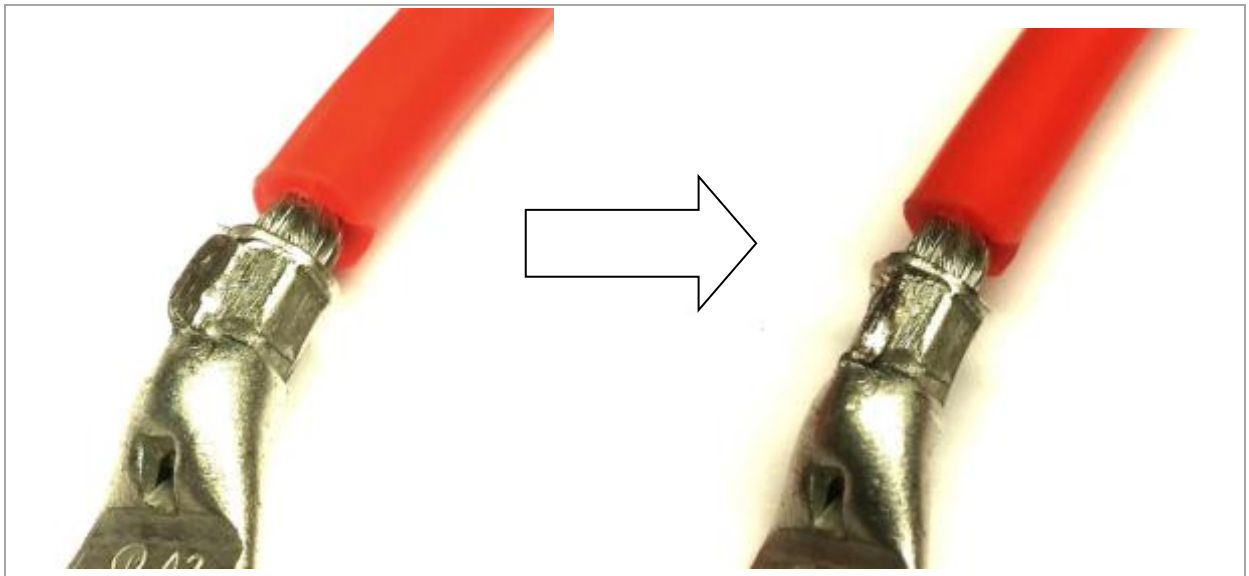
Strip the insulation on the other side of the two short pieces at a length that suits your input connector. When using the XT150 connector from the shop, the recommended length is 5mm.



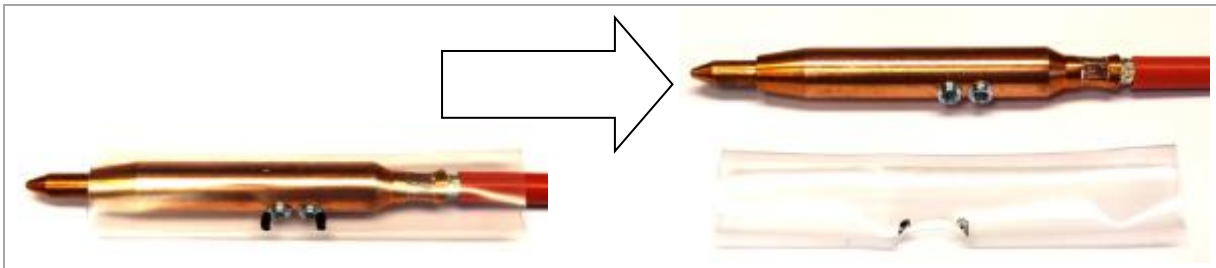
Attach cable lugs and electrode systems to the cable ends. Insert as many strands of the core as possible. It should be possible to insert all strands; it helps to rub and spin the core between your fingers to further compress them. Do not excessively twist them, because that *increases* their diameter.



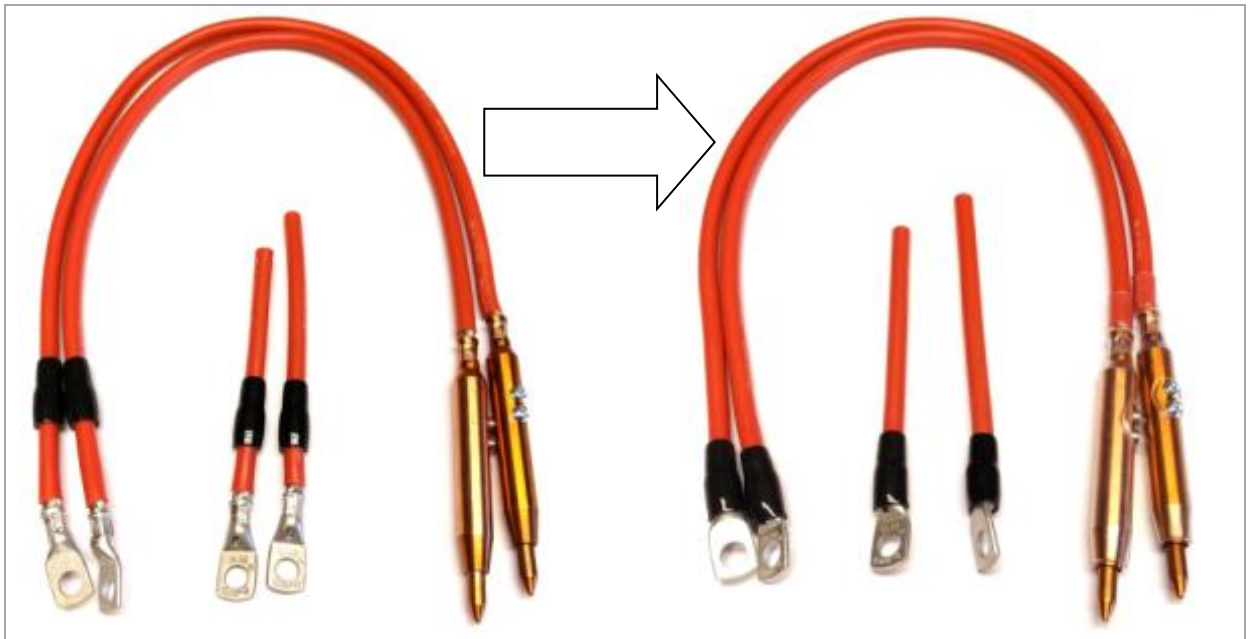
Press the cable lugs and brass tubes using the heavy duty crimp tool. Carefully center each part as shown on the left to achieve a good fit.



Check for burrs and flatten them.



Mark the heat shrink tubing like shown on the left, in order to create a cutout for later access to the set screws.



Slip the prepared tube pieces over the electrode holders, and shrink them with the heat gun. Shove the grommets over the cable lug's crimp sections.

INPUT CONNECTOR

REQUIRED EQUIPMENT

Soldering iron with at least 80W and large tip	
Solder with flux core	
Tack flux (optional)	
Two pairs of pliers	
Kapton tape	

REQUIRED PARTS

1	Set of two male XT150 terminals (contacts and red+black housings)
2	Assembled input cables

ASSEMBLY STEPS

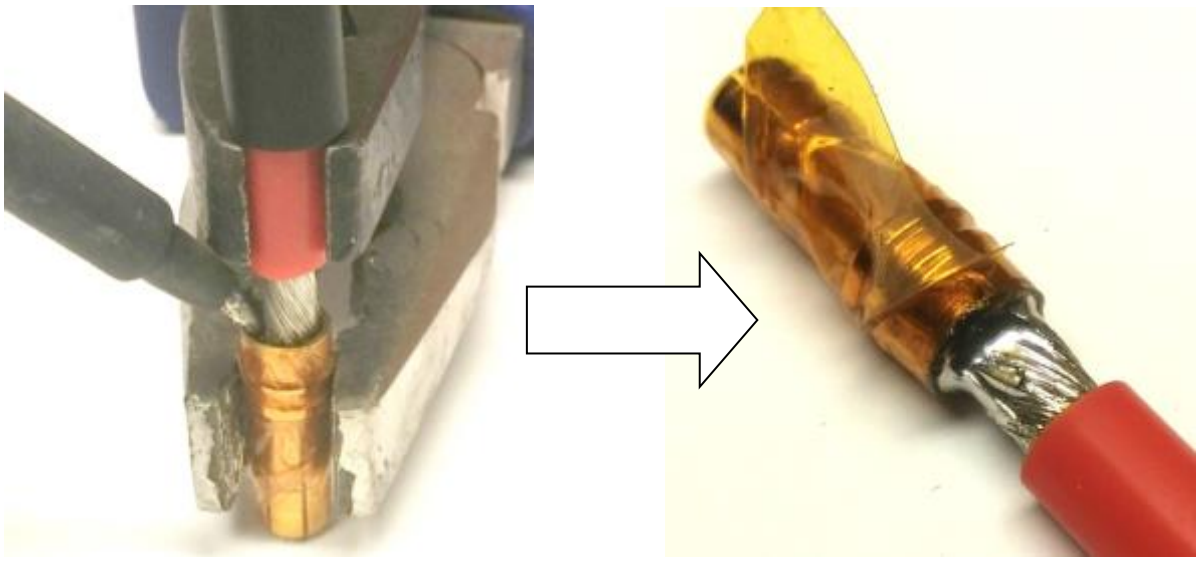
IMPORTANT! The two input cables have different lengths. It is important that you match them correctly with the input terminals:

NOTE: in the pictures the two cables look equally long; the real pieces differ by 14mm, the longer one is the positive input.

- The **longer** cable receives the positive / PLUS terminal
- The **shorter** cable receives the negative / MINUS terminal

Wrap a few layers of Kapton tape around the XT150 contact element (left picture). This serves two purposes: it adds thermal insulation and eases soldering when the element is clamped in the pliers, and it prevents solder from flowing down the sides of the element. Pour some tack flux into the cup as shown in the right picture. Fill roughly 1/5 of the cup depth.

Wrap rubber bands around the handles of both pliers. Build a stack as shown above and clamp the contact element in the lower one, and the cable in the upper one. Carefully insert all strands of the cable core. Make sure not to forget the contact housing in this setup! I know what I'm talking about…



Hold the soldering iron as shown above, making sure to touch both the contact piece and the cable core. After a heating phase of approximately ten seconds, start adding solder to that joint. Continue with patience, until the cup is entirely filled and the liquid solder has formed a meniscus between contact and cable core. The result should look like in the right picture.

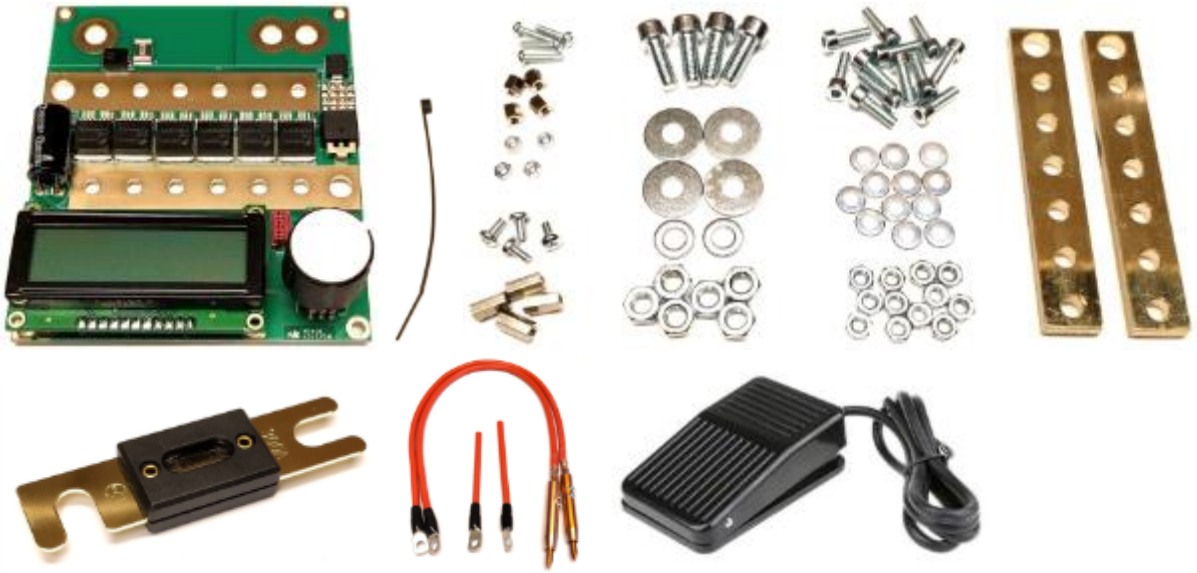
Remove the Kapton tape, and pull the contact housing into position. It clicks noticeably when it locks; you have to pull firmly.

SYSTEM

REQUIRED EQUIPMENT

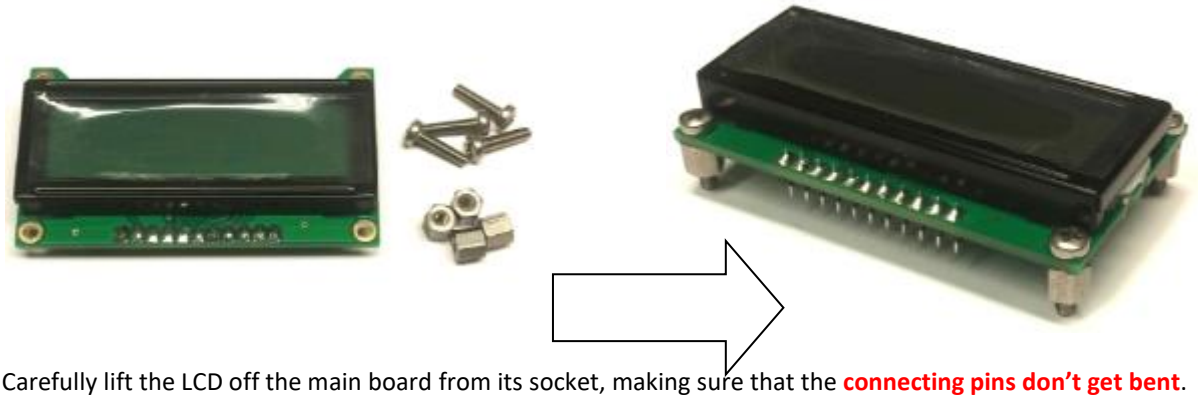
Allen keys 3mm and 5mm	
Wrenches 5mm, 7mm, and 10mm	
Flat-tip screwdriver 2mm	
Philips head screwdriver PH1	

REQUIRED PARTS

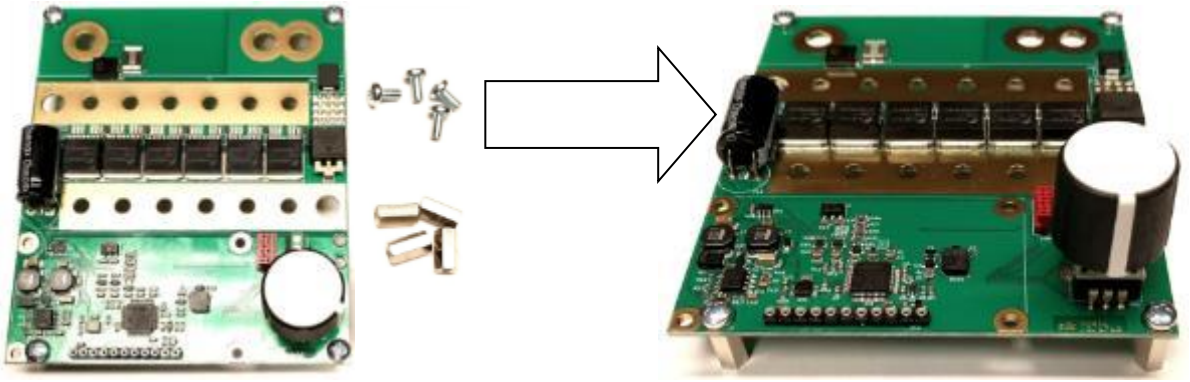


1	Assembled electronics module with dial knob and LCD
2	Assembled electrode cable assembly with electrodes
2	Assembled input cables
2	CNC machined brass bus bars
1	Foot switch
1	Fuse ANL 300A
12	Screw DIN912, M4 x 12mm, steel galvanic
4	Screw DIN912, M6 x 16mm, steel galvanic
12	Nut DIN934, M4, steel galvanic
6	Nut DIN934, M6, steel galvanic
12	Washer DIN125, M4 x 9mm x 0.8mm, steel galvanic
2	Washer DIN125, M6 x 12mm x 1.6mm, steel galvanic
4	Washer DIN9021, M6 x 18mm x 1.6mm, steel galvanic
4	Standoff M3 x 10mm, female-female, brass galvanic
4	Screw DIN7985, M3 x 6mm, steel galvanic
4	Standoff M2.5 x 5mm, female-female, brass galvanic
4	Screw DIN7985, M2.5 x 12mm, steel galvanic
4	Nut DIN934, M2.5, steel galvanic
1	Cable tie, 100mm x 2.5mm

ASSEMBLY STEPS

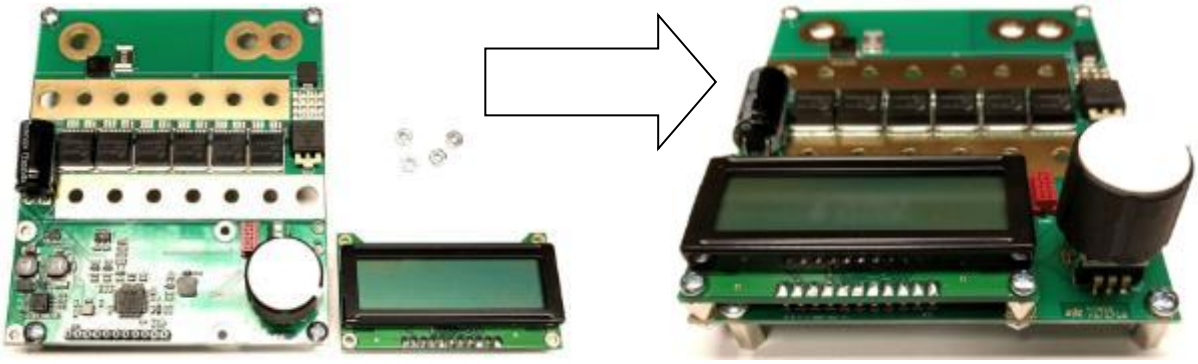


Carefully lift the LCD off the main board from its socket, making sure that the **connecting pins don't get bent**. Use the Philips screwdriver and the 5mm wrench to fasten the M2.5 screws and short standoffs to the LCD. Use only moderate torque here.

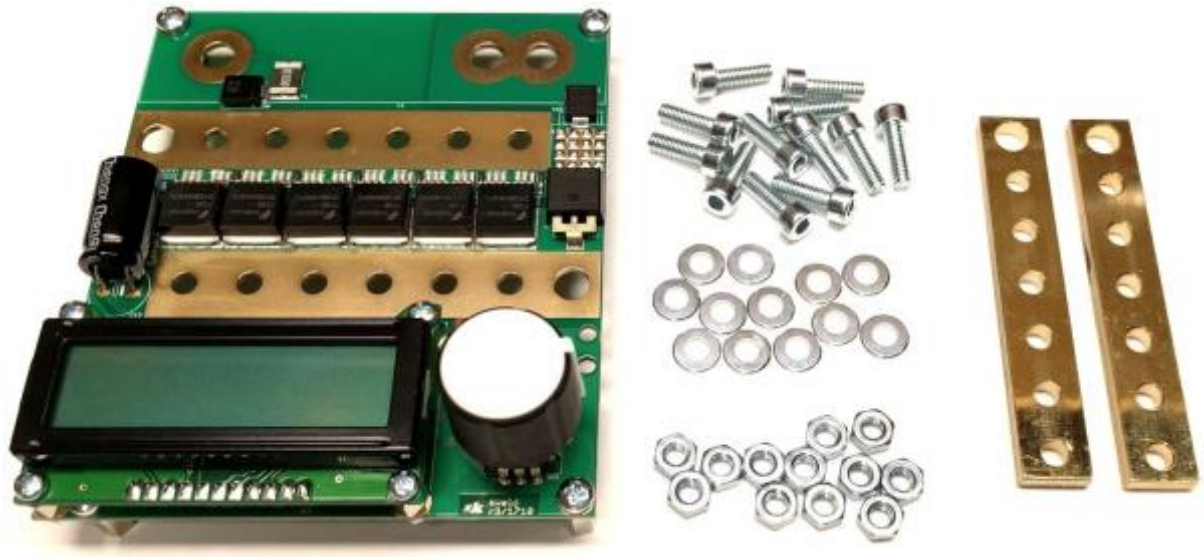


Use the Philips screwdriver and the 5mm wrench to fasten the M3 screws and long standoffs to the main board.

NOTE: if you plan to enclose the system with the **3D printed** *kWeld* housing, then please skip this step and do **not** mount these standoffs and screws. For the **laser-cut** housing, the standoffs **are needed**.



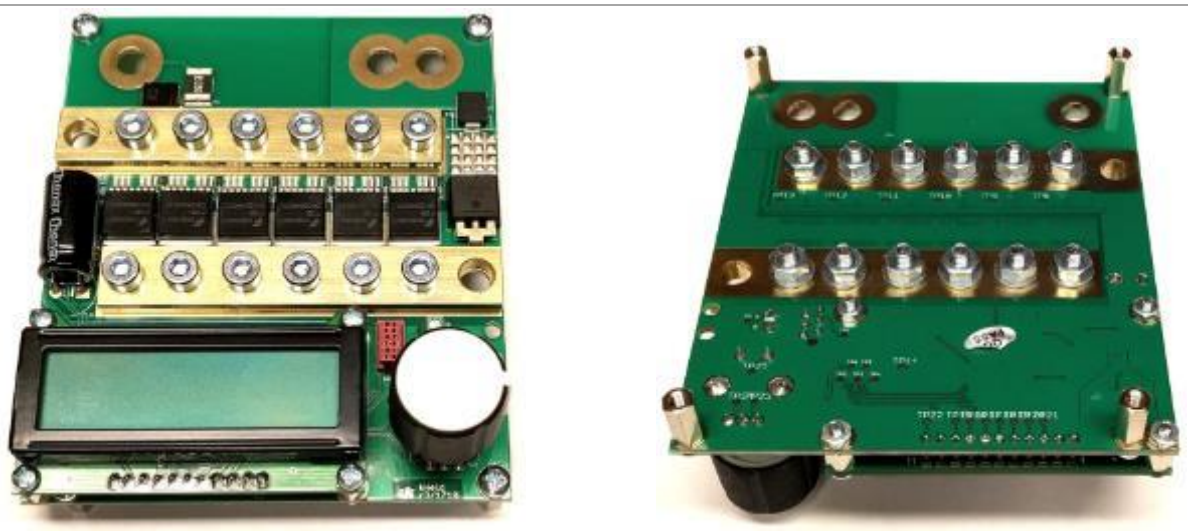
Use the 5mm wrench to mount the LCD to the main board with the M2.5 nuts. On the lower left side, there is not much space between the already mounted standoff and the screw, and it may be necessary to change the standoff's orientation to make enough space for the nut to turn.



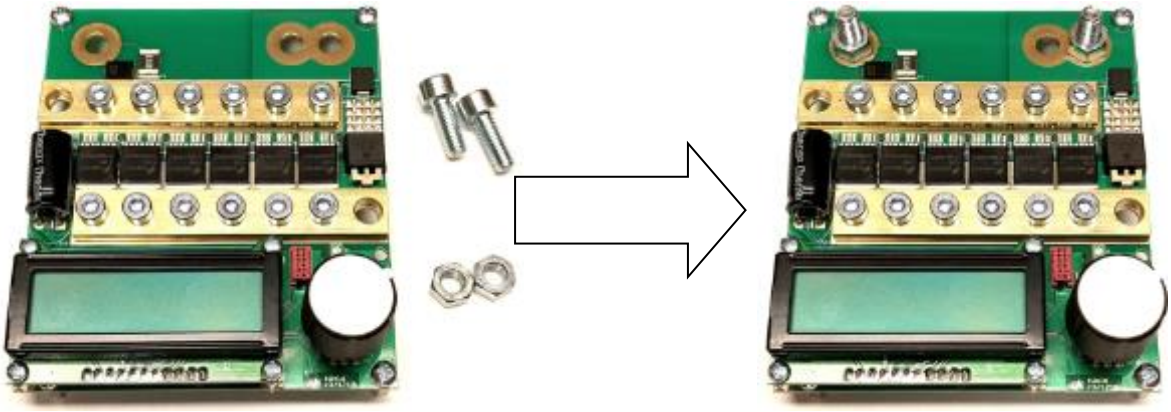
Mount the bus bars to the main board with M4 screws, washers and nuts, using the 7mm wrench and the 3mm Allen key. Use only the supplied bus bars: they are part of the current measurement circuit and must not be replaced by another solution. The washers go at the bottom side of the circuit board. When fastening the nuts, make sure that you never use the circuit board to counter the tools, and especially stay away from the large capacitor on the left. Keep paying attention to this in the following as well.

Observe correct orientation of the washers, you may damage the circuit board otherwise.

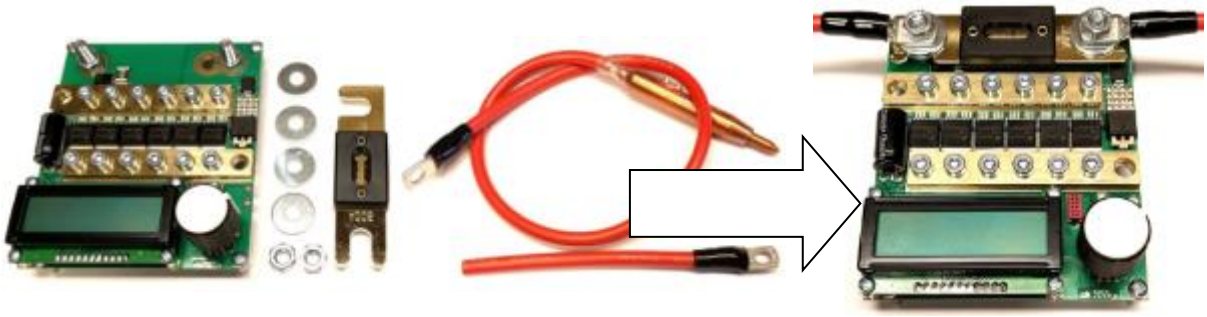
Make sure that the two 6mm holes are correctly aligned before fastening the screws.

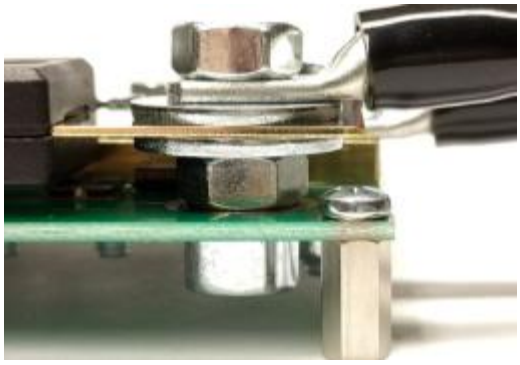


The assembly should look like this after you have finished mounting the bus bars.

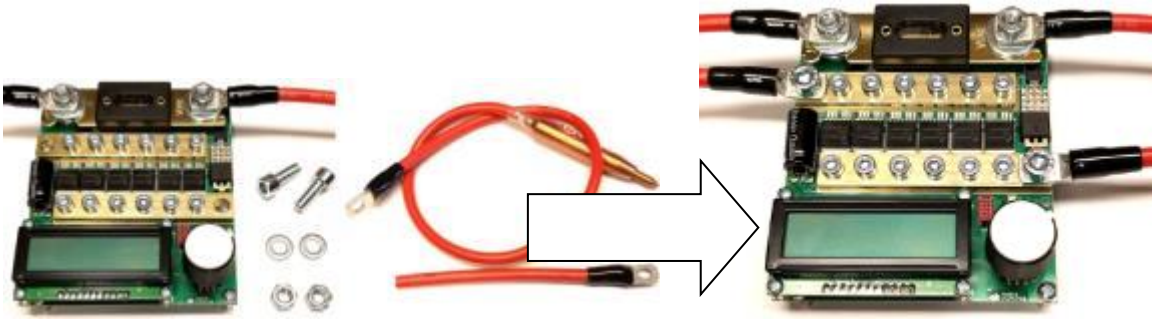


Use the 10mm wrench and the 5mm Allen key to mount two sets of M6 screws and nuts to the main board as shown on the right.



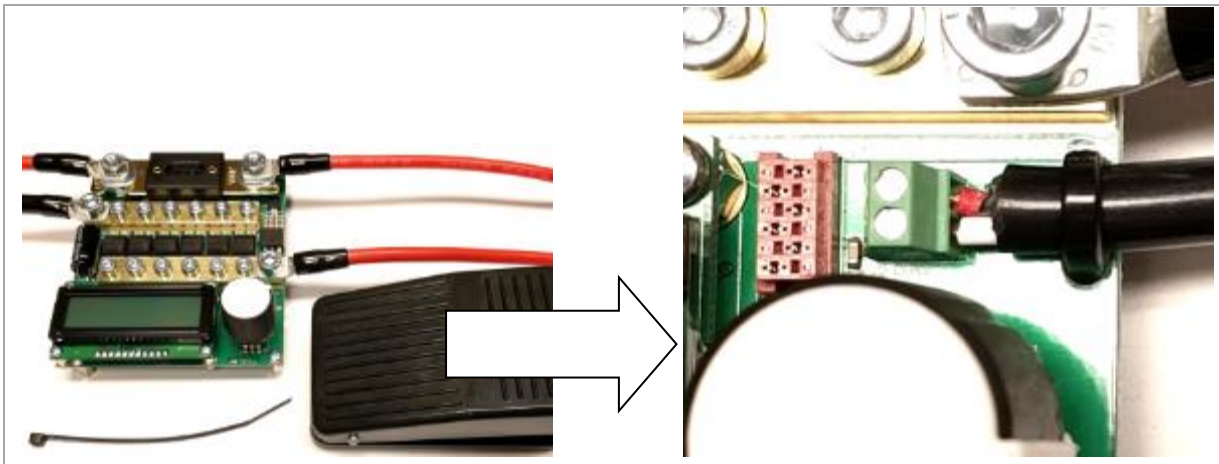


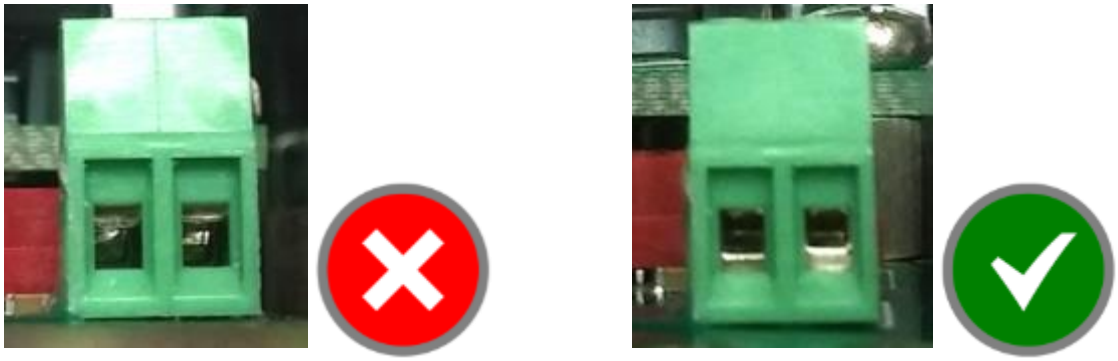
Use the 10mm wrench and the 5mm Allen key to mount the fuse, the **longer** input cable (**positive / PLUS terminal**), and the **longer** of the two electrode cables. Use two **large** M6 washers on each side, plus one M6 nut. The input cable is attached to the left fuse terminal, and the electrode cable to the right. The lower left picture shows the correct stacking: circuit board – nut – washer – fuse – washer – cable lug – nut. Pay attention to center-align the fuse.



Use the 10mm wrench and the 5mm Allen key to mount the **shorter** input cable (**negative / MINUS terminal**), and the shorter of the two electrode cables to the bus bars with one set of M6 screw, **small** M6 washer and nut on each side. Again, the input cable is attached to the left bus bar terminal, and the electrode cable to the right. Pay attention to the correct orientation of the washer as shown.

Strip the connecting cable of the foot switch: outer jacket by 8mm, inner jackets by 5mm. Cut off the black wire, it is not needed. Twist each remaining core.





Insert the tinned cable strands of the foot switch into the screw terminals on the right (above the dial, polarity does not matter), and fasten the screw terminals with the 2mm flat-tip screwdriver. Work gently as the screw terminals can bend otherwise. Make sure that the screw terminals are fully open before inserting the wires, as shown on the lower right. Slide the cable tie through the two circuit board holes and clamp the cable with it, creating a strain relief.

Congratulations! You have successfully assembled the *kWeld* kit. At this point, I suggest double-checking all connections, as a loose screw is the last thing you need at current flowing in excess of 1000 A. Also, double-check for correct wiring:

With the LCD readable (the dial at the lower right), the two input terminals are on the left: PLUS is the upper left terminal at the fuse, MINUS the lower left one at the bus bar. The electrode cables go to the two terminals on the right. Reversed input polarity destroys the unit (the copper bridge on the underside of the board burns through).

To complete the kit and make it operational, you need to connect it to a suitable power source. The *kWeld* operation manual discusses its requirements and a number of different options; this is not within the scope of this document.

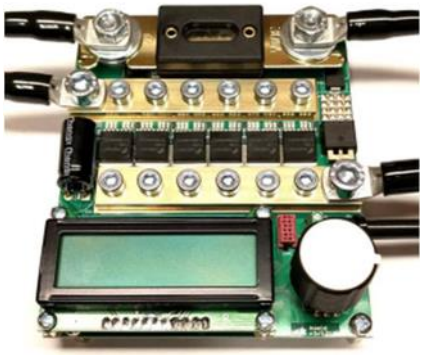
Furthermore, I strongly recommend enclosing the system with a suitable housing before connecting it to a power source. An accidental short circuit that is in front of the fuse can easily result in catastrophic failures like burning cables or batteries.

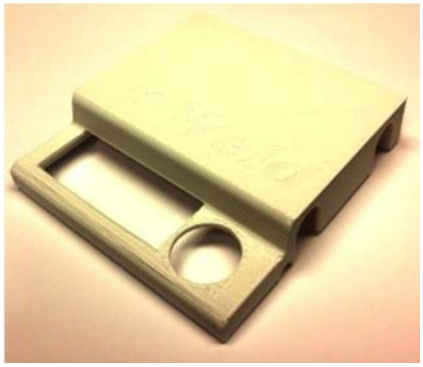
3D-PRINTED HOUSING ASSEMBLY

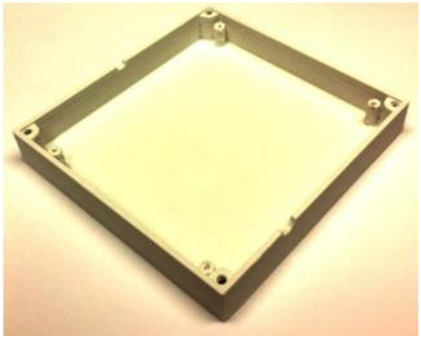
REQUIRED EQUIPMENT

Philips head screwdriver PH1

REQUIRED PARTS







1 Assembled kWeld system

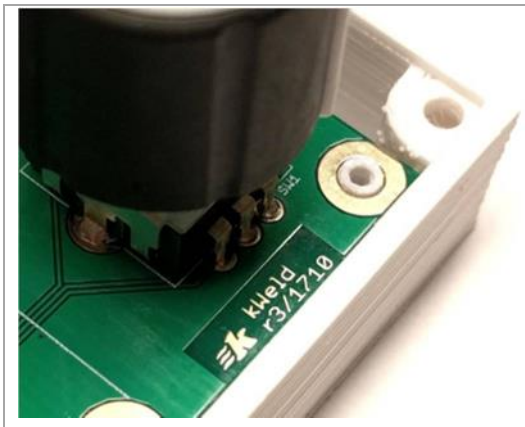
1 Lower kWeld housing shell (download: https://www.keenlab.de/index.php/product/kweld-housing-stl-model/)

1 Upper kWeld housing shell (download: see above)

4 Self-tapping screw DIN 7981, 2.9mm x 9.5mm

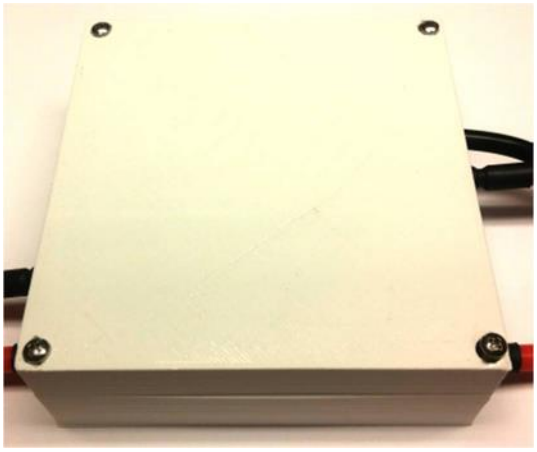
4 Adhesive rubber foot

ASSEMBLY STEPS

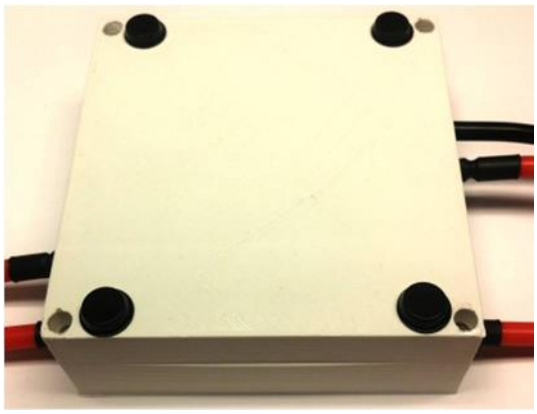


Push the circuit board into the lower shell. Ensure the correct orientation by matching the foot switch cable with the corresponding cutout. Make sure that all four edges are completely sunken into position as shown on the right.

NOTE: if you had assembled the M3 standoffs, then you need to remove them now. To remove the lower left one, you also need to temporarily disassemble the LCD. Lift the LCD straight and do not bend the connecting pins.



Fit the upper shell, carefully flip the entire package, and fasten the four screws with the Philips screwdriver. As the housing is 3D printed, take great care not to over tighten them.



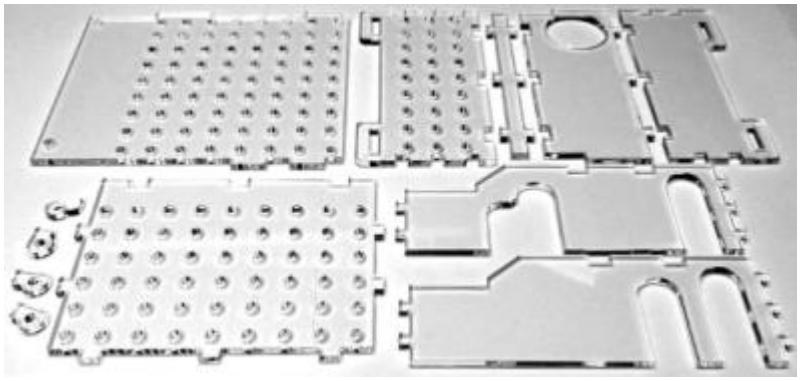
Stick on the bumpers - finished!

LASER-CUT HOUSING ASSEMBLY

REQUIRED EQUIPMENT

Pattex transparent glue (option 1)	
Acrifix 1R 192 glue (option 2)	
VMS Transpa Fix 6K (option 3)	

REQUIRED PARTS

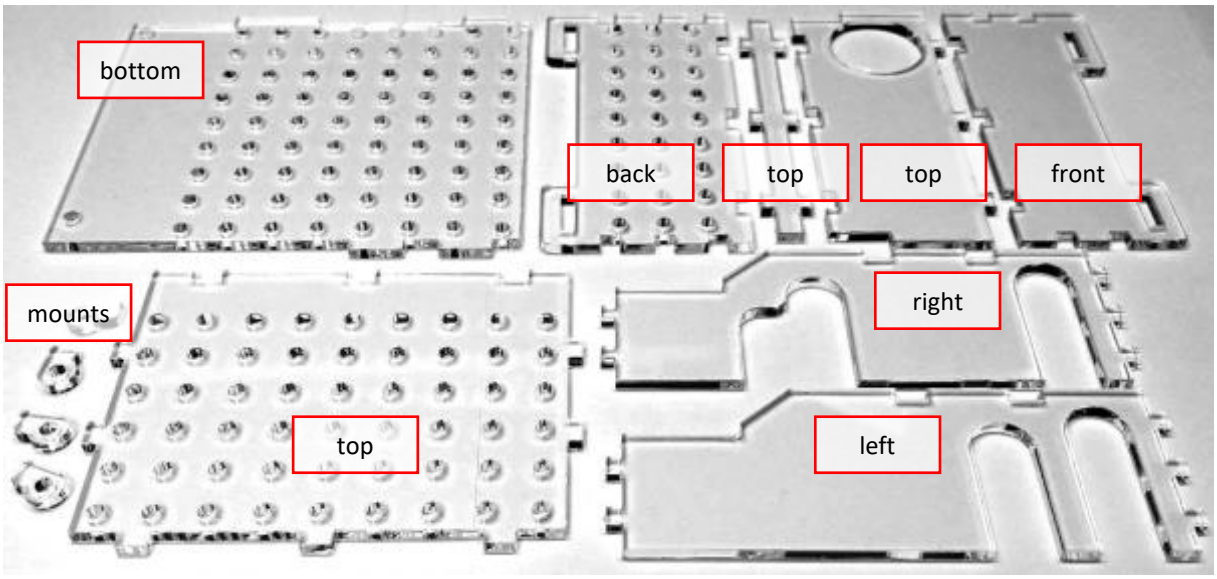


1	Assembled *kWeld* system
1	Laser-cut housing part set (see details on next page)
4	Screw DIN7985 M3x10

PREPARATION

Safety notice: when working with glue, ensure good ventilation and make sure to read and observe the related safety instructions.

The following picture gives an overview of the different acrylic glass parts that are included in the kit. All parts have protective labels on both sides that you need to remove before starting assembly. Please handle the parts carefully, as acrylic glass is far less scratch resistant than regular glass.

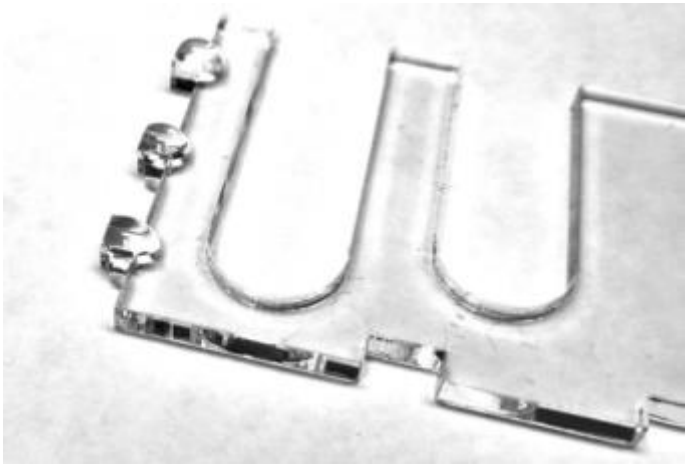


The recommended way to glue all parts together is to add a small amount of glue to the locations shown below, and then carefully join the two parts. There should be no force involved at all in any of these steps; the parts are designed to fit easily. If the suggested order of steps is followed, then it should be possible to assemble all parts at once, without letting the glue cure between each step. This approach guarantees that all joints will finally be well aligned. If you feel uncomfortable with the suggested procedure, then you should add curing breaks whenever you find them appropriate.

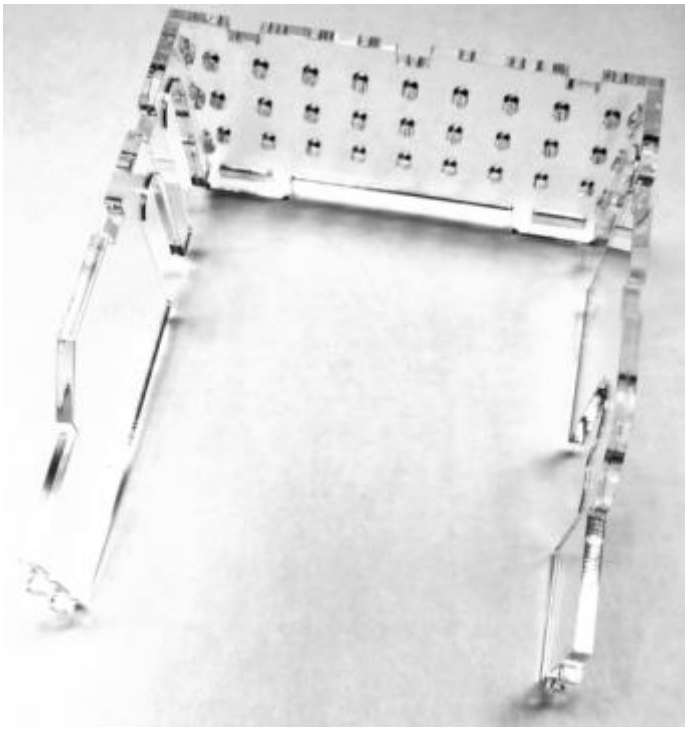
Please make sure to read to the end of this chapter *before* starting the assembly. Take your time and examine all parts. Then make up your mind and develop a procedure that you feel comfortable with.

ASSEMBLY STEPS

Apply three drops of glue to the *left* part as shown. Make sure to apply the drops to that side which will later face inside. Repeat this step with the *right* part, again making sure to wet the correct side.

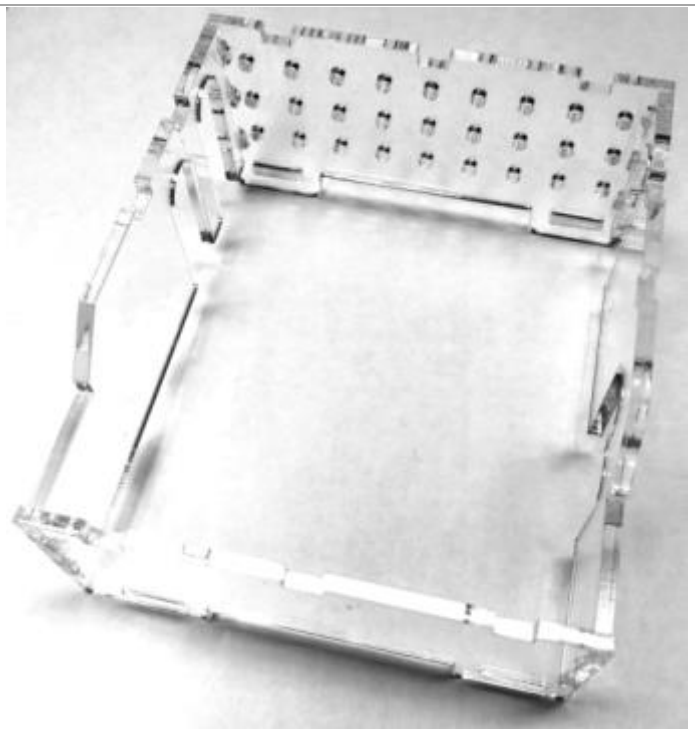


Hold the *left* and *back* parts vertically, and slide them together (pay attention, the *back* part is *not* symmetrical). Carefully lift your hand off the *left* part, grab the *right* part instead and slide it to the *back* part as well. Lift both hands, the assembly should be able to stay together on its own. The result should look as follows:

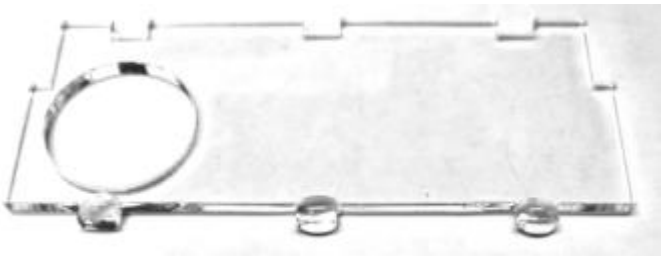


IMPORTANT: make sure not to mix up the *left* and *right* parts, as you will not be able to easily correct this mistake later. (Again, I know what I am talking about…)

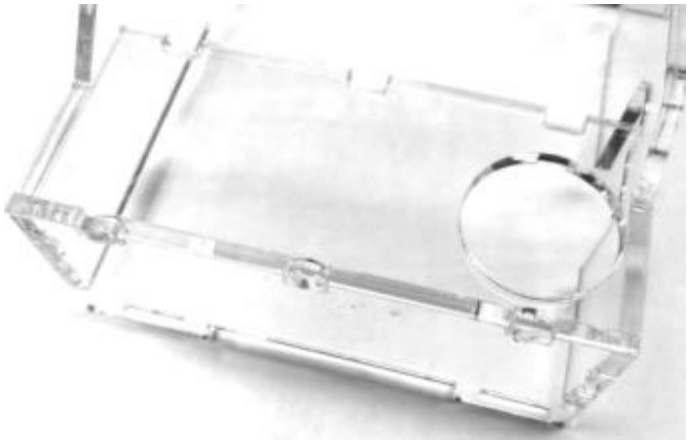
Apply six drops of glue to the nibs at both sides of the *front* part. The part is *not* symmetrical, pay attention to its orientation. Hold the result from the last step and slowly slide in this *front* part, while ensuring that the spacing between the *left* and *right* parts allows for this. You need to slightly lift both side parts one after another, in order to fit each of them. Readjust the *back* part as necessary while doing this to keep it from falling off. The result should look as follows:



Apply three drops of glue to the *top* part *with the large hole* as shown.

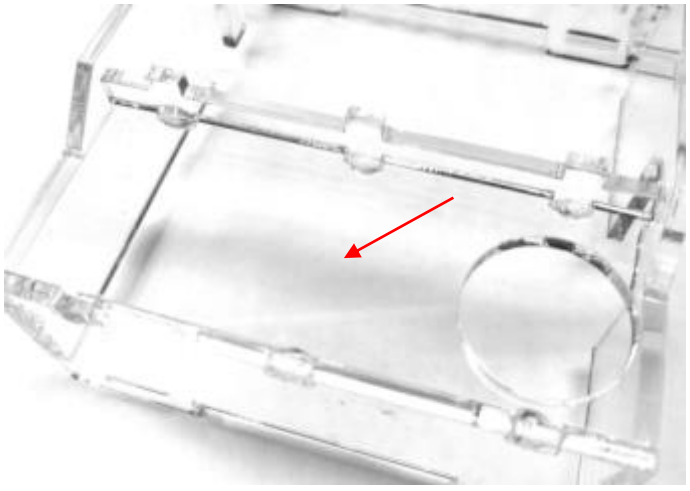


Carefully mount the *top* part *with the large hole* while holding the remaining assembly with the other hand:

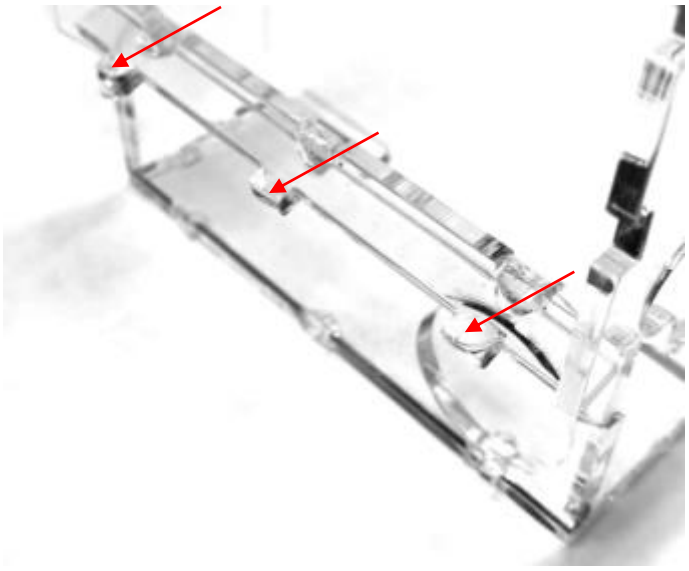


Add three drops to the *small top* part as shown (this part again is symmetrical):

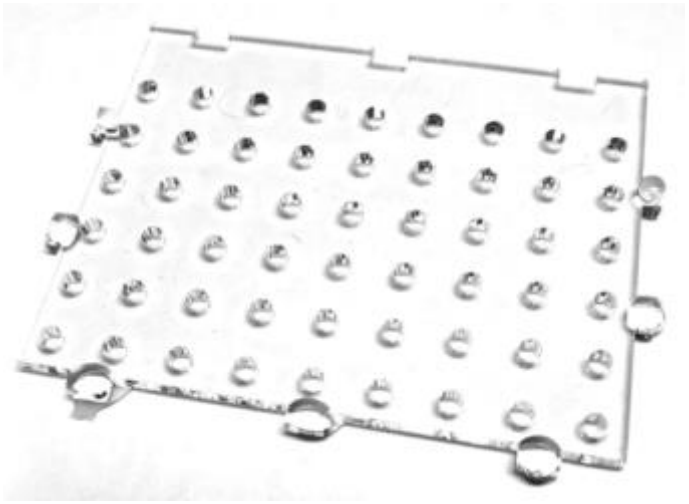
Carefully insert the *small top* part in vertical orientation between the *left* and *right* parts. While sliding it into the *top* part *with the large hole*, gently push the latter down at the shown location:



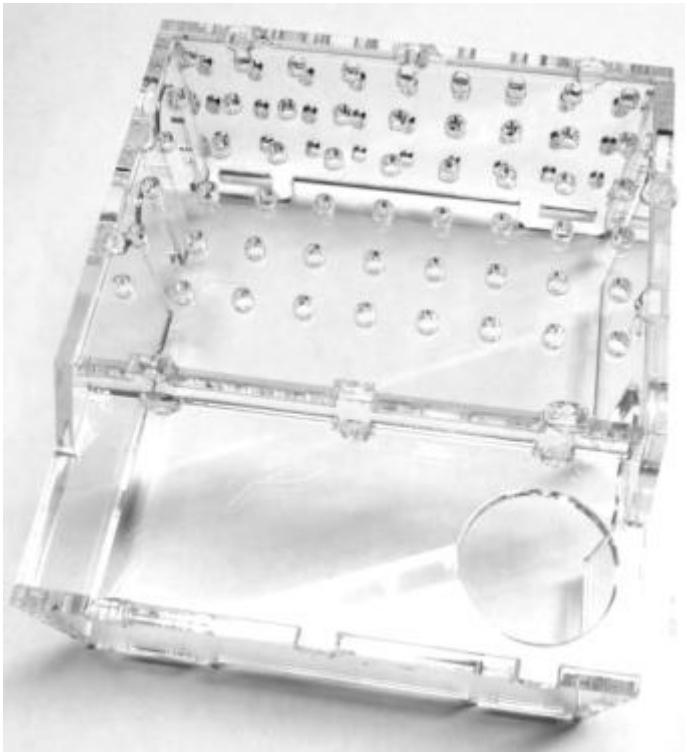
Carefully tilt the assembly, and apply three drops of glue to the locations indicated below. Make sure not to tilt the *small top* part. After having done that, turn the assembly back flat on the table.



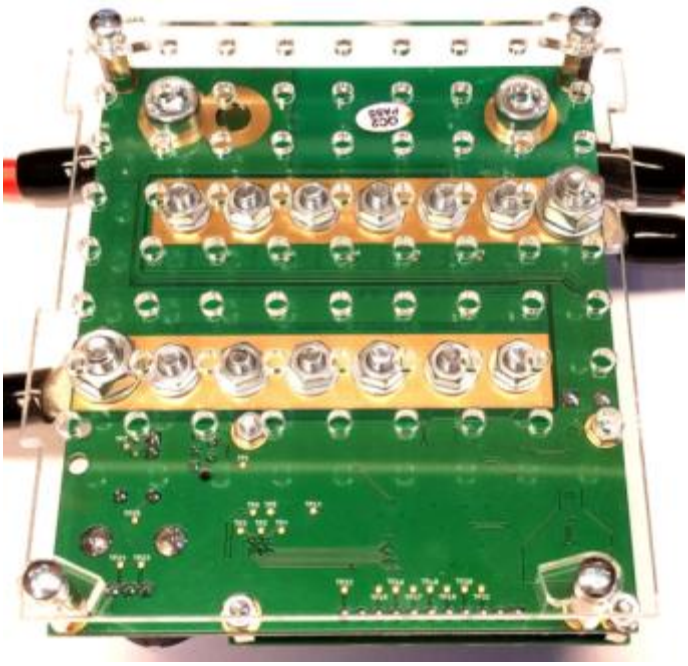
Apply seven drops of glue to the *large top* part as shown (this part is again symmetrical):



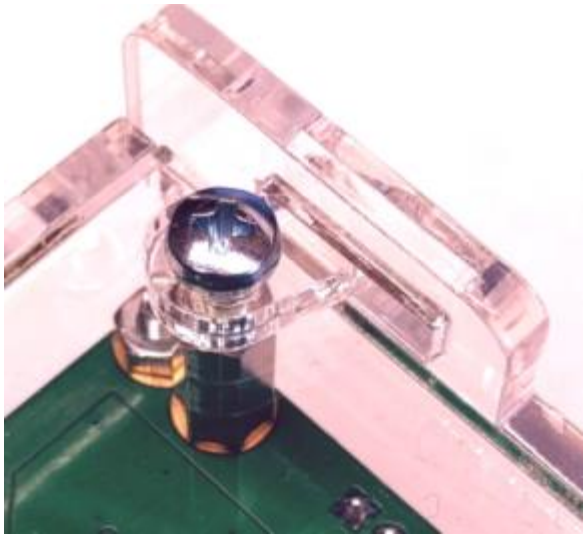
Slowly slide in the *large top* part from above, making sure to fit into all existing parts simultaneously. You may have to slightly bend the existing assembly, in order to make sure that all parts are orthogonal to each other. The housing is now finished and should look like below. You can now check if all parts fit tightly, and gently push them closer together as necessary. It is then time to let the glue cure.



After the curing time of your chosen glue, you can complete the system with the *kWeld* module. At first, mount the *bottom* part to the module, using the four supplied M3x10 *screws* and the four acrylic mounting *brackets*. Make sure to orient the *brackets* like shown in this picture. Do not fasten the screws yet.



Slide in this assembly into the finished housing like shown. Slide each *bracket* into their corresponding receptacle on the *front* and *rear* parts. Push with moderate force until they fit tightly. Finally, fasten the four screws, again with moderate torque.



Finished!

REVISION HISTORY

1.0	2017-07-30	First published, still incomplete version
2.0	2017-08-25	First complete version for *kWeld* hardware revision 2 - New electrode / holder system - Completed electronics soldering steps - Completed system assembly steps - Cabling lengths modified to compensate unequal main board bolt positions - Completed pictures - Preliminary housing assembly guide
3.0	2017-12-29	Updated to *kWeld* hardware revision 3
4.0	2018-04-03	Updated to *kWeld* hardware revision 3.1 - Added laser-cut housing assembly instructions
5.0	2018-07-31	Updated to *kWeld* hardware revision 3.2 - Updated pictures for electrode system assembly - Added hints for laser-cut housing assembly
6.0	2026-10-27	Revisions 3 to 3.3; bus-bar, wiring and polarity notes; cable lengths; 3D-printed housing section restored; wording corrections