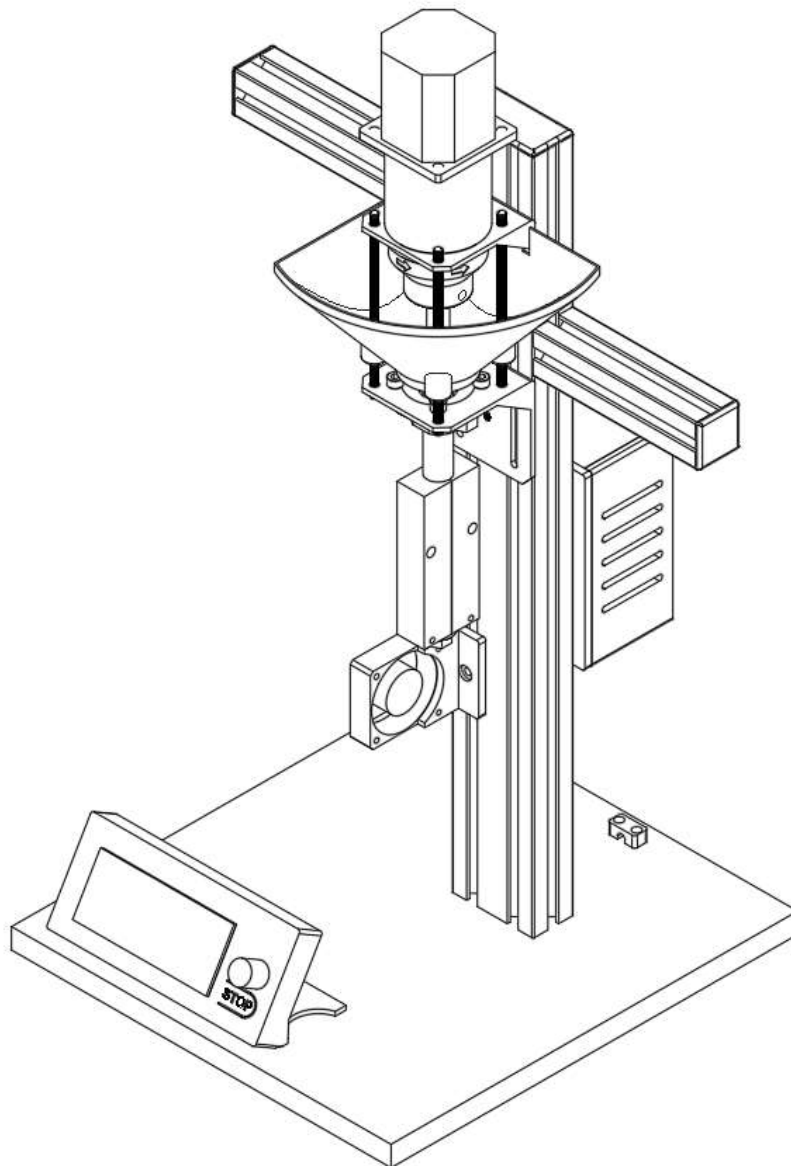


04 Electronics assembly

Assembly instructions

Original Desktop Filament Extruder E1.6 by ARTME 3D

Version 04.01.2022





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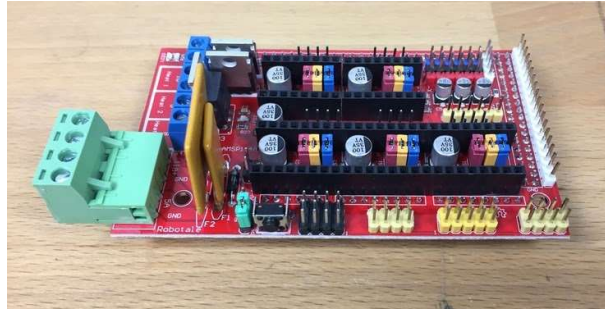

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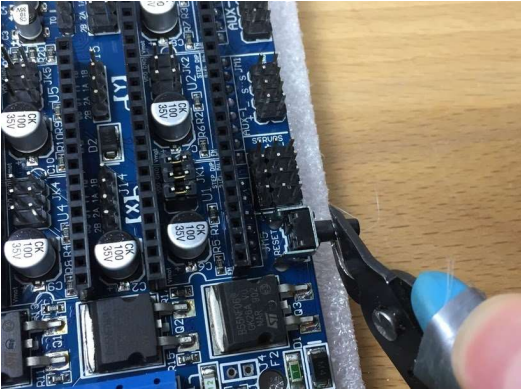

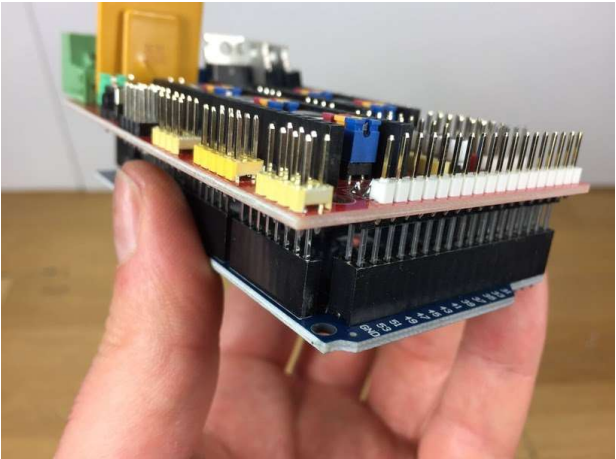
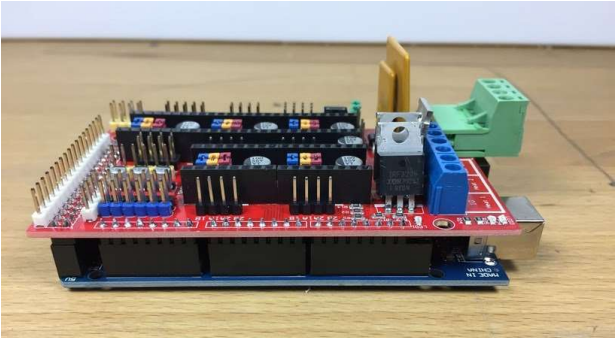
Required tools for this assembly section:

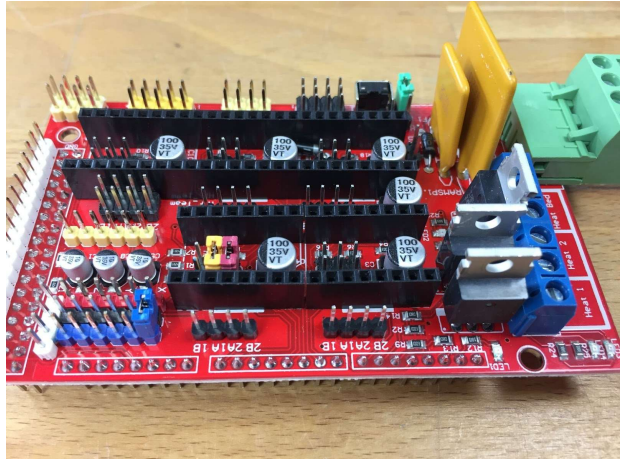
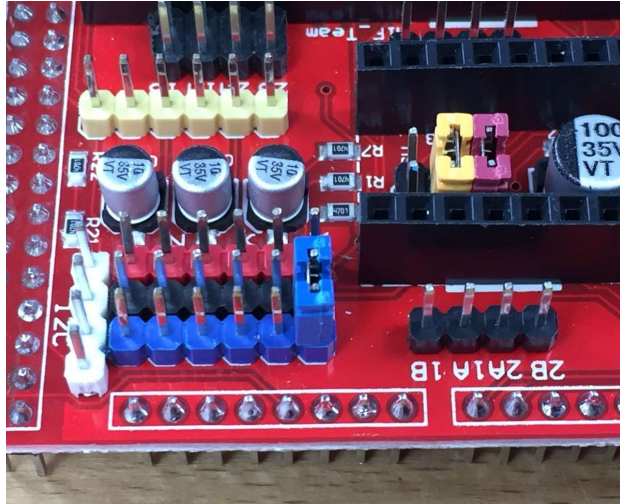
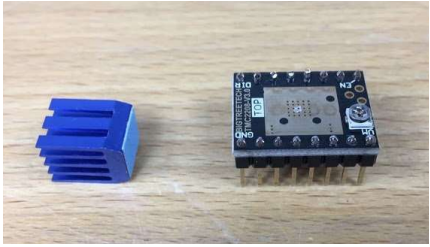
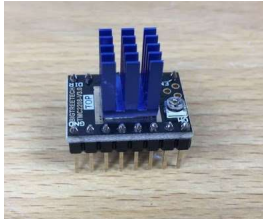
Phillips screwdriver PH1
File/sandpaper/cutter knife
Side cutter
Wire stripper/knife
Slotted screwdriver 3mm

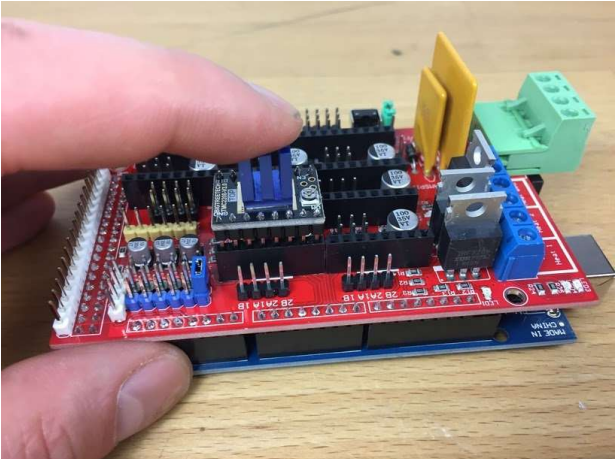
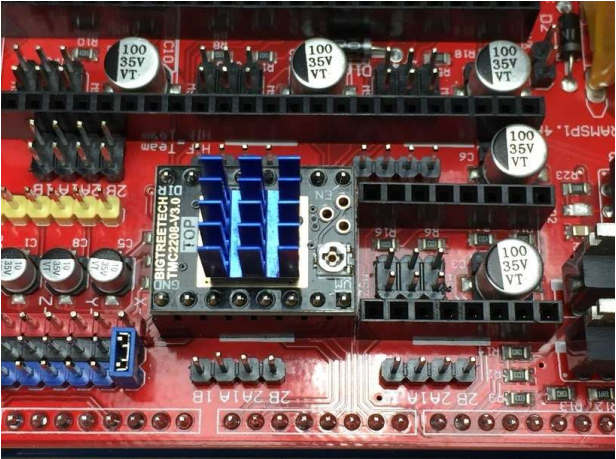


Overview packages

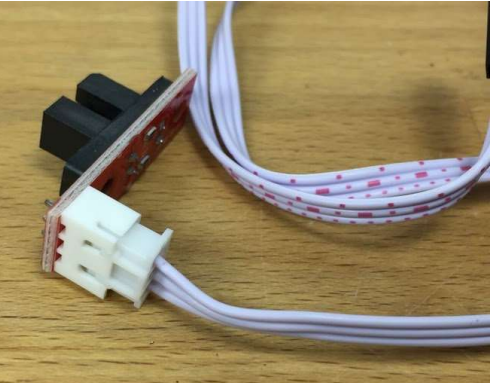
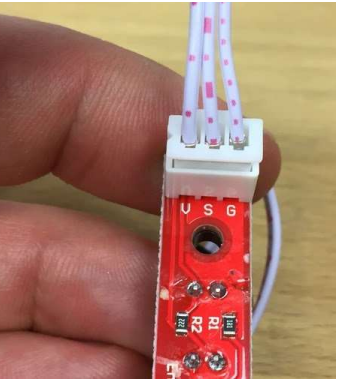
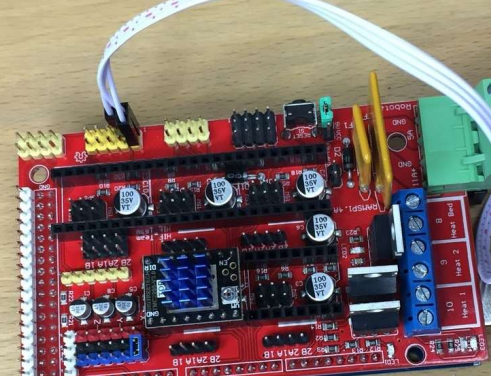
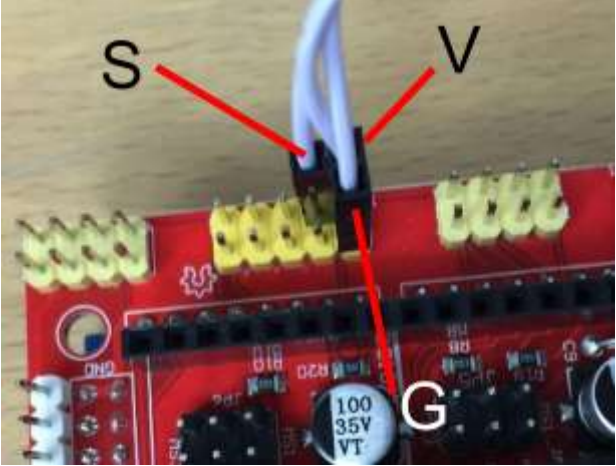
Package 0: Delivered carton
Package 1: Screws (SC)
Package 2: Spare Parts (SP)
Package 3: Custom Metal Parts (CM)
Package 4: Extruder Barrel (EB)
Package 5: Electronics (EL)
Package 6: Tools (TO)

Montage Elektronik		
1	<p>CAUTION: Please be extremely careful when handling electronic components:</p> <p>Avoid electrostatic charge! (Touch grounded metal parts, such as a radiator, to discharge before handling electronic components).</p> <p>Do not bend circuit boards!</p> <p>Never pull or plug plugs or components during operation!</p> <p>Handle electronics only when switched off!</p> <p>Always pay attention to the correct polarity of the connections!</p> <p>If these rules are not observed, the electronics may be damaged or destroyed. ARTME 3D is not liable for these damages.</p> <p>If you have purchased an original ARTME 3D extruder kit, you can start at step 15, as the electronics are pre-assembled.</p>	
2	<p>Remove from package 5:</p> <p>1x Arduino (EL01)</p>	
3	<p>Remove from package 5:</p> <p>1x Ramps 1.4 or 1.5 (EL02)</p> <p>The system works with Ramps 1.4 or 1.5. The kit includes one of the two boards depending on availability. They look different in color. But all pins and connections are identical.</p>	
4	<p>Ramps 1.5</p> <p>This is how a Ramps 1.5 board can look like.</p>	

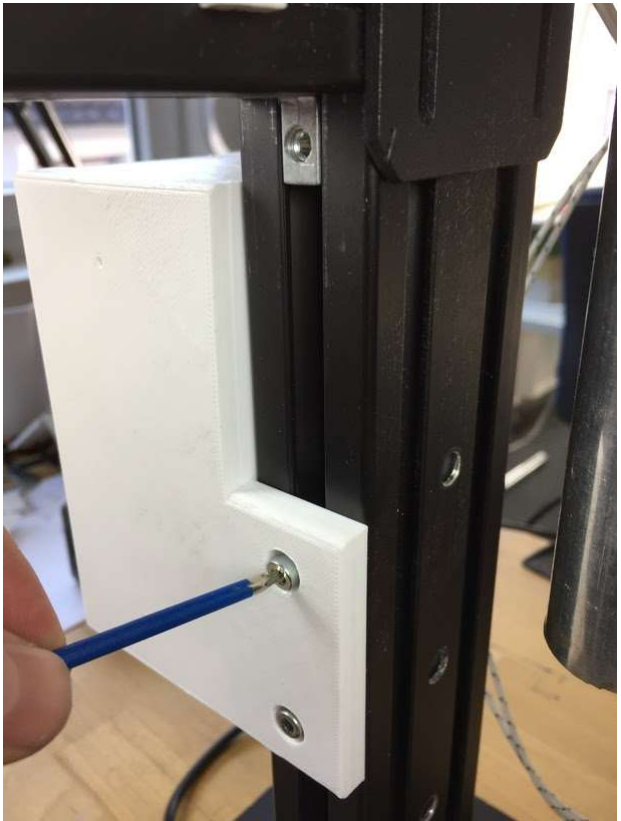

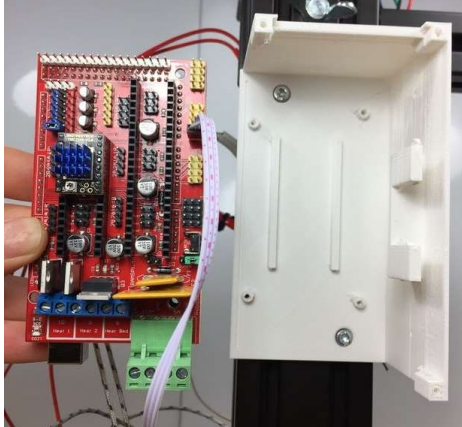
5	<p>The Ramps board has a small button on the side. This reboots the Arduino. If the button is long as shown in the picture, it must be shortened, otherwise the board does not fit into the housing. This can be done with a side cutter.</p>	
6	<p>The button of the probe should not be longer than 3 mm.</p>	
7	<p>The Ramps board is plugged onto the Arduino. Attention: here it is very important that all pins are aligned straight and hit the right slot. Only then press the boards together to connect them.</p>	
8	<p>Check if all pins are plugged in correctly.</p>	


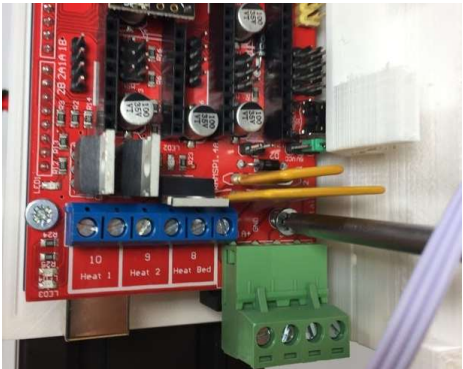
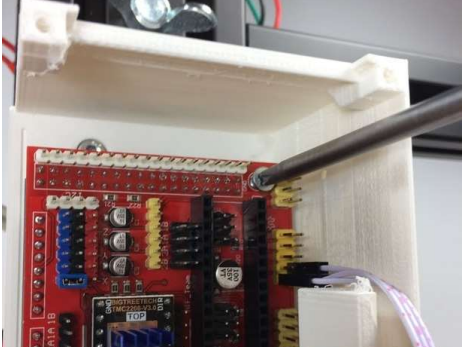
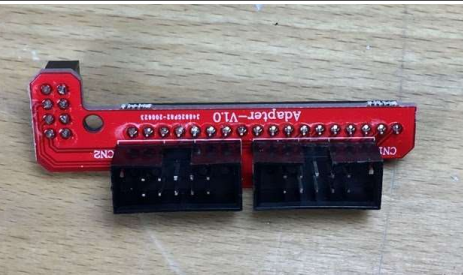
9	<p>Remove from package 5: 3x jumper (EL03)</p> <p>The 3 jumpers (in the picture with the colors red, yellow and blue) must be plugged. See exact position next step.</p>	
10	<p>The position of the 3 jumpers can also be found in the electronics diagram. This is stored in the folder "07_electronics".</p>	
11	<p>Remove from package 5: 1x stepper motor driver (EL04)</p> <p>The stepper motor driver is usually supplied with a separate heat sink, which must be glued on. Remove the foil from the adhesive strip on the heat sink.</p>	
12	<p>The heat sink is glued to the center of the surface provided for this purpose. Make sure that the heat sink does not touch the solder joints.</p>	

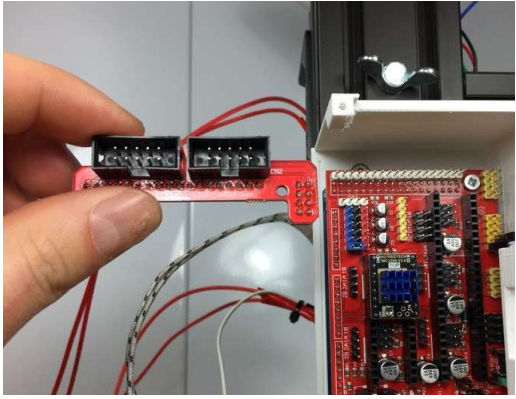
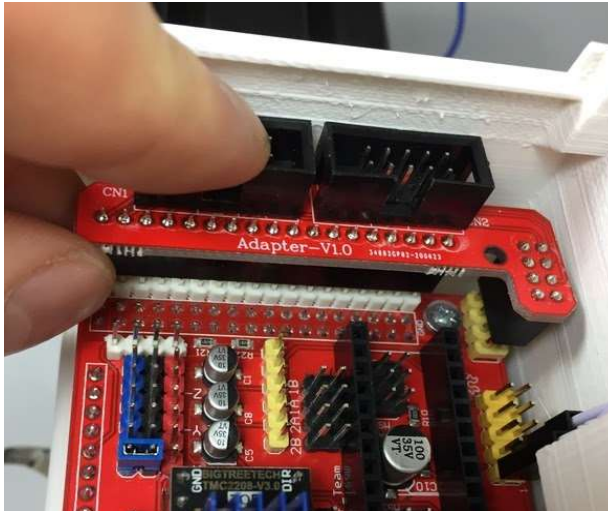

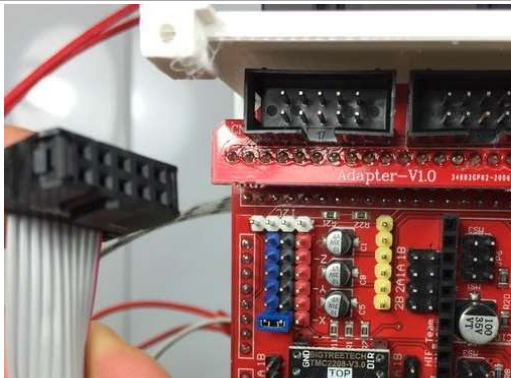
13	<p>The stepper motor driver is plugged into slot E1 of the Ramps Board. Pay attention to the correct orientation. The TMC 2208 is plugged in as shown in the picture. The small potentiometer next to the heat sink shows how the driver is aligned. In the electronic diagram in the folder "07_electronics" is marked where the corresponding pins of the motor driver must be located, if you use another one.</p>	
14	<p>Check the alignment of the motor driver and if all pins are connected correctly.</p>	
15	<p>Remove from package 5: 1x optical limit switch (EL05)</p>	
16	<p>Take the limit switch and connecting cable to hand.</p>	

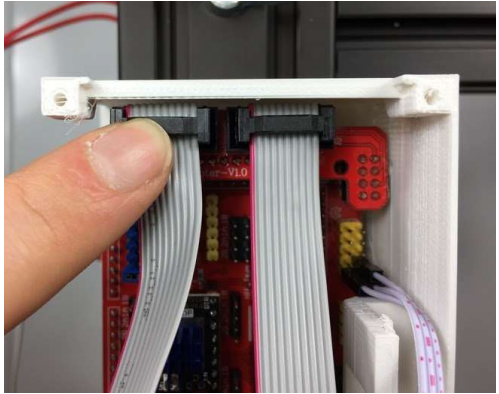
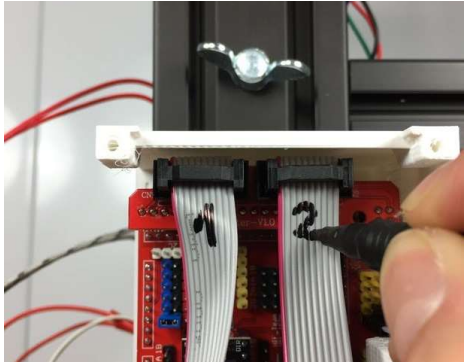
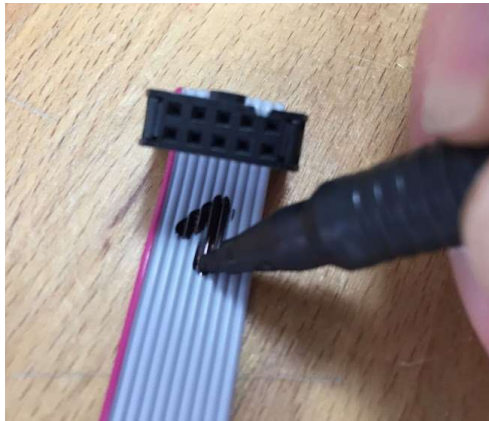
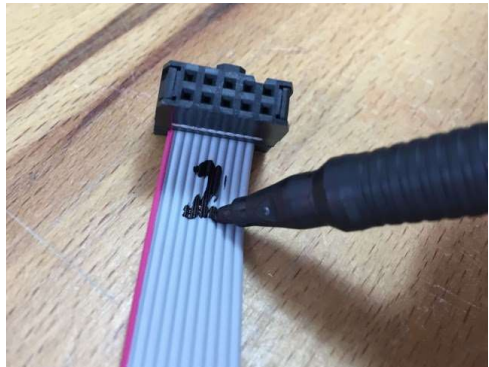
17	<p>Connect the connecting cable to the sensor. The connector is coded by pins so that it can only be plugged in one orientation.</p>	
18	<p>Make a note of which letter belongs to which line. The lines are distinguished by dots and dashes.</p>	
19	<p>The other end of the connecting cable is now plugged onto the board. Note the plug field. The alignment of the individual connectors see next step.</p>	
20	<p>Connector alignment, see picture. If the designations on the sensor differ, you can find more details in the electronics diagram in the "07_electronics" folder.</p>	

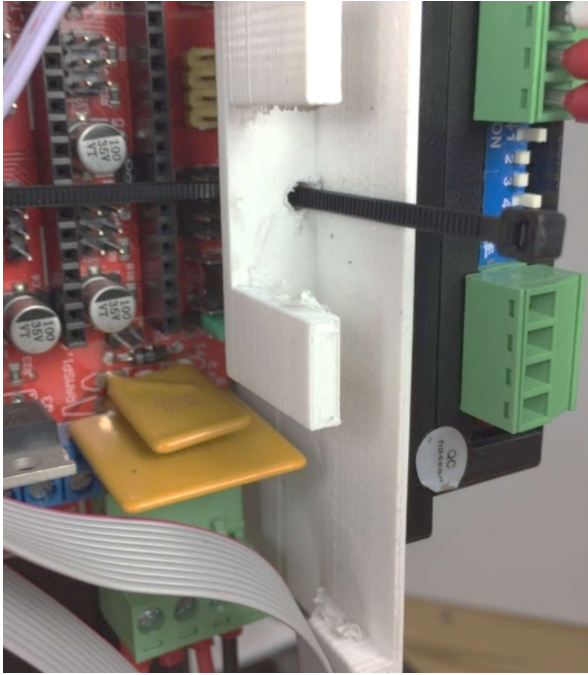
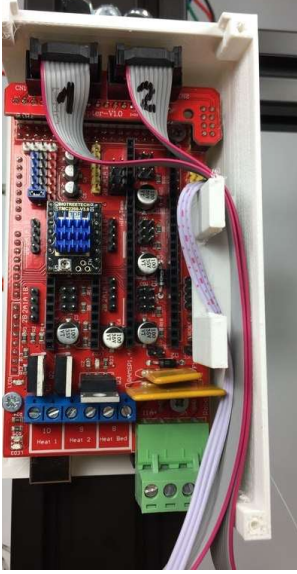

21	<p>3D printing: 1x Arduino housing (EL06)</p> <p>Remove from package 1: 2x cap head screw M4x10 (SC04) 2x hammer nut M4 (SC10)</p>	
22	<p>Insert the cap head screws through the holes and screw the hammer nuts onto the screws.</p>	


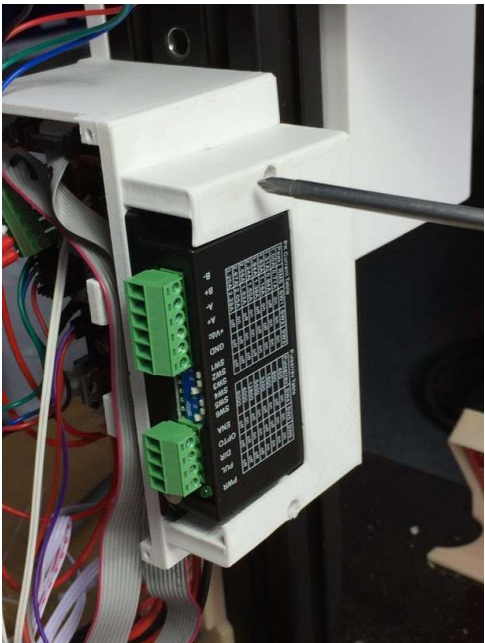

23	<p>Tool from package 6: Allen key size 3</p> <p>The housing faces backwards and is screwed to the aluminum profile from the side. The lower edge of the Arduino housing has a distance of approx. 16cm to the mounting plate. Again, make sure that the hammer nuts twist in the groove when tightening the screws.</p>	
14	<p>Remove from package 1: 3x wood screw 3x25 (SC02)</p>	
25	<p>Alignment of the board for installation in the housing.</p>	

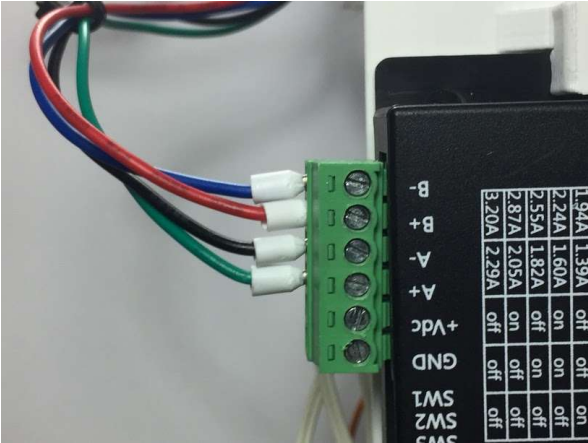
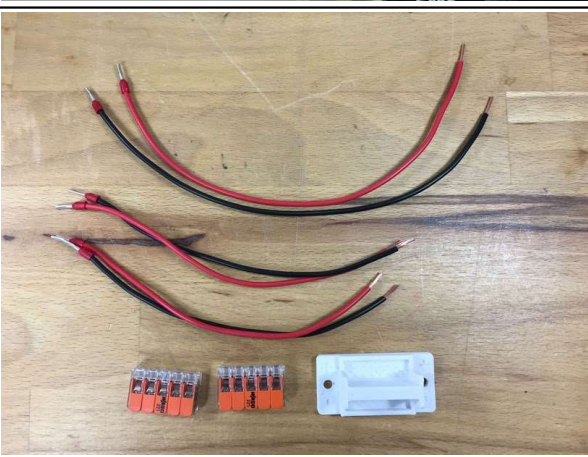
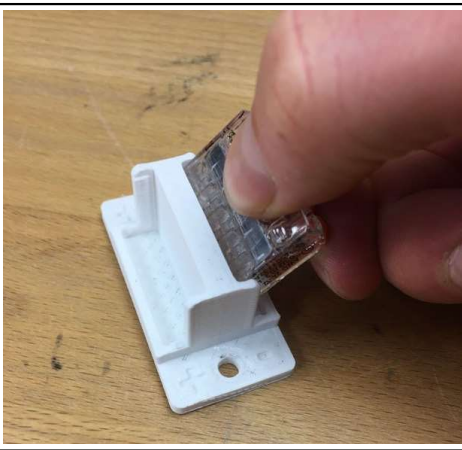
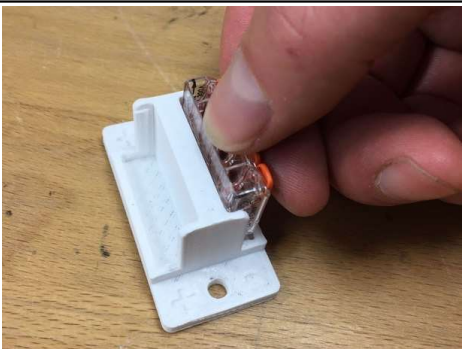
26	<p>Tool: Phillips screwdriver PH1</p> <p>Hold the board in the housing. Insert a 3x25 screw at the bottom left through the corresponding holes in the boards, screw it into the housing and tighten it only slightly.</p> <p>If you do not hit the holes for the screw correctly, it may help to turn the device over and screw in the screws from above instead of from the side.</p>	
27	<p>Insert a screw at the bottom right through the corresponding holes in the boards, screw it into the housing and tighten it only slightly.</p>	
28	<p>Insert a screw at the top right through the corresponding holes in the boards, screw it into the housing and tighten it only slightly.</p>	
29	<p>Remove from package 5: 1x LCD adapter (EL07)</p>	

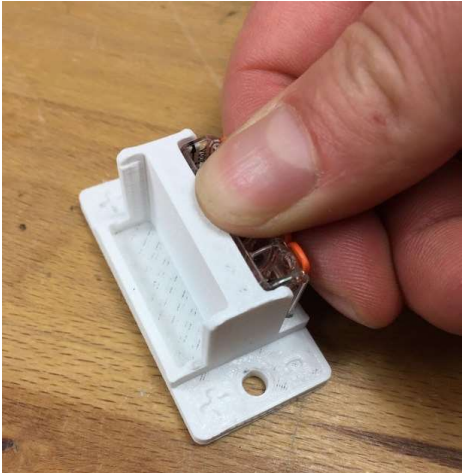
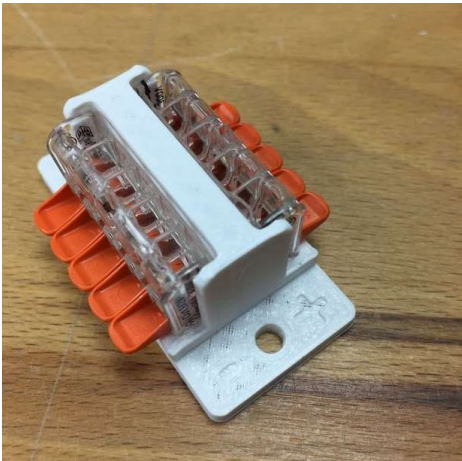
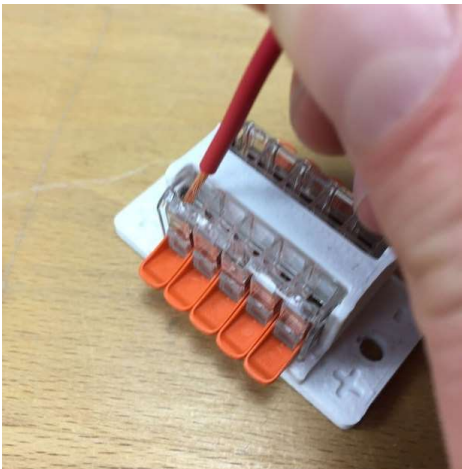
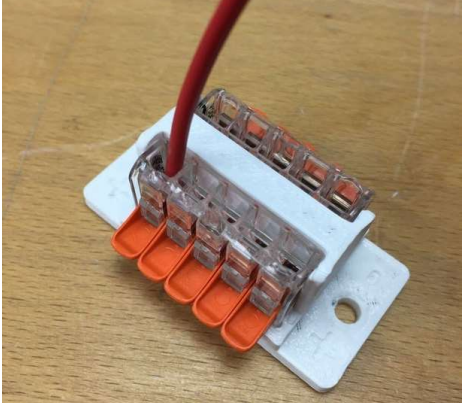
30	Alignment of the LCD adapter for installation.	
31	Hold the adapter on the upper pin rows and align it so that all pins hit the corresponding slots. Double check. Then plug on by pressing on.	
32	Remove from package 5: 2x LCD cable (EL08)	
33	Alignment of the LCD cables before installation. The two connector ends of an LCD cable are designed differently. Select the connector that has the coding groove at the appropriate location to be plugged in as in the next step.	

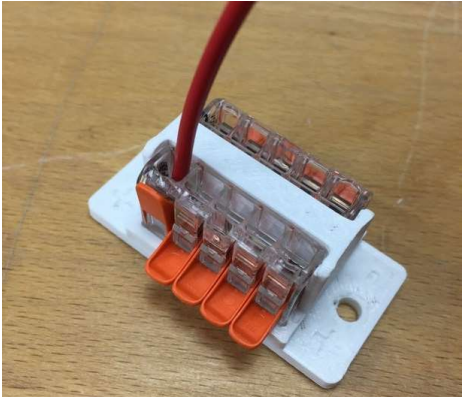
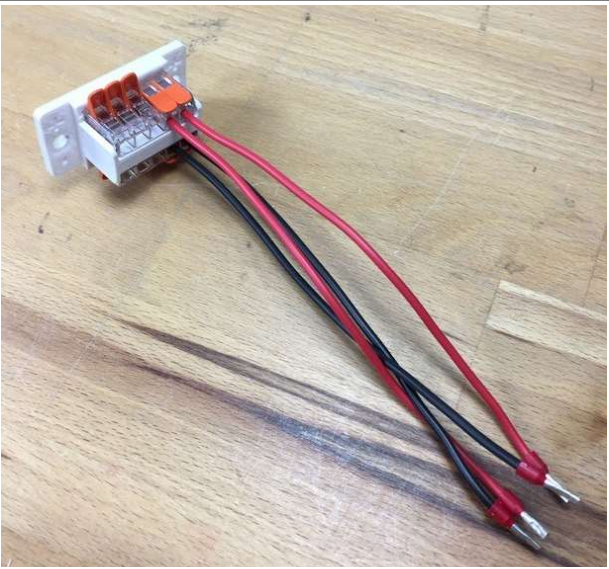
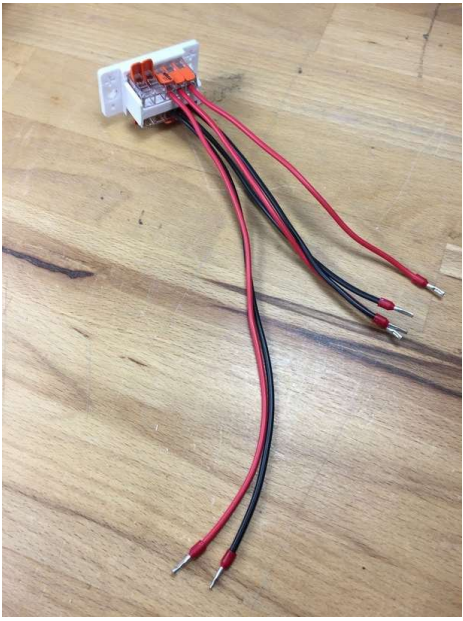

34	Then attach by pressing on.	
35	<p>Tool: Marking pen</p> <p>Label the cable as shown in the picture.</p>	
36	<p>Label the corresponding counterparts of the cables with the same number.</p> <p>The cable that was labeled with a 1 in step 36 also gets a 1 at the other end of the cable.</p>	
37	The cable, which was labeled with a 2 in step 35, also gets a 2 at the other end of the cable.	

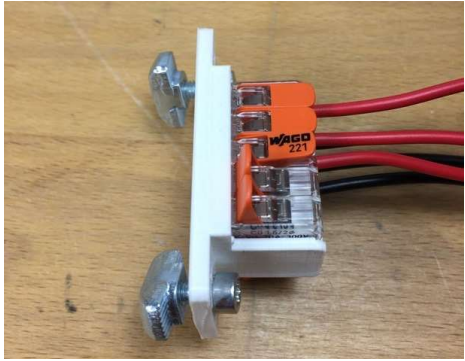
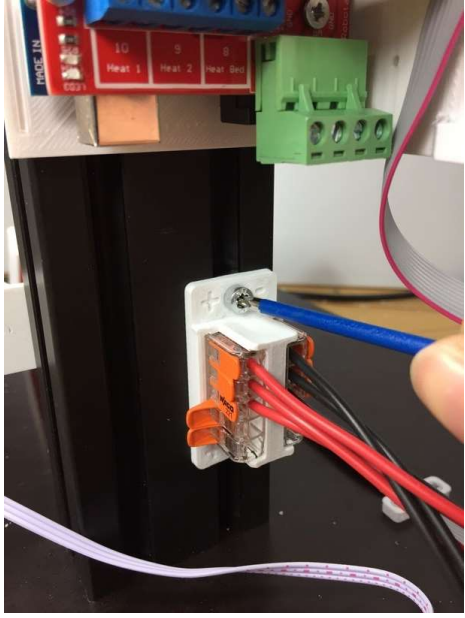
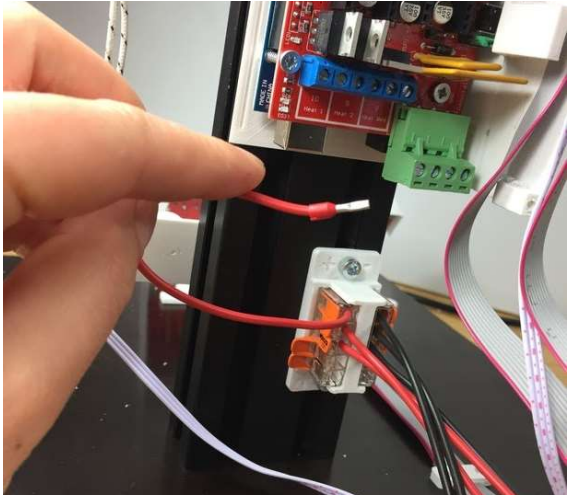
38	<p>Remove from package 2: 1x cable tie (SP11)</p> <p>The lateral holding arm in the housing is used to organize the cables later. Insert a cable tie through the corresponding opening. Use a pair of tweezers to pull the end out to the left.</p>	
39	<p>Place the LCD cables and the connecting cable of the sensor in the holding arm.</p>	
40	<p>Remove from package 0: 1x stepper motor driver DMT322T (MO04) 3D print: 1x driver mounting (EL11) Remove from package 1: 2x wood screw 2.5x12 (SC01)</p>	

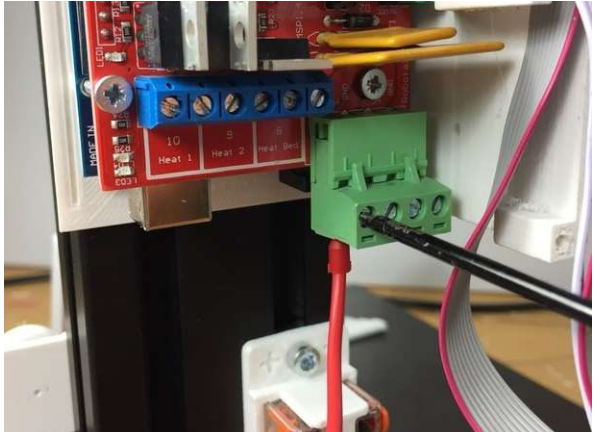
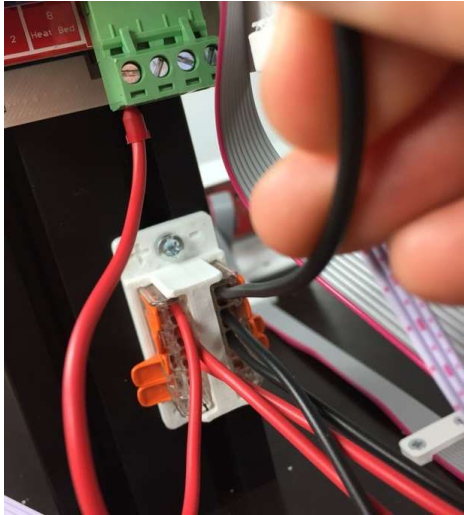
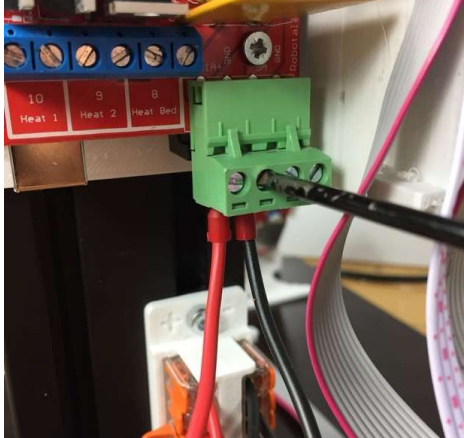
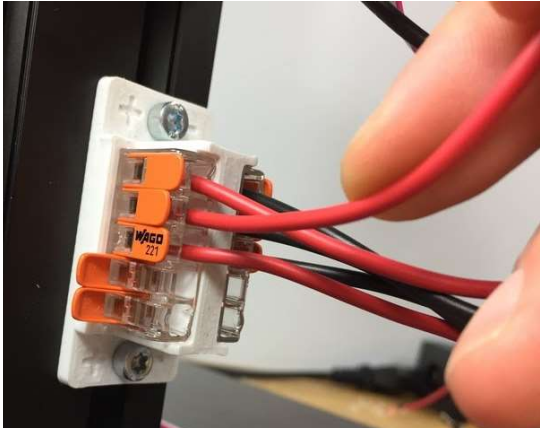
41	<p>Turn the stepper motor driver upside down and insert it into the mounting. See picture.</p>	
42	<p>Tool: Phillips screwdriver PH1</p> <p>Insert the two screws through the holes provided and screw the bracket to the side of the Arduino case. Holes are provided in the Arduino housing for this purpose.</p>	
43	<p>Set the dip switches on the motor driver. (See photo)</p> <p>The setting means: 3200 steps per revolution 1.9 A maximum phase current</p> <p>In a few cases (depending on the material) it may be necessary to increase the motor current a little later.</p>	

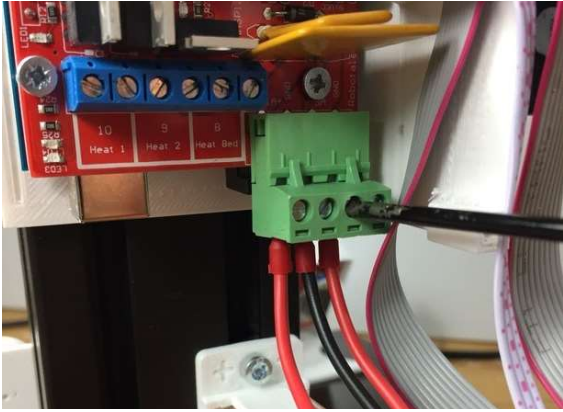
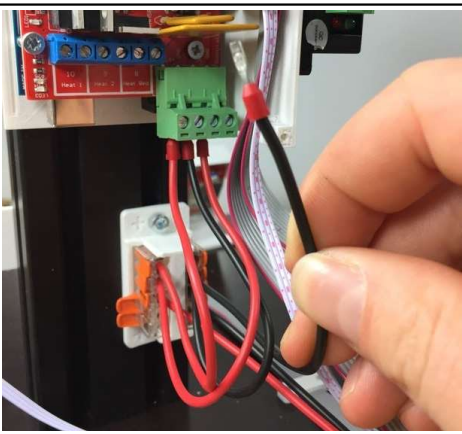
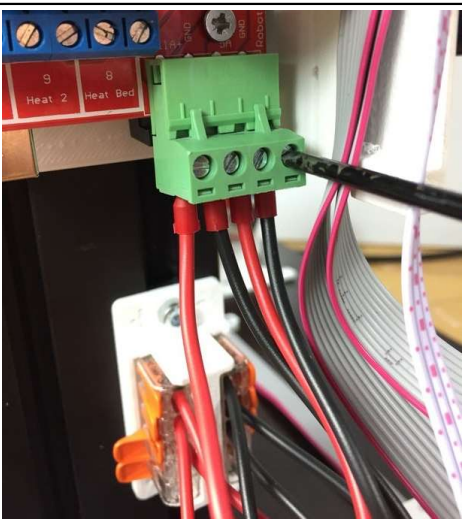
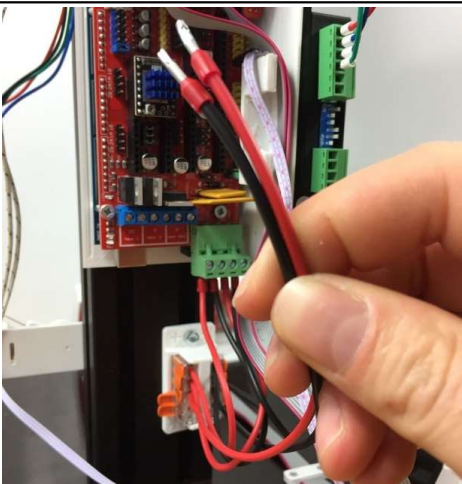
44	<p>Tool: Slotted screwdriver 2.5mm</p> <p>Connect the connecting cable of the large stepper motor (MO01) to the stepper motor driver. Colors see picture. If you use another motor with different color coding, you will find more details in the electronic diagram in the folder "07_electronics". After screwing, check if all contacts are tight.</p>	
45	<p>Remove from package 5: 2x terminal Wago 221 (EL09) 2x cable black 150mm (EL13) 2x cable red 150mm (EL14) 1x cable black 260mm (EL15) 1x cable red 260mm (EL16) 3D printing: 1x holder clamp (EL10)</p> <p>A wire end ferrule must be pressed onto one end of each cable.</p>	
46	<p>Press the Wago clamp into the holder. To do this, place it on the side and press it down.</p>	
47	<p>Straighten the position.</p>	

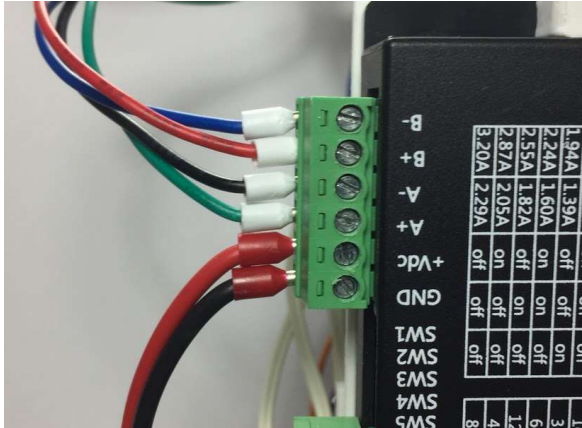
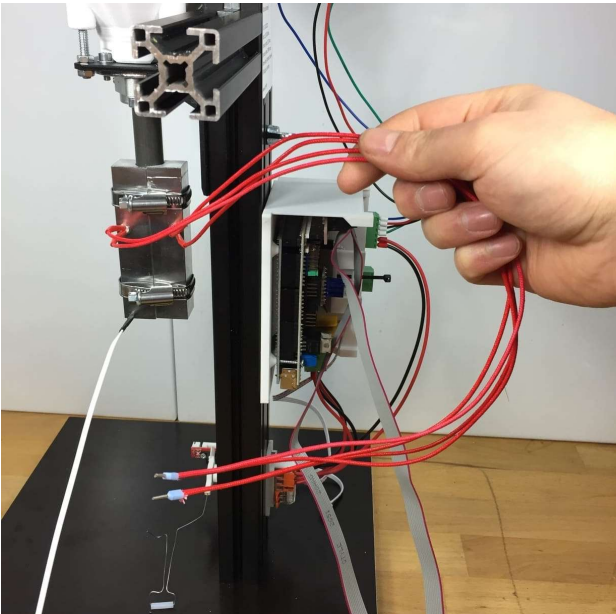
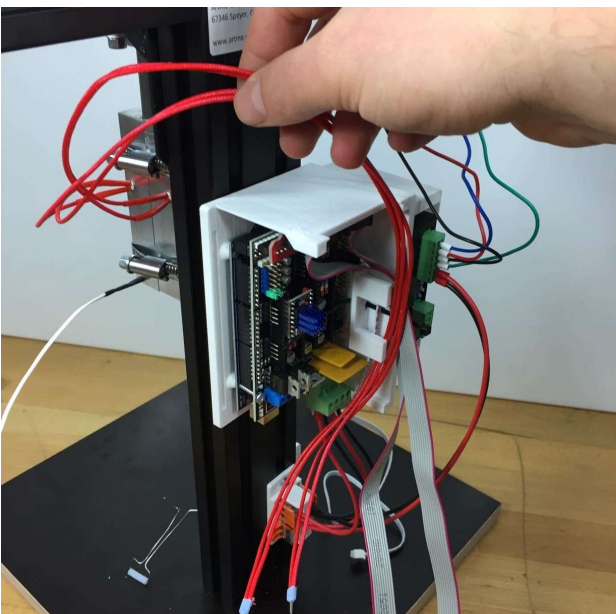
48	And press in completely. The Wago clamp locks into place.	
49	Open the small clamping levers.	
50	make sure that the "+" marking on the terminal holder points to the left. Then insert a red 150mm wire (EL14) into the top terminal.	
51	The line must be fully inserted.	

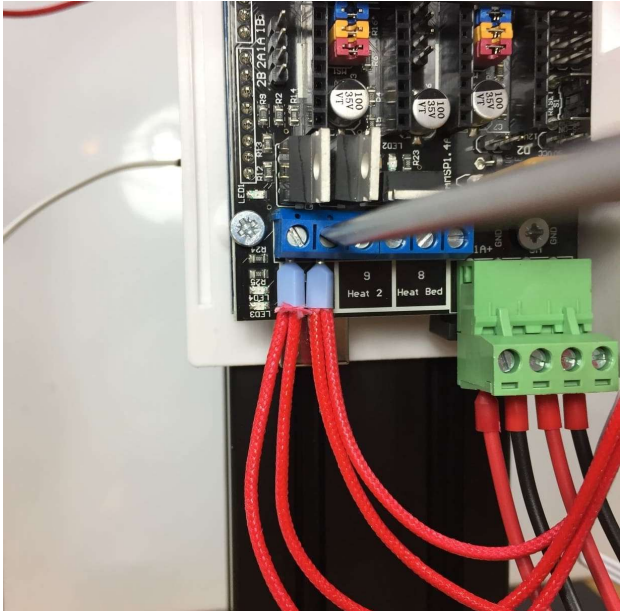
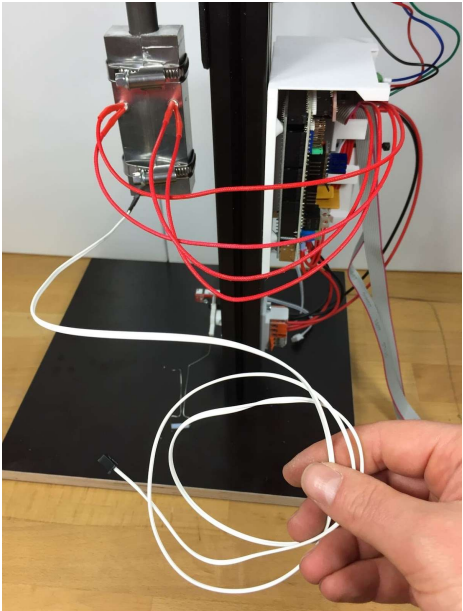
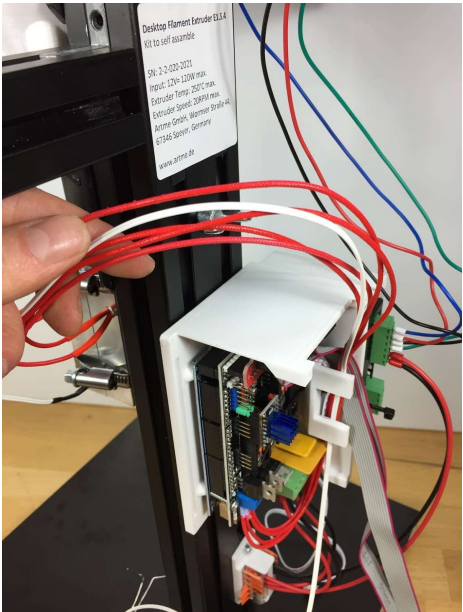
52	Then close the clamping lever. This establishes a secure electrical connection.	
53	Now install the remaining 150 mm long wires. The black wires are plugged into the wago terminal, which is located on the side marked '-'. See picture.	
54	Now clamp the 260 mm long wires. Red again on the "+" side and black again on the "-" side.	
55	Remove from package 1: 2x hammer nut M4 (SC10) 2x cap head screw M4x10 (SC04)	

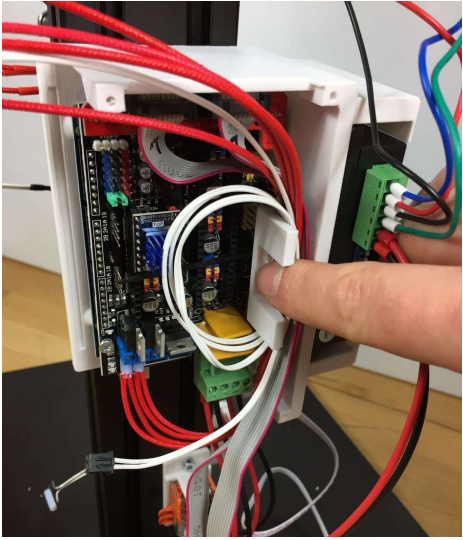
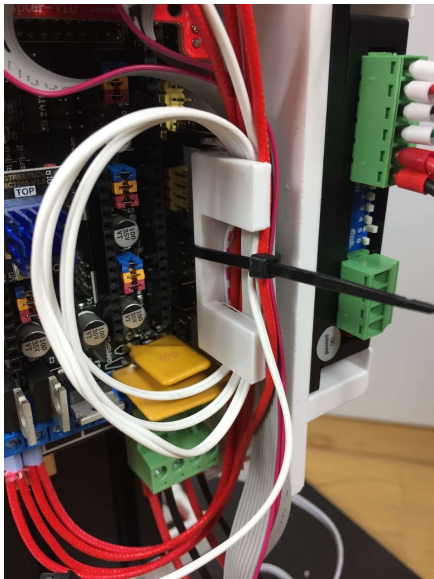
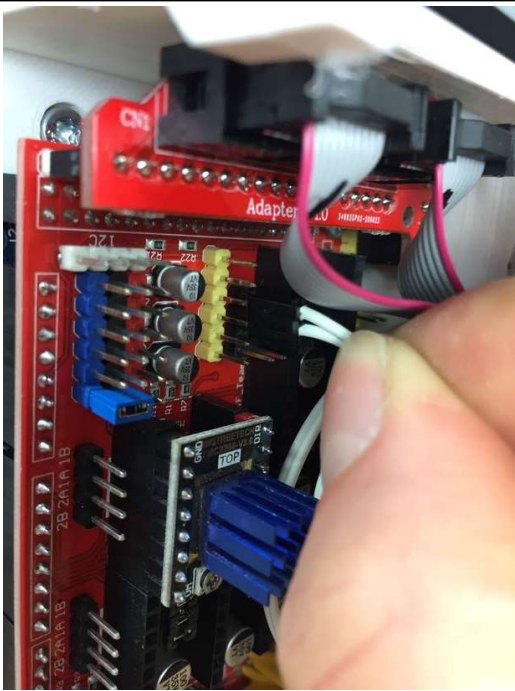
56	Install cap screw and hammer nut on clamp holder.	
57	<p>Tool from package 6: Allen key size 3</p> <p>Mount the clamp holder from behind on the aluminum profile. Approx. 30mm above the mounting plate. Again, make sure that the hammer nuts twist in the groove when tightening the screws.</p>	
58	Take the red 150 mm long wire which is plugged into the left Wago terminal at the top.	

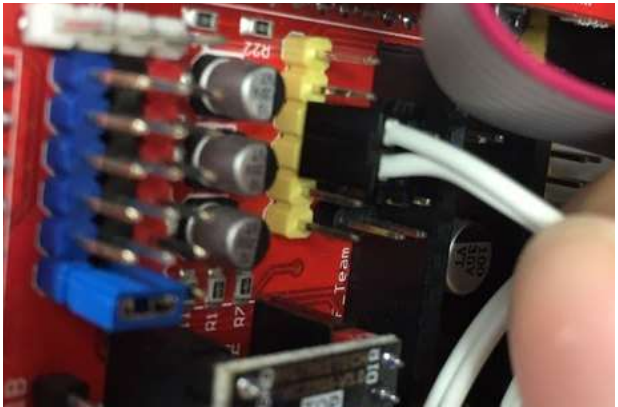
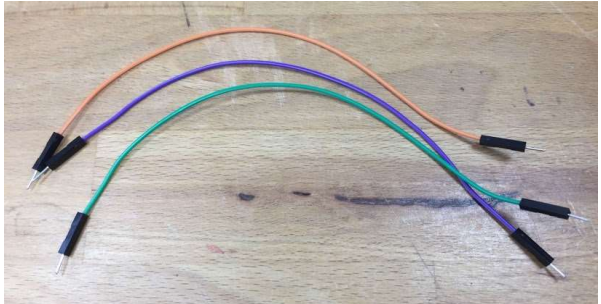
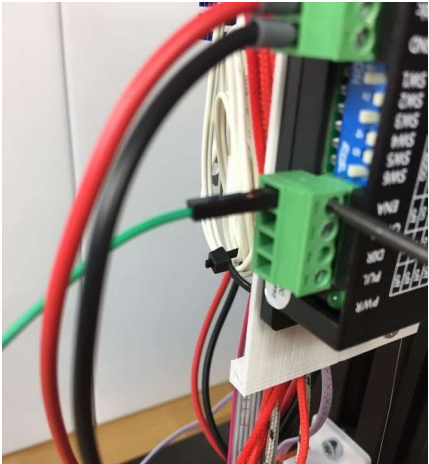
59	<p>Tool: Slotted screwdriver 3mm</p> <p>Connect them to the Ramps Board. Important plug in exactly as shown in the picture.</p>	
60	<p>Take the black 150 mm long cable which is plugged into the right Wago terminal at the top.</p>	
61	<p>Tool: Slotted screwdriver 3mm</p> <p>Connect them to the Ramps Board. Important plug in exactly as shown in the picture.</p>	
62	<p>Take the second red 150 mm long wire which is plugged into the left Wago terminal at the top.</p>	

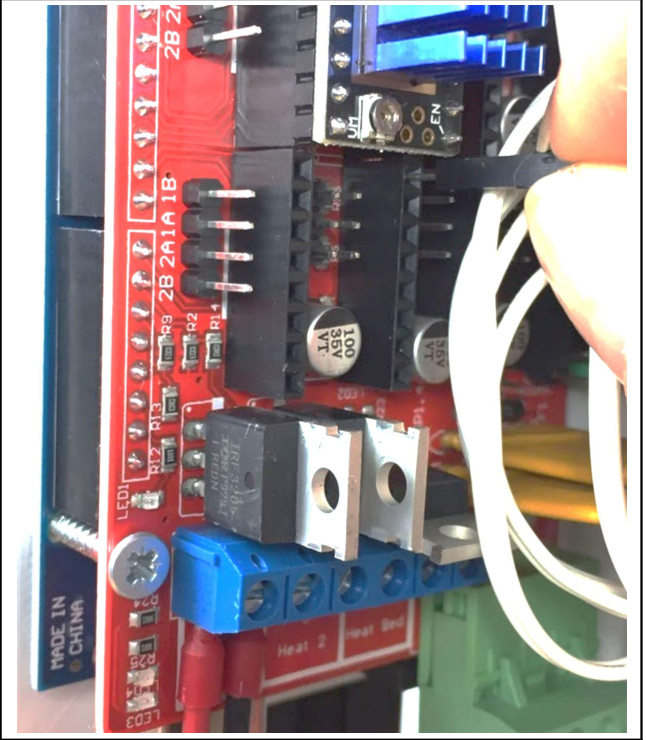
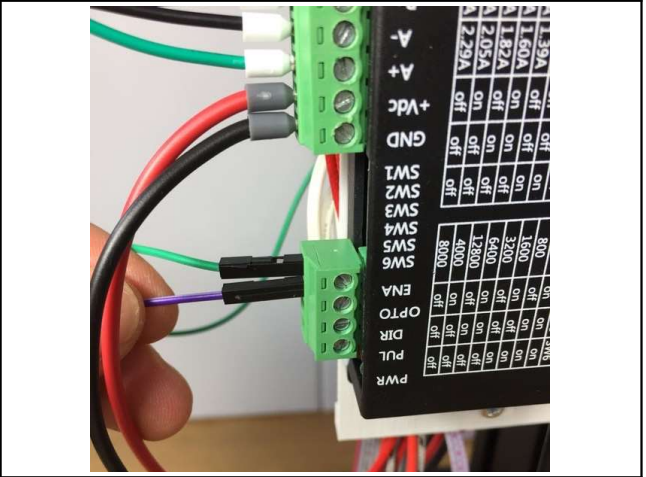
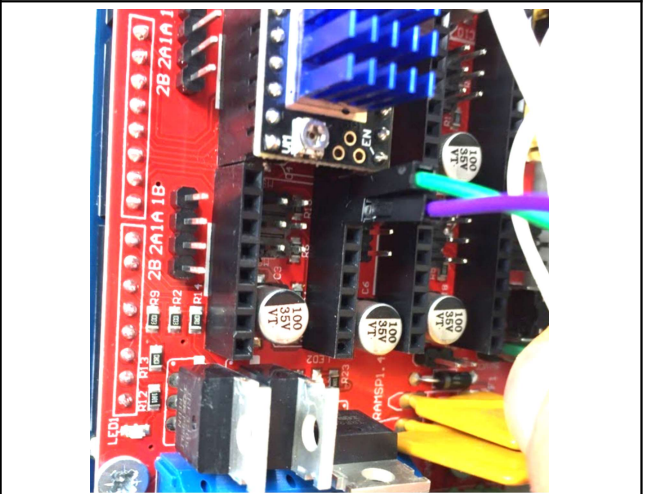
63	<p>Tool: Slotted screwdriver 3mm</p> <p>Connect them to the Ramps Board. Important plug in exactly as shown in the picture.</p>	
64	<p>Take the second black 150 mm long wire which is plugged into the right Wago terminal at the top.</p>	
65	<p>Tool: Slotted screwdriver 3mm</p> <p>Connect them to the Ramps Board. Important plug in exactly as shown in the picture.</p>	
66	<p>Take the remaining two 260 mm long wire to hand.</p>	

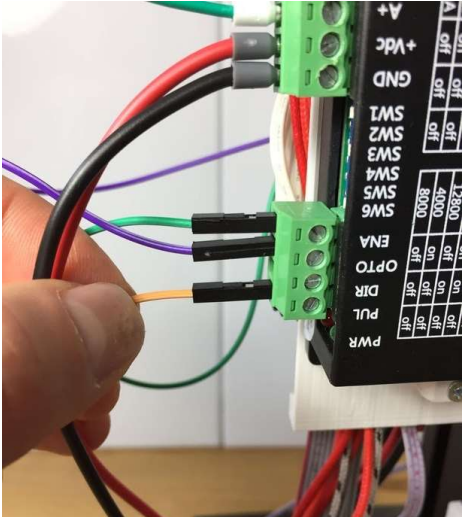
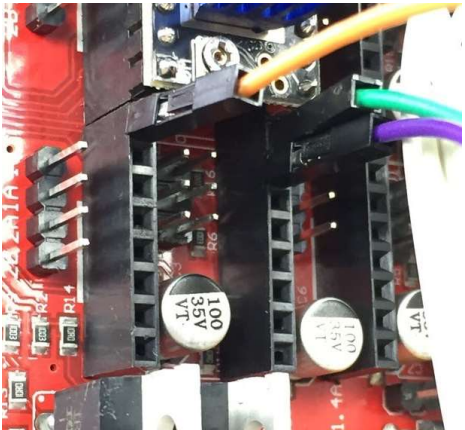
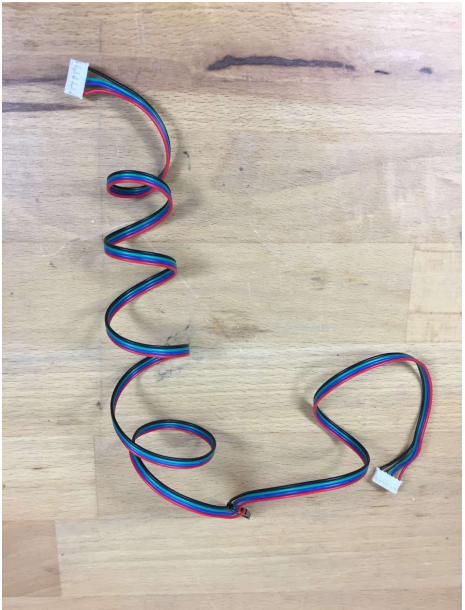
67	<p>Tool: Slotted screwdriver 3mm</p> <p>Connect these to the motor driver. Important: Connect red to Vdc+ and black to GND.</p> <p>Check that all connections to ramps and motor driver are tight.</p>	
68	<p>Take the connection cable of the heating cartridges to hand.</p>	
69	<p>Lead the cables to the back. In the Arduino housing there is a fixing point where the wires will be locked later.</p>	

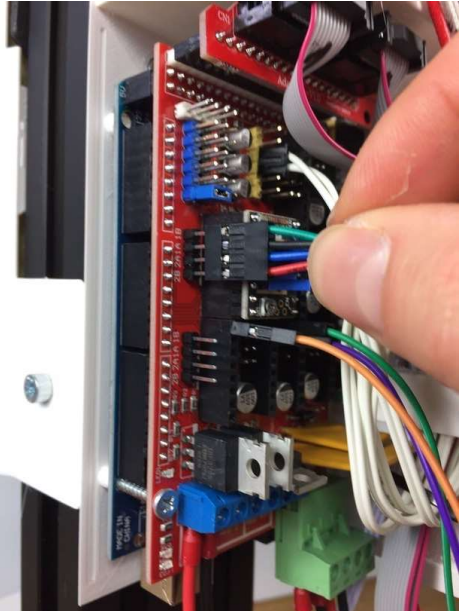


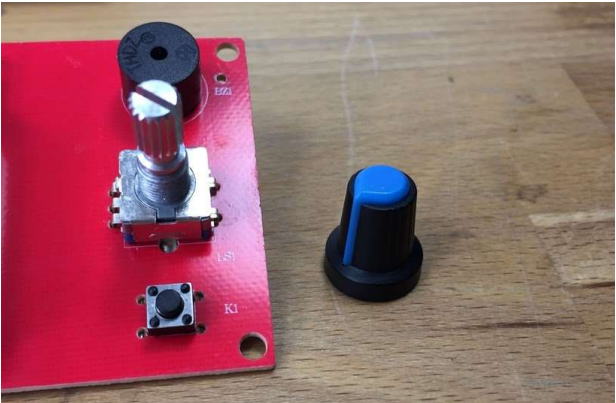
70	<p>Tool: Slotted screwdriver 3mm</p> <p>Connect the cable to terminal D10 on the ramp. The polarity does not matter.</p>	
71	<p>Take the connecting cable of the thermistor to hand.</p>	
72	<p>Guide the line to the rear.</p>	

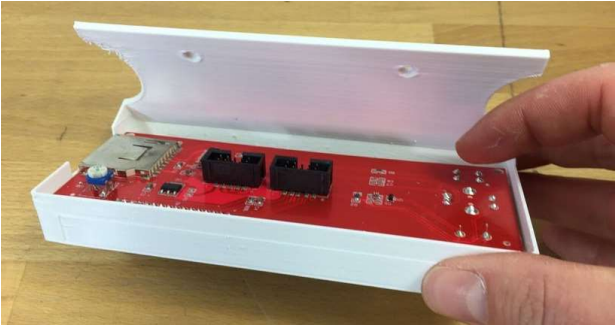

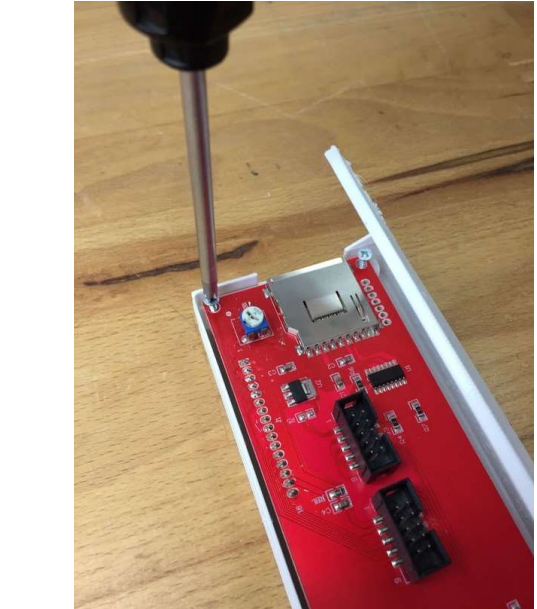

73	<p>Fix the wires to the holder arm. The lead from Thermistor can be wrapped around the holder as it is a little too long.</p>	
74	<p>Pull the prepared cable tie to the holding arm and cut off the protruding piece.</p>	
75	<p>Plug the thermistor connector into the following slot on the ramp. (Yellow slot in the picture). For details see next step.</p>	

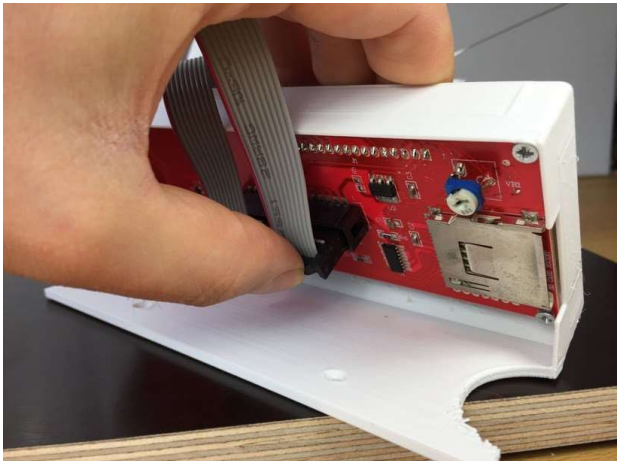
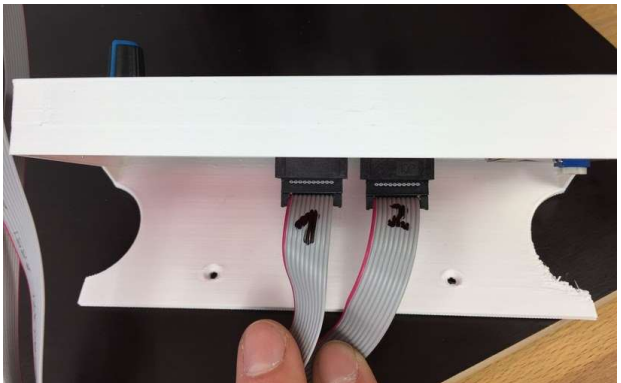

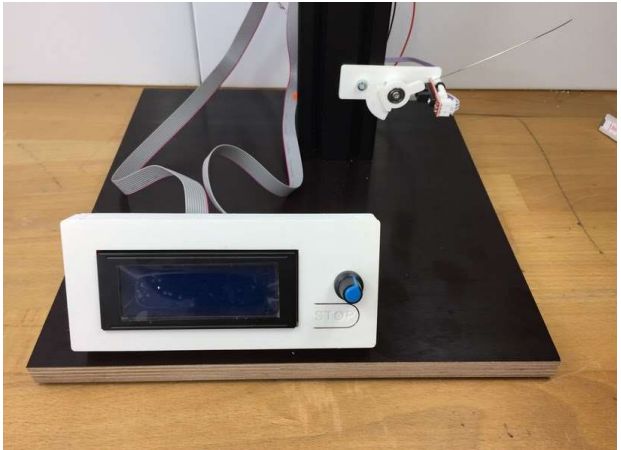
76	<p>Plug the connector to the middle two pins. Polarity does not matter.</p>	
77	<p>Remove from package 5: 3x Dupont connecting cable (EL12)</p>	
78	<p>Tool: Slotted screwdriver 3mm</p> <p>Connect a connecting line on the motor driver to ENA. The color of the cable does not matter.</p>	

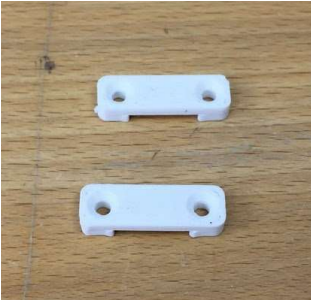
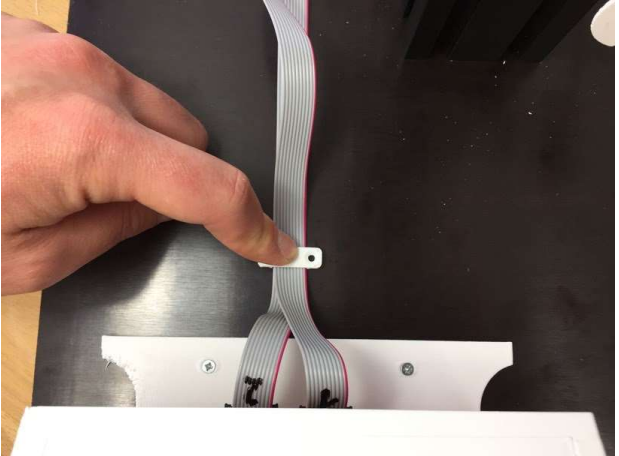
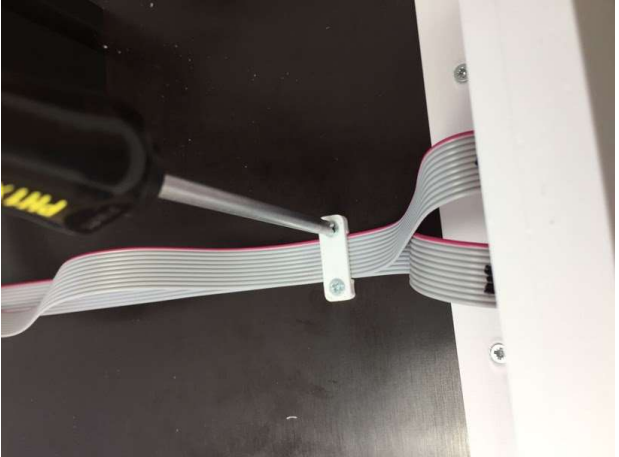
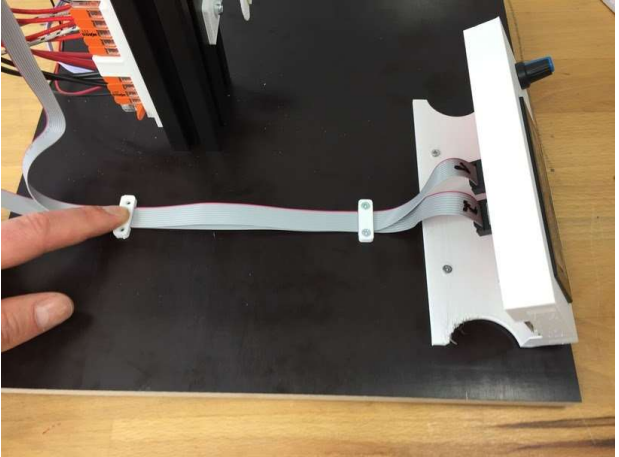
79	<p>Plug the other end of the connecting cable into slot E0 (under the stepper motor driver that is already plugged in): The slot consists of two black connector rows. Plug the other end of the connection line in the right row to the uppermost slot. For details see also electronics diagram in folder "07_electronics".</p>	
80	<p>Tool: Slotted screwdriver 3mm</p> <p>Connect another connecting line on the motor driver to OPTO. The color of the wire does not matter.</p>	
81	<p>Plug the other end of the connection line in the right row directly under the already plugged line.</p> <p>For details, see also the electronics diagram in the "07_electronics" folder.</p>	

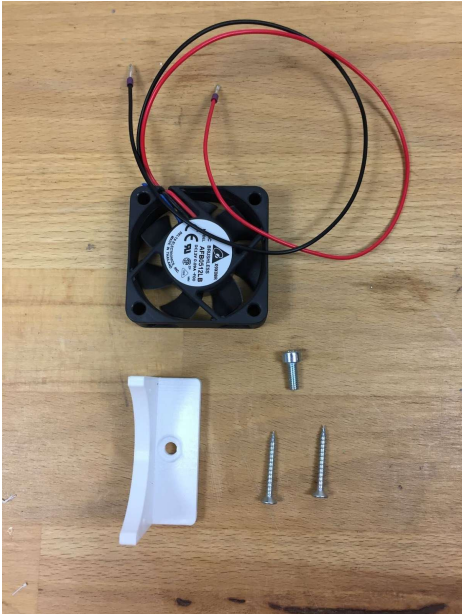
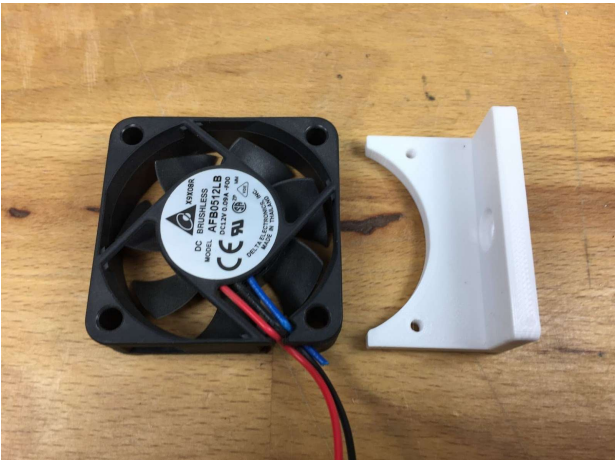
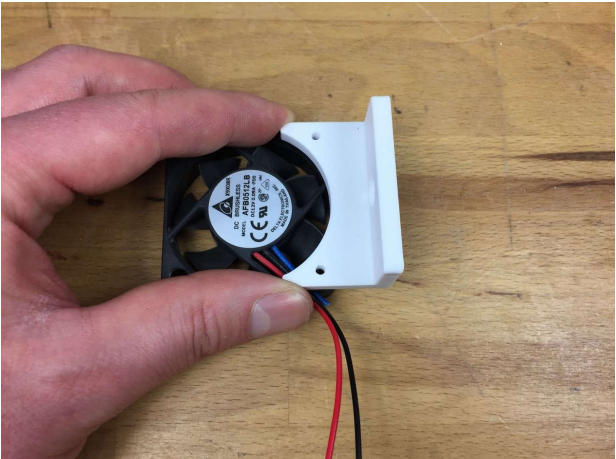
82	<p>Tool: Slotted screwdriver 3mm</p> <p>Connect the last connecting wire on the motor driver to PUL. The color of the wire does not matter.</p>	
83	<p>Plug the other end of the connecting cable into the top slot in the left row.</p>	
84	<p>Remove from package 5: 1x Y-stepper motor cable (EL21)</p>	

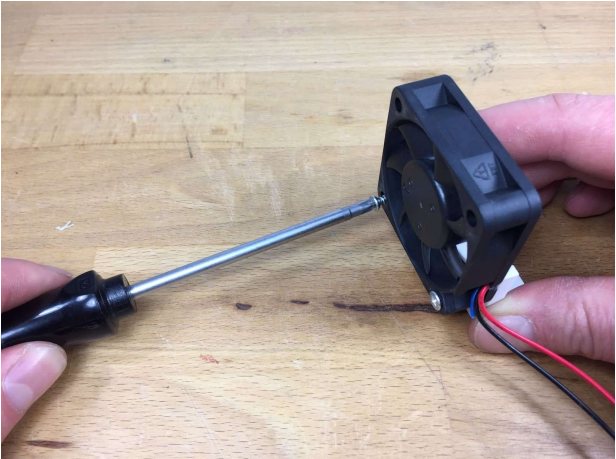

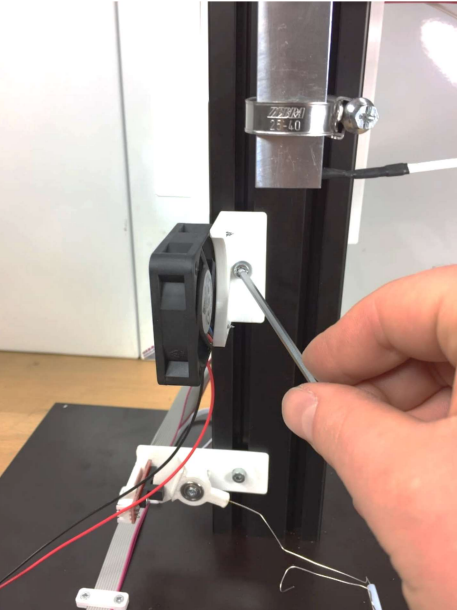
85	<p>Plug the black connector of the Y-stepper motor cable into the Ramps Board. See picture for slot. The long end of the Y-cable is led upwards. The short end is routed downwards.</p>	
86	<p>The red wire on the plug must point downwards. Make sure that the plug is pushed all the way open.</p>	
87	<p>3D printing: 1x LCD holder (EL23) Remove from package 5: 1x LCD 2004 display (EL24)</p>	
88	<p>Remove the knob by pulling it.</p>	

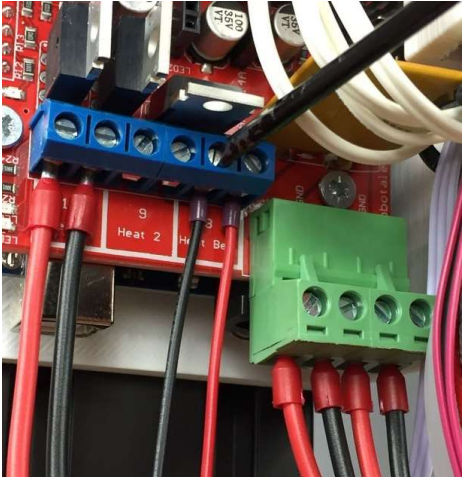
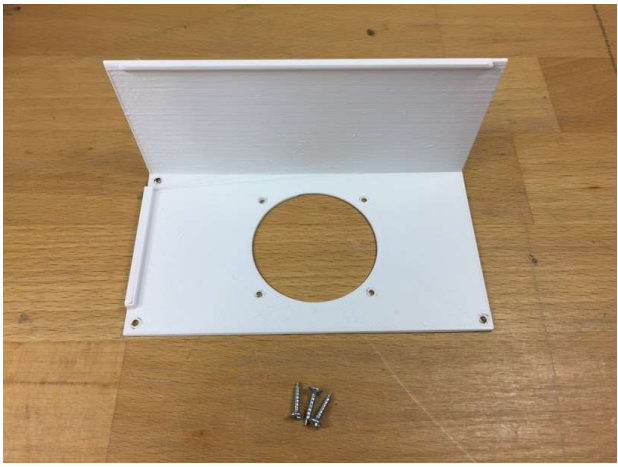
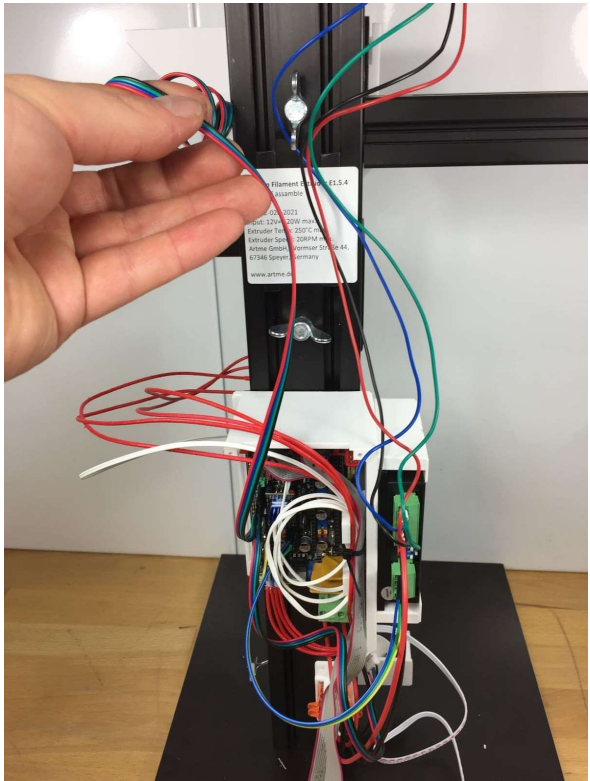
89	Insert the display into the display holder from behind.	
90	Display and rotary knob in the right place.	
91	<p>Remove from package 1: 4x wood screw 2.5x12 (SC01) Tool: Phillips screwdriver PH1</p> <p>Screw the display tight from behind in all four corners.</p>	
92	Replace the rotary knob. If the rotary knob can no longer be pressed well, remove it again by pulling and insert something like a paper ball into the rotary knob as a spacer and push the rotary knob back on. The rotary knob should now have a little more distance and be easier to press.	

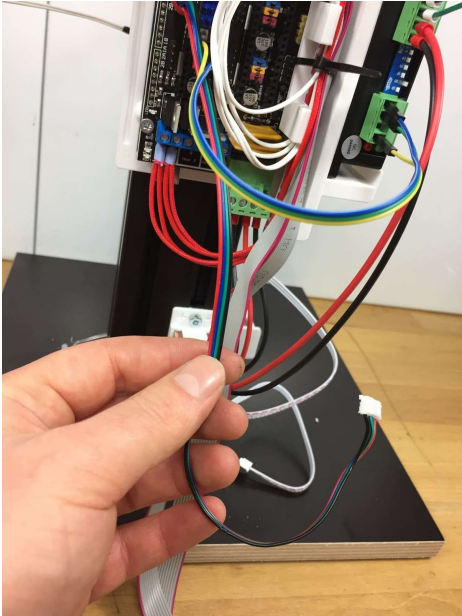
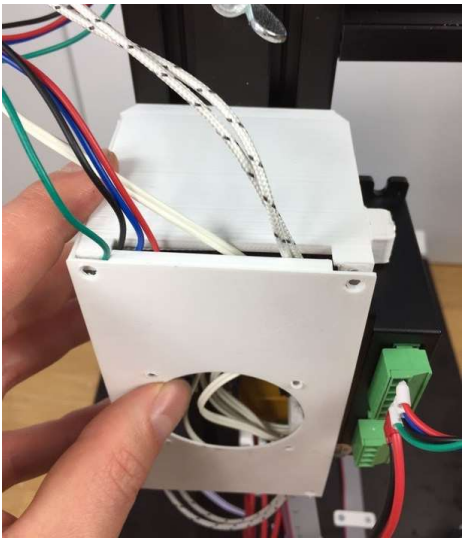
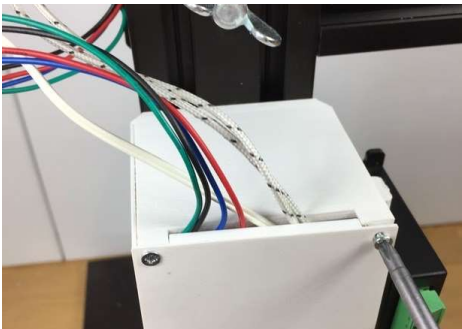
93	Connect the LCD cable. See next step for cable alignment.	
94	The cable with the number 1 is on the left, the cable with the number 2 is on the right.	
95	<p>Remove from package 1: 2x wood screw 2.5x12 (SC01)</p> <p>Tool: Phillips screwdriver PH1</p> <p>Screw the display holder tight. The position depends on the available length of the ribbon cable. See next step.</p>	
96	This is roughly how the display should be positioned. If the ribbon cable is a bit shorter, the display can be mounted a bit further back.	


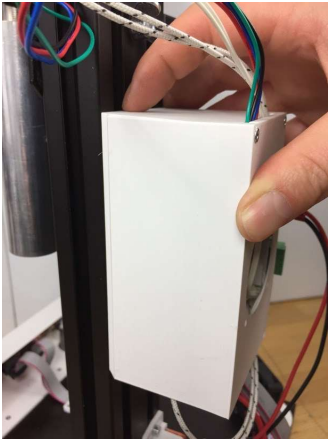
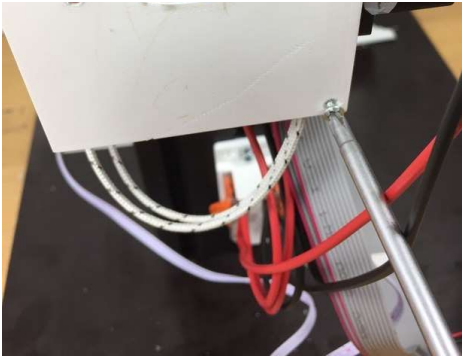
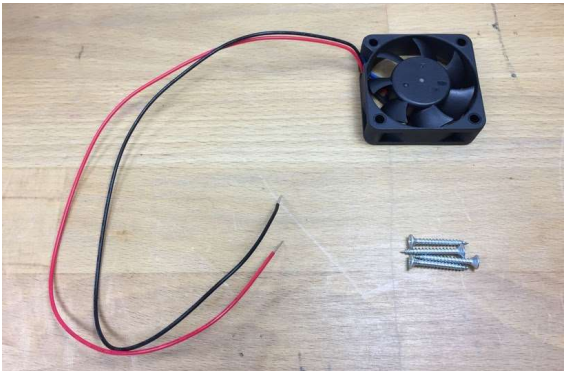
97	<p>3D printing: 2x holder ribbon cable (EL25)</p>	
98	<p>Superimpose LCD cables and attach clamp.</p>	
99	<p>Remove from package 1: 2x wood screw 2.5x12 (SC01) Tool: Phillips screwdriver PH1</p> <p>Screw clamp tight.</p>	
100	<p>Remove from package 1: 2x wood screw 2.5x12 (SC01) Tool: Phillips screwdriver PH1</p> <p>Align LCD cable straight and put on second clamp and screw tight.</p>	

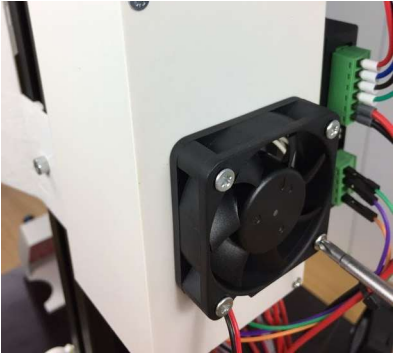
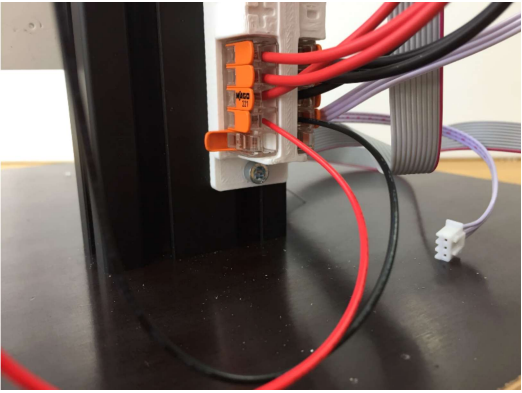
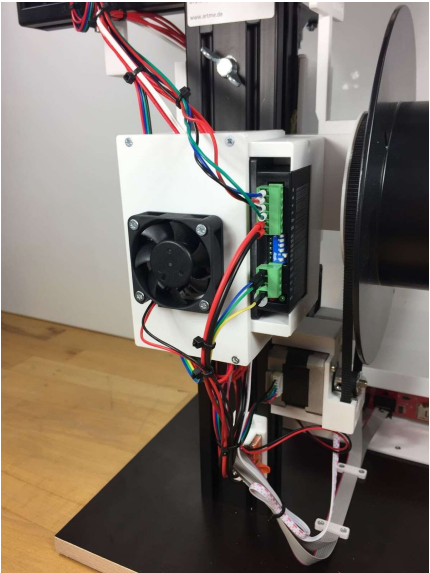
101	<p>3D print</p> <p>1x Fan bracket (EL26)</p> <p>Remove from package 5:</p> <p>1x fan 12V (EL27) with wire end ferrules (EL28)</p> <p>Remove from package 1:</p> <p>2x wood screw 3x25 (SC02)</p> <p>1x cap head screw M4x10 (SC04)</p>	
102	<p>Align fan and bracket as shown in the picture. Pay attention to the alignment of the connecting cables. The sticker of the fan must be visible.</p>	
103	<p>Place the holder in this position on the fan and hold both so that you can turn it over and insert the two screws into the corresponding holes.</p>	



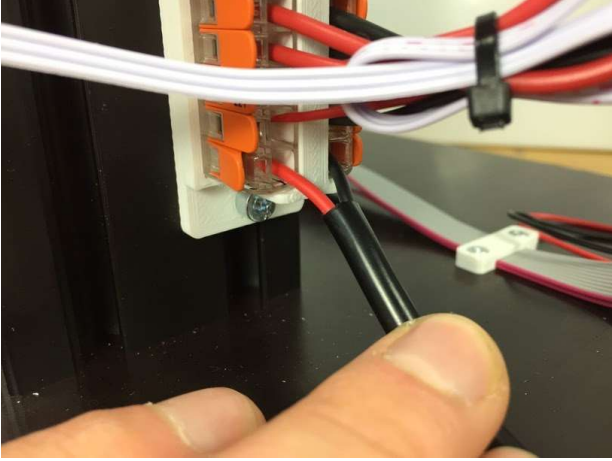
104	<p>Tool: Phillips screwdriver PH1</p> <p>Screw the fan to the fan bracket.</p>	
105	<p>Attach the fan holder to the aluminum profile of the main frame. To do this, insert the M4x10 cylinder screw through the hole on the fan holder and screw the screw into the slot nut on the profile in the left groove.</p>	
106	<p>Tool from package 6: Allen key size 3</p> <p>Align the fan straight and fix it with a distance of approx. 120mm to the base plate.</p>	


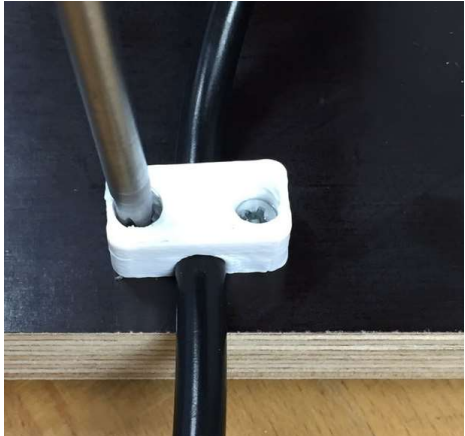

107	<p>Tool: Slotted screwdriver 3mm</p> <p>Connect the connection cable of the fan on the Ramps Board to connection D8. Attention: Pay attention to polarity. Red wire to right terminal, black wire to left terminal. See picture.</p>	
108	<p>3D printing: 1x lid Arduino housing (EL18) (Older version shown in picture)</p> <p>Remove from package 1: 3x wood screw 2.5x12 (SC01)</p>	
109	<p>Hold together the cables leading up from the housing and organize them a little. Make sure that the long end of the Y-cable is led upwards and the short end of the cable is led downwards.</p>	

110	<p>Keep the lines leading down from the housing together and organize them a bit.</p>	
111	<p>Put on the cover. Align the lines so that they are in the resulting slot.</p>	
112	<p>Tool: Phillips screwdriver PH1</p> <p>Tighten the two upper screws in the lid.</p>	

113	Align the lid so that the side wall meets the slot and closes.	
114	Closed side wall.	
115	Tighten the lower screw in the cover.	
116	<p>Remove from package 5: 1x fan 24V or 12V (EL19) (without ferrules)</p> <p>Remove from package 1: 4x wood screw 3x25 (SC02)</p>	

117	<p>Tool: Phillips screwdriver PH1</p> <p>Screw the fan to the cover. Caution: Do not tighten the screws very tightly, otherwise they will slip.</p>	
118	<p>Connect the fan to the Wago terminals. Attention: red wire to "+", black wire to "-".</p>	
119	<p>The cables will be arranged and fixed later. However, this will not be done until the spool drive and puller have been mounted. (Assembly steps follow)</p>	

120	<p>Required component: 1x power supply 12VDC 10A (not included) Please use a closed, safe power supply as shown. Attention: in countries with 110/120V mains voltage, a power supply with 12.5A must be used.</p> <p>3D printing: 1x strain relief (EL22)</p> <p>Remove from package 1: 2x wood screw 2,5x12 (SC01)</p>	
121	<p>Cut the connector on the 12v output of the power supply and strip the wires (with knife/stripping pliers/scissors). If you use knife or scissors, be careful not to hurt yourself.</p>	
122	<p>Connect the 12V line of the power supply to the Wago terminals: Pay attention to polarity again! Connect the positive pole (+) of the power supply to the Wago terminal on the left side (marked with "+"). Connect the negative pole (-) of the power supply to the right Wago terminal (marked with "-"). The colors red and black are not always present on every power supply. Reversing the polarity can damage the components. If in doubt, measure with a meter to determine the correct polarity.</p>	

123	Position the strain relief in the rear area. Fix the cable with it.	
124	<p>Tool: Phillips screwdriver PH1</p> <p>Remove from package 1: 2x wood screw 2.5x12 (SC01)</p> <p>Tighten strain relief.</p>	
125	Connect the power cord to the power supply. But do not plug it into a power outlet yet.	
<p>Done:</p> <p>Now continue with the assembly instructions "05-Spool drive assembly".</p>		