



## Assembly Instructions C1 Control Kit



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## Technical Data

<b>Main board supply:</b>	via power supply
<b>Protection class:</b>	III (Safety extra-low voltage)
<b>Max. Operating voltage main board:</b>	36 VDC
<b>Max. Sum of the output currents:</b>	500 mA
<b>Max. Number of axis motors:</b>	4
<b>Control of axis motors:</b>	Leadshine power amps
<b>Inputs:</b>	4 x Reference input 1 x Emergency stop 1 x Tool length sensor (Probe)
<b>Outputs:</b>	2 x Transistor output +24 VDC (Fog / flood cooling, aux), max. 100 mA each 1 x Relay output for spindle potential-free (FI circuit max 5A) or +24 VDC, max. 100 mA
Machine frame, Sorotec, Alu-Line	1 x fan connection +24 VDC, max. 300 mA
<b>Power supply:</b>	
<b>Input voltage (primary side):</b>	100 ... 240 VAC (50/60 Hz)
<b>Max. Current consumption (input):</b>	1.9 A
<b>Power consumption:</b>	450 VA
<b>Output voltage (secondary side):</b>	36 VDC
<b>Max. Output current:</b>	3.7 A
<b>Max. Output power:</b>	133.2 W



## General safety information

Only operate the controller indoors.

Protect the controller from extreme heat, moisture and aggressive liquids.

Do not switch on the controller if you suspect a fault or if there is obvious damage. In this case, secure the device against being switched on again until perfect function is ensured. If in doubt, we will be happy to advise you at any time - give us a call.

## Introduction

We thank you for the trust you have shown in us by purchasing the C1 Control kit. We recommend reading these instructions through completely before starting the installation and then proceeding step by step as described.

## Usage

The kit described here is supplied by Sorotec for setting up a three-axis control for CNC machines, especially of the „Hobby Line“ type. For use with the Basic or Compact Line, there is another version of this manual, which you can download from our shop.

## Required tools

Ordinary hand tools such as screwdrivers of various shapes and sizes, wire cutters, etc. should be available. The following tools are also required:

- Wire stripper
- Crimping pliers for wire end ferrules



### Attention!

Only carry out the work if you are familiar with the necessary actions and suitable tools are available.

Sorotec GmbH assumes no liability for property damage or personal injury that occurs during installation or operation of the control!



### Attention!

The electrical structure described here works in the low voltage range below 60 volts, which is safe for humans. Nevertheless, pay careful attention to possible sources of error (insulation, grounding, ...) in order to ensure proper function. Short circuits in particular can damage parts of the system or cause fires.



Fig. 1: The kit

### Scope of delivery

	Housing C1 Control	1		Oval head screw DIN 7981 2,9 x 9	12
	Stepper motor output stage	3		Cylinderhead screw DIN 7985 M3 x 6	30
	Motherboard	1		Cylinderhead screw DIN 912 M5 x 25	1
	Power supply 36 V	1		Fan screw 5 x 16	4
	Ground connection cable	1		Washer Ø M5	2
	Fan set	1		Tooth lock washer Ø M3 <sup>18</sup> Ø M5 <sup>19</sup>	11 4
	Main switch	1		Nut M5	2
	Cable gland M12 <sup>8</sup> M16 <sup>9</sup>	9 4		Functional earth sticker	1
	Cable gland M16 EMV	4		Control line 2 x 0,5 mm <sup>2</sup>	4
	Rubber foot	4		Jumper	1
	Spacer nut M3 x 10	15		Blade Receptacle 2,8 mm	2
				Ground cable	1

## Preparation of the housing

### Base


For this construction phase you will need:		#
1	Housing base	1
4	Rubber foot	11
8	Cylinderhead screw M3 x 6	14
8	Tooth lock washer M3	20
8	Spacer nut M3	12
1	Main switch	7
1	Front cover adapter module	



Fig. 2: Housing base

- Glue the four feet **11** into the corners of the floor **1**. Lateral distance approx. 5 mm.
- Provide the eight bottom holes with spacer sleeves **12**. between the spacer sleeves and the base plate (see images 2 and 4).
- Insert the main switch **7** into the rectangular opening on the front of the housing. The switch engages and does not need to be screwed down (see Fig. 4).
- Place the 3D-printed front cover that you received with the adapter module into the recess in the front of the housing and temporarily secure the part with an adhesive strip to prevent it from slipping out (see Fig. 4).

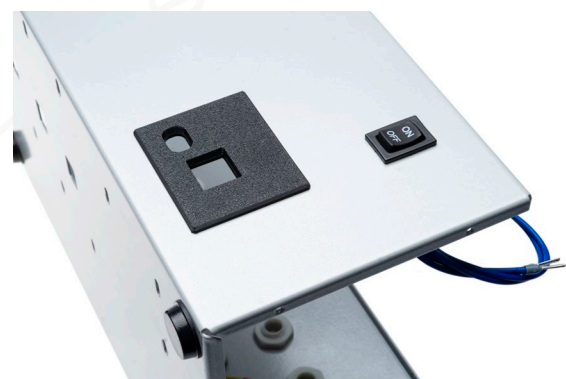


Fig. 3: Main switch and front cover

#### Note

*The cover is not part of the scope of delivery. It may be difficult to determine the correct orientation. However, when the housing is assembled later, the correct position becomes obvious and can be corrected quickly if necessary.*



Fig. 4: The housing base inside

### Cable glands

For this construction phase you will need:		#
1	Pre-assembled housing base as on page 7	1
6	Cable gland M12	8
3	Cable gland M16	9
3	Cable gland M16 EMV	10
1	Cylinderhead screw	15
1	Washer M5	17
4	Tooth lock washer M5	19
2	Nut M5	20
1	Ground cable	25



Fig. 5: Rear side with cable glands. Potential expansions are already prepared.

- Remove the paint inside and outside 2 mm around the holes for the metal screw connections and the functional earth screw (FE) and mount the cable glands 8, 9 und 10 as shown in Fig. 5.

The spare screw connections are intended for potential control system expansions—for instance, the addition of a fourth axis. The necessary mounting holes on the back of the housing have already been prepared.

- Assemble the functional grounding screw (FE) together with the ground cable 25 as shown in Fig. 6.



### Attention!

Make sure there is good electrical contact between the earthed screw connections and the housing!

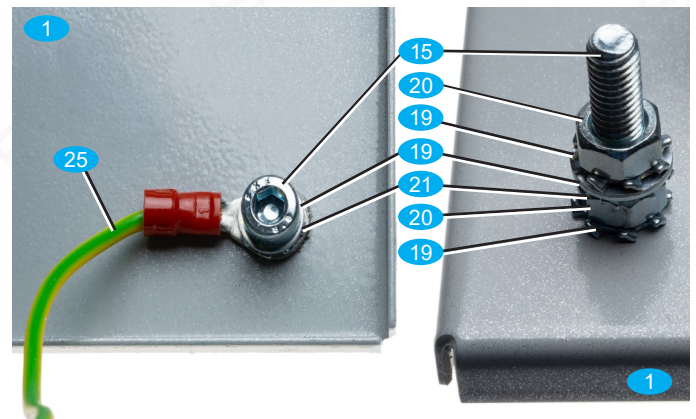


Bild 6: Functional grounding screw (FE) inside / outside

### Cover

For this construction phase you will need:		#
1	Housing cover	1
1	Fan set	6
4	Fan screw	16

- Mount the fan **6** with the fan screws **16** and the fan cover on the housing cover **1**, as shown in Fig. 7.

**i Note**

*The fan should blow into the case. The direction of flow is marked with an arrow on the side of the fan.*

- Place the filter fleece on the fan cover and attach the filter cover.

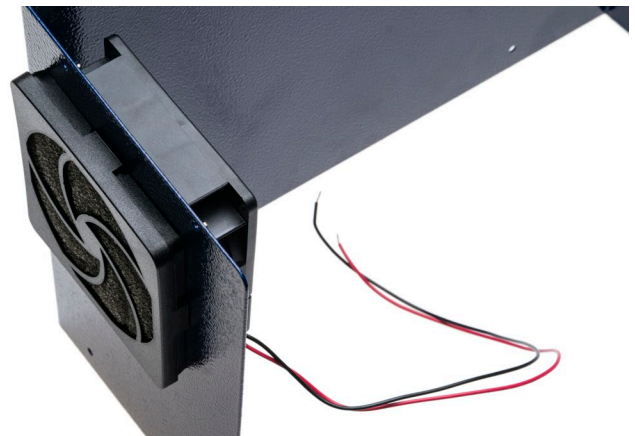


Fig. 7: The filter cover is snapped onto the fan cover together with the filter fleece.

### Installation of Mainboard and Adapter Module

For this construction phase you will need:		#
1	Motherboard	3
1	Adapter module	<b>i</b>
1	Connection cable	<b>i</b>
16	Cylinderhead screw M3 x 6	14
4	Spacer nuts M3	12
	Pre-assembled housing base	

**i Note**

*The adapter module and the matching connection cable depend on the control software you are using and are not part of the scope of delivery.*

*Both Estlcam and Beamicon2 can be downloaded from the manufacturers' websites.*

- Mount the four spacer sleeves **12** for the adapter module with cylinder head screws **14**. See Fig. 8.
- Mount the main board with cylinder head screws **14** on the base. See Fig. 9.

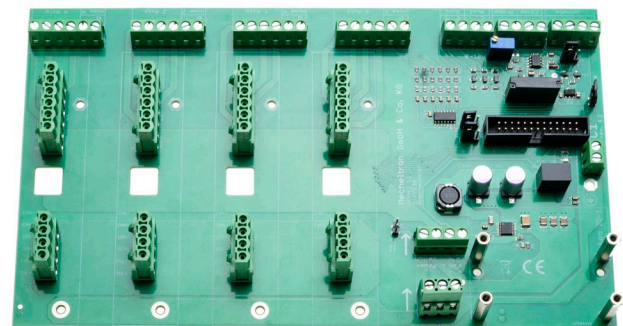


Fig. 8: Motherboard, the prepared space for the adapter module at the bottom right

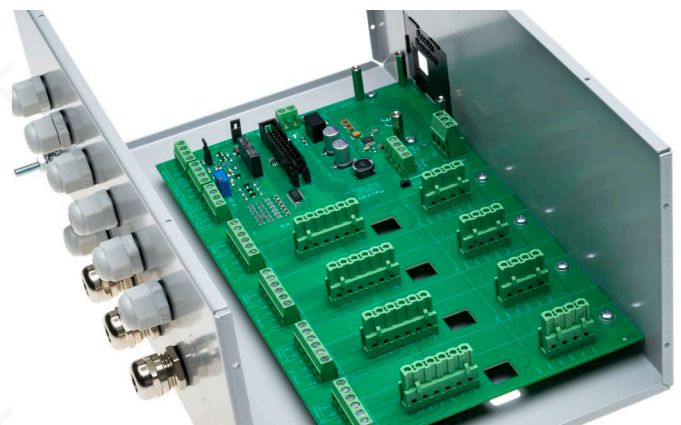


Fig. 9: Housing base with mounted motherboard

- Screw the adapter module into place with cylinder head screws **14**.
- Connect the adapter module and the motherboard with the connection cable. See Fig. 10.



### Attention!

The mainboard can be severely damaged if powered on without the output stages inserted. Be sure to wait until the control system is fully assembled before switching it on for the first time.

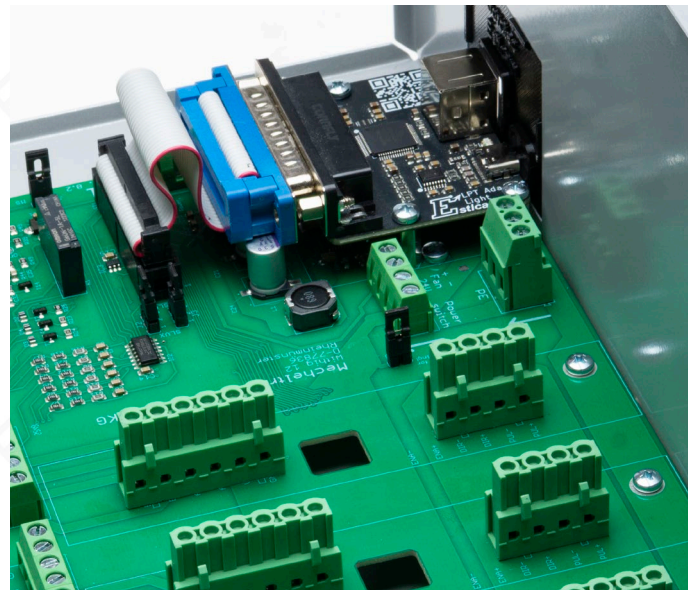


Fig. 10: The mounted adapter module with connection cable

## Final assembly

### Cabling

For this construction phase you will need:		#
	Partially assembled control	
	Cable according to circuit diagram	
1	Power supply 36 V	<b>4</b>

- Prepare the cables by stripping approx. 10 cm each and fitting the stripped ends with wire end sleeves.
- Guide the cables through the respective cable glands. Do not tighten the screw connection yet.
- **EMV cable gland**  
The EMC cable glands made of metal should ensure a good electrically conductive connection between the shielding braid of the motor connection cables and the earthed housing ground.

Mount the motor cables as shown in Fig. 11 by placing the suitably shortened shielding braid back on the outside of the plastic inner part and screwing it with the union nut.

- Connect the cables as described in the circuit diagram. See Fig. 12 on next page.

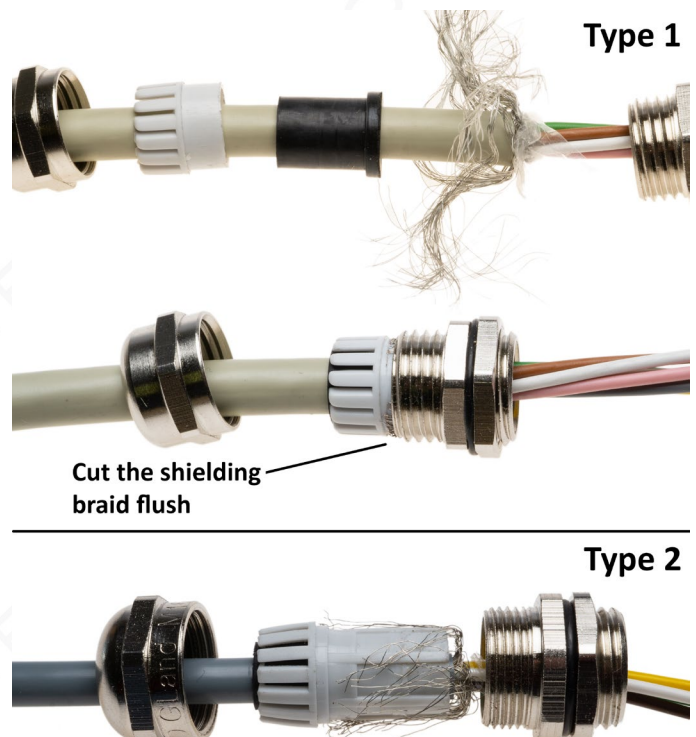


Fig. 11: Insertion of the cable shielding in the EMC screw

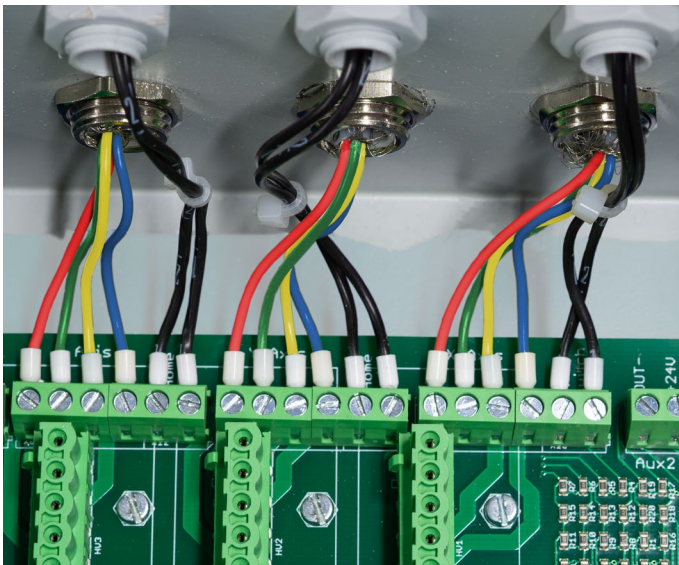


Fig. 12: Angeschlossene Kabel für Schrittmotoren und Endschalter

- Push the cables into position in the feed-throughs and tighten the screw connections.
- Connect the main switch to the terminals labeled „Power Switch“. See Fig. 13.
- Connect the ground cable **25** to the ground terminal, as shown in Fig. 14.
- Connect the power supply **4** to the terminal next to the adapter module, as shown in Fig. 15.

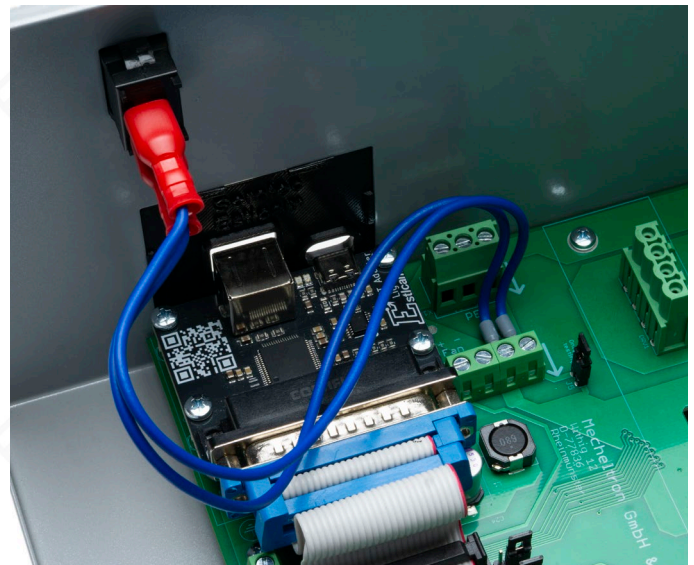


Fig. 13: Connection of the Main Switch

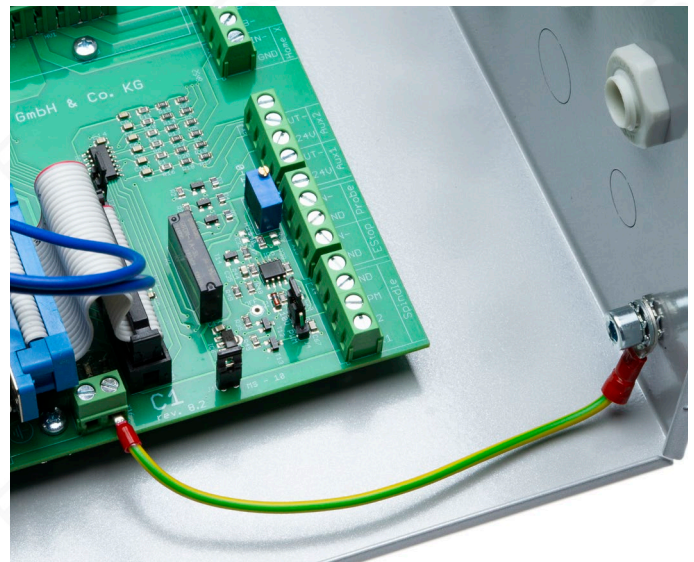


Fig. 14: Connecting the Grounding Cable

## Tool length sensor

One of the most important accessory options is a tool length sensor. The terminals for the connection are labeled „Probe“ on the main board..

### **i** Note

*Always connect your tool length sensor as an opener. The correct wiring can be found in the data sheet of the TLS, or you can determine this with a continuity tester.*

- Connect the tool length sensor cable as shown in Fig. 16 on the next page.

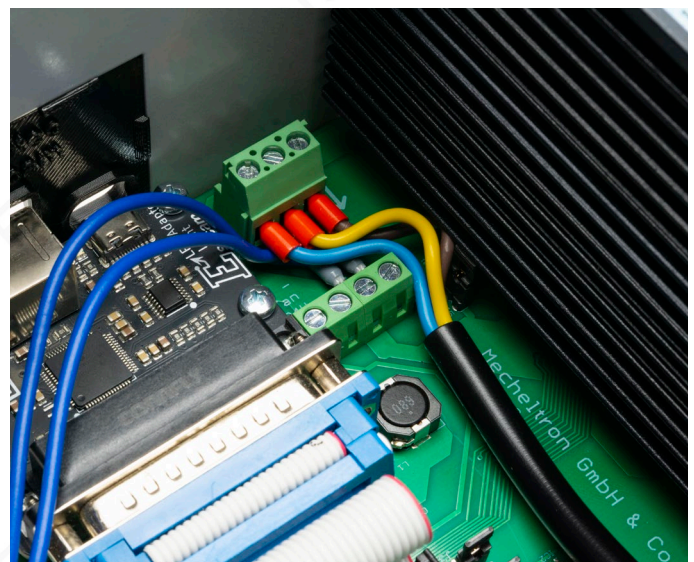


Fig. 15: Power Supply Connection

### Emergency Stop Switch Connection

#### Hobby-Line machines

Use the female spade terminals **24** to connect the control line **22** to the emergency stop switch mounted on the front face of your machine. Use wire ferrules for the connection to the controller.

#### Other machines

Standard emergency stop switches feature screw terminals for connection. Accordingly, fit the control cable **22** with wire ferrules at both ends.

Fig. 16 shows the connection on the mainboard.

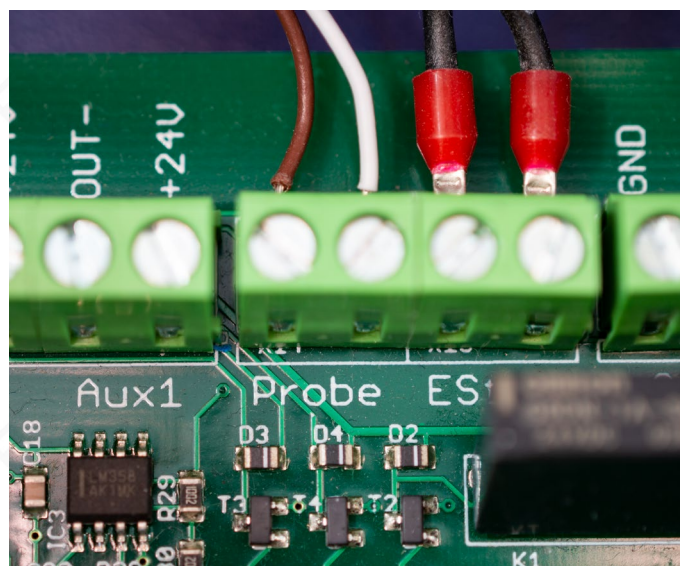


Fig. 16: Connection of the tool length sensor, here with brown and white wire. To the right the emergency stop.

### Option Switchbox

The switch box is optionally available in the Sorotec shop (EZB.MINI.SBR.01), which can be used to switch 230 V externally via a 24 V signal. Useful e.g. for operating minimum quantity lubrication or chip extraction.

The switch box is connected to the +24 V and Aux 1 or +24 V and Aux 2 terminals on the main board using the control cable supplied with 2 x 0.5 mm<sup>2</sup> **22**. See image 20.

The box can also be used for the spindle (AMB / Ma-fell), here the jumper is plugged into the board and the switch box is clamped to K2 (+24 V) and GND at the spindle output.



Fig. 17: Option Switchbox



### Attention!

The sum of all currents at the terminals Aux 1, Aux 2, fan and spindle output must not exceed 500 mA. Higher currents can damage the motherboard. See also "Technical data" on page 4.

It is therefore advisable to supply a possibly existing spindle fan with its own power supply unit.

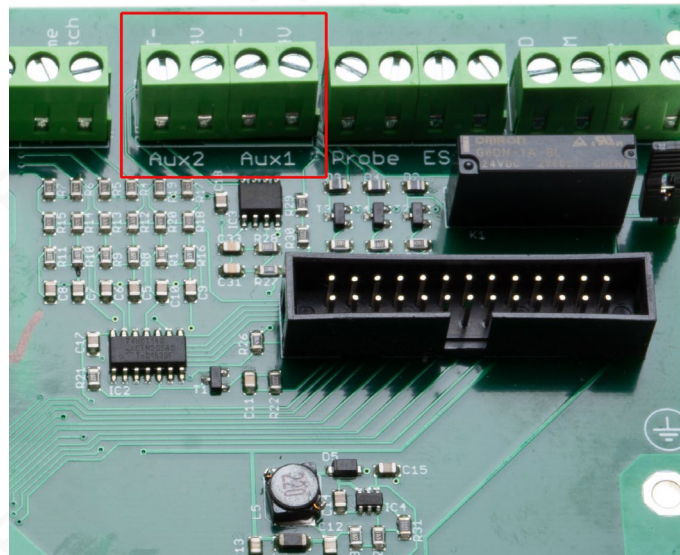


Fig. 18: The Aux 1 and Aux 2 terminals on the motherboard

### Preparation of the power amplifiers

Before installation, the output stages must be adapted to the stepper motors used. To do this, the eight **DIP switches** must be set correctly.

#### Example Hobby-Line:

For the **motor set with 4.2 A rated current** offered by Sorotec for the **Hobby Line** and for the **556 power amplifiers** from Mecheltron the following position of the DIP switches is correct:

1	2	3	4	5	6	7	8
Off	Off	On	Off	On	Off	On	On

#### Example Compact-Line:

For the **Compact-Line** and **Compact-Line Light** motor set, also offered with **556-series power amplifiers** and a rated current of **4.2 A**, the following DIP switch configuration is correct:

1	2	3	4	5	6	7	8
Off	Off	On	Off	Off	Off	On	On

**i** We strongly recommend that you set switches 1 to 3 only as specified, otherwise the motors could overheat.

However, this switch position is only an example. If other motors are used, the setting must be made using the tables printed on the output stages (see Image 19).

The first three DIP switches determine the current with which the respective motor is operated. The last four switches in the series regulate the „resolution“: This means the number of steps into which a single motor revolution is broken down.

The stepper motors used perform 200 steps of 1.8 ° per revolution. With the DIP switch setting shown, the output stage divides these full steps into 8 micro steps each. This then results in 1600 steps per revolution of the motor. With a spindle pitch of 10 mm / revolution, one microstep theoretically corresponds to a travel distance of 0.00625 mm.

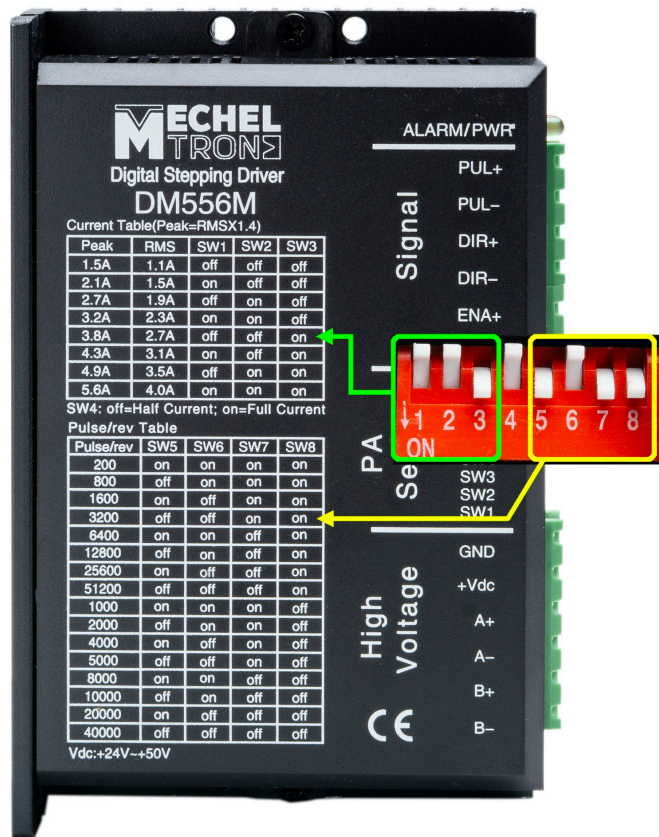


Fig. 19: DIP switch setting for current and resolution for the Hobby-Line motorset



### Attention!

Before commissioning, check the resolution entries in your control software! The machine cannot work properly if the values do not match the setting.

### Install power amplifiers

For this construction phase you will need:		#
	Partially assembled control	
3	Pre-configured stepper motor drivers	2

- Remove the screw terminal connectors that are not required.
- Plug the prepared power amplifiers into positions one to three on the motherboard. See Fig. 20.



Fig. 20: Attached power amplifiers

### Fourth output stage in slave mode

If an axis is to be driven with two spindles and two motors, a fourth output stage is required. Four-axis software can usually be configured accordingly. When using three-axis software, the fourth output stage can be configured for slave operation with jumpers on the main board. The parallel connection can be made either for the X-axis (jumper 1-2) or for the Y-axis (jumper 2-3), as described in Fig. 21.

Jumper bridges are not included in the scope of delivery.

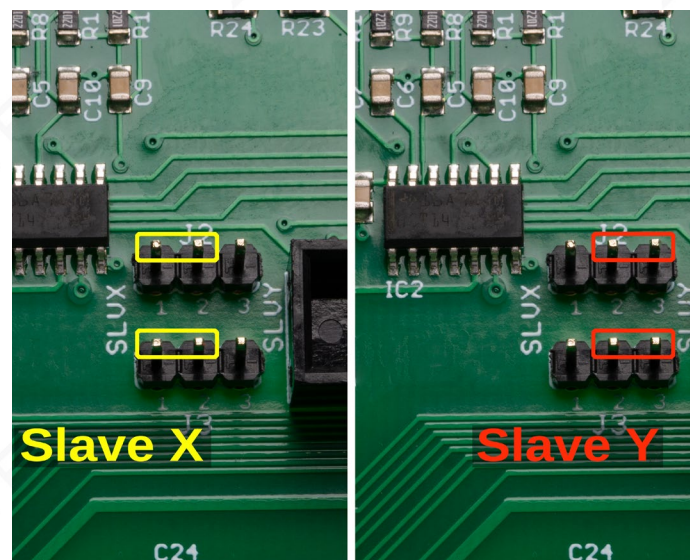


Fig. 21: Jumper for slave operation of a fourth output stage

### Cover

For this construction phase you will need:		#
	Partially assembled control	
	Pre-assembled housing cover	
6	Oval head screw	13

- Connect the fan to the terminal labeled „FAN“ on the motherboard. See Fig. 22.
- Close the housing and mount the cover with screws 13.

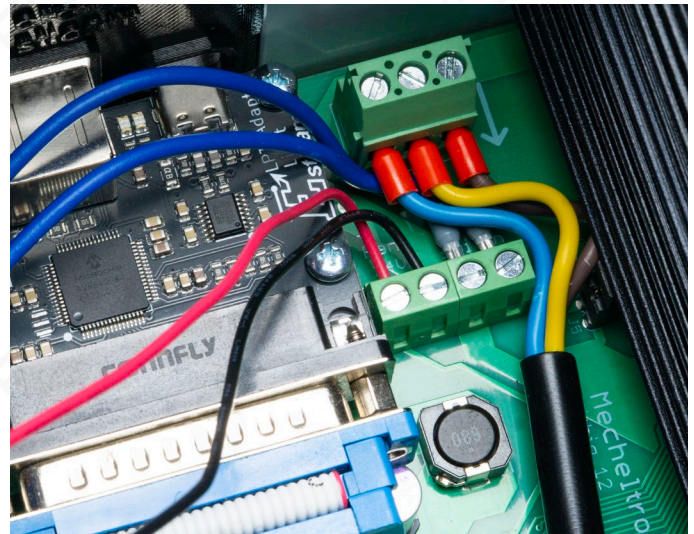


Fig. 22: Connection of the fan (red / black) next to the main switch.

### Earth connection cable

For this construction phase you will need:		#
	Partially assembled control	
1	Earth connection cable	5
1	Functional earth sticker	21

- Affix the sticker 21 above the ground screw connection.
- Screw the ring cable lug 5 of the earthing connection cable between the washer of the toothed washer of the earthing screw connection. **Also lay all grounding cables coming from the machine here.** Make sure it is tight.

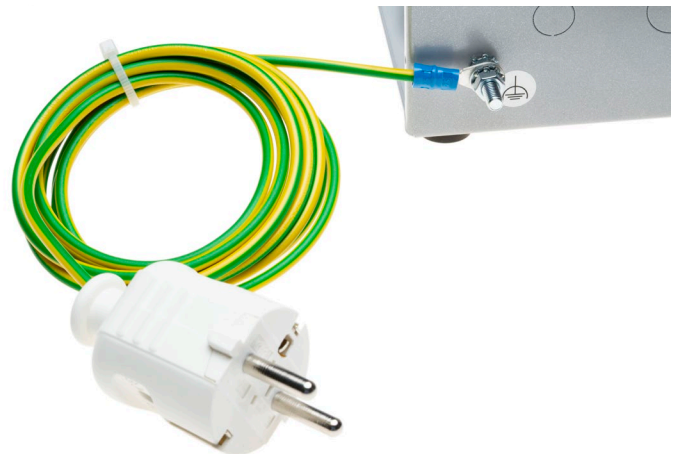


Fig. 23: Ground cable screwed to functional ground (FG)

### Commissioning

- Plug the earth connection cable into a properly earthed socket.
- Connect the control computer to the control.
- Establish the power supply with the external power supply unit.

The control is now ready for use and can be put into operation.



Fig. 24: Fully assembled C1 Control with power supply