

SOROTEC

Assembly Instructions CNC Control Kit 3 axes, midi housing



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SOROTEC GmbH
Withig 12
77836 Rheinmünster

Tel.: +49 (0) 7227-994255-0
Fax: +49 (0) 7227-994255-9
E-Mail: sorotec@sorotec.de
Web: www.sorotec.de

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Introduction

We thank you for the trust you have placed in us, which you have shown with the purchase of the control kit. We recommend reading through these instructions completely before building and then assembling the kit step by step as described.

Required tools

Ordinary hand tools such as screwdrivers in various shapes and sizes as well as side cutters etc. should be available. The following tools are also required:

- Electronics soldering equipment
- Wire stripper
- Crimping pliers for end sleeves
- Crimping pliers for cable lugs



Attention danger!

The mains plug must be pulled out before opening the housing.



Caution!

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

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



Attention danger!

It is expressly pointed out that the electrical connection is the responsibility of the electrical installer! In particular, the correct connection of the protective conductor and the subsequent protective conductor test must be carried out by electrotechnically qualified personnel in accordance with the relevant national regulations!



Scope of delivery

Illustration	Description	Number
1	steel housing	1
2	emergency stop in an IP 65 housing	1
3	coupling relay	1
4	DIN rail 0,05 m	1
5	adhesive feet 20 x 6	4
6	sticker	1
7	switching power supply 48 V	1
8	power stage	3
9	adapter board for power stage	3
10	Interface Advance PRO	1

Illustration	Description	Number
11	IEC chassis connector	1
12	power switch	1
13	fuse holder	2
14	fuse 5 x 20 mm 6.3 A slow blow	2
15	fuse 5 x 20 mm 10 A slow blow	1
16	outlet	2
17	socket 6pole	4
18	D-Sub-socket 9pole with solder cups	3
19	D-Sub-socket 9pole for ribbon cables	1
20	D-Sub-socket 25pole for ribbon cables	2

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Illustration	Description	Number
21	D-Sub-plug 25pole for ribbon cables	1
22	D-Sub-plug 9pole with solder cups	4
23	D-Sub-plug 9pole for ribbon cables	1
24	D-SUB mounting kit	5
25	Housing for D-SUB 9	4
26	cable connector Binder 6pole	4
27	fan 80 x 80 x 25 mm 12 V with grille lid	1
	protection and cover frame with dust filter for fans	1
29	ring terminal 0.5 ... 1 mm ²	6
30	blade receptacle 0.5 ... 1 mm ²	7

Illustration	Description	Number
31	circular socket 0.5 ... 1 mm ²	2
32	round plug 0.5 ... 1 mm ²	2
33	range shrinkable tubing	1
34	range ferrules	1
35	power cord	1
35	patch cable 0.5 m	3
36	D-SUB cable 25pole	1
K1	ribbon cable 25pole	0.8 m
K2	ribbon cable 9pole	0.8 m
K3	control line Oelflex 110 2 x 0.5 mm ²	3 m

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Illustration	Description	Number
K4	PVC wire 0.5 mm ² dark blue	10 m
K5	PVC wire 0.5 mm ² black	10 m
K6	PVC wire 0.5 mm ² green / yellow	10 m
K7	PVC wire 0.5 mm ² light blue	10 m
K8	PVC wire 1 mm ² black	10 m
S1	lens head screw DIN 7981 M3.5 x 9,5	10
S2	stand off M3 x 30	4

Illustration	Description	Number
	cylinderhead screw DIN 84 M3 x 6 S3 M4 x 6 S4 M4 x 10 S5 M5 x 6 S6	4 4 8 2
	countersunk screw DIN 965 M3 x 12 S7 M4 x 16 S8 M4 x 40 S9	2 8 4
	cylinderhead screw Allen DIN 6912 M6 x 25	1
	washer DIN 125 M3 U3 M4 U4 M5 U5 M6 U6	6 24 2 2
UZ	toothed washer DIN 6797 M6	4
	nut DIN 934 M3 M3 M4 M4 M5 M5 M6 M6	6 20 2 2

Preparing the housing

For this construction phase you need:		#
1	steel housing	1
4	adhesive feet	5
1	DIN rail	4
2	cylinderhead screw M5 x 6	S6
2	washer M5	U5
2	nut M5	M5
1	power switch	12
1	fan	27
1	dust filter for fans	28
4	countersunk screw M4 x 40	S9
4	washer M4	U4
4	nut M4	M4
2	fuse holder	2
2	fuse 6.3 A	14
1	IEC chassis connector	11
1	fuse 10 A	15
2	countersunk screw M3 x 12	S7
2	washer M3	U3
2	nut M3	M3
2	outlet	16
8	countersunk screw M4 x 16	S8
8	washer M4	U4
8	nut M4	M4
1	cylinderhead screw M6 x 25	Z1
2	washer M6	U6
4	toothed washer M6	UZ
1	nut M6	M6

Prepare the housing 1 for the installation and wiring of the modules as follows:

- Open (if not already done) the pre-punched installation openings for the power switch 12, the IEC device connector 11, the two fuse holders 2 above the outlets, the 25pole D-Sub connector, three of the four places for 9pole D-Sub sockets 18 and also three of four holes for the six-pole panel jacks 17.

- Remove all burrs and sharp edges from the installation openings.
- Glue the rubber feet 5 into the four corners on the bottom of the case. Distance from each side approx. 8 mm.
- Check and correct the length of the mounting rail 4 if necessary - it should be 5 cm.
- Mount the mounting rail with the screws S6, washers U5 and nuts M5 in its place in the rear part of the housing (see Fig. 11).
- Push the power switch 12 with the „0“ upwards into the rectangular opening on the front of the housing until the edge of the switch lies flat. The switch is self-holding, a screw connection is not necessary.
- Mount the fan 27 with screws S9, washers U4 and nuts M4 with the connection cable downwards behind the grille opening on the front. Screw the grill cover of the fan onto the outside of the housing as shown in Fig. 1. Pay attention to the direction of flow: The cool air should be blown into the housing!
- Slide the cover frame 28 with the dust filter inserted onto the grille cover of the fan.



Fig. 1: Mounting the fan

- Mount the IEC connector **11** with screws **S7**, washers **U3** and nuts **M3** in the opening provided on the rear.
- Equip the integrated fuse holder of the IEC device connector with the 10 A fuse **15**.
- Mount the two built-in outlets **16** with screws **S8**, washers **U4** and nuts **M4**.
- Now install the fuse holders **13** belonging to the sockets in the holes above.
- Equip the fuse holders **14** with a 6.3 fuse each.

Central grounding screw



Caution!

The next step concerns the central grounding point of the controller. Poor grounding is a common and difficult to detect source of errors. Carry out the work with special care.

Below the sockets, near the center, is the hole for the central earthing point. The screw installed here must have good conductive contact with the housing plate.

The central earthing screw is provisionally installed - later four PE cables with cable lugs are installed from the inside.

- Remove the paint a millimeter or two around the hole.

- Thread a washer **U6** and a toothed washer **UZ** onto the screw **Z1** and insert the screw from the inside through the hole. Now thread another tooth lock washer on the outside, followed by a nut **M6**. Two more tooth lock washers follow, a normal washer and finally another nut.



Fig. 2: Central grounding screw inside (left) and outside

i Grounding cables are connected using ring cable lugs, on the inside between the washer and the toothed washer, on the outside between the two outer toothed washers.

Power supply and Stages

For this construction phase you need:		#
1	power supply	7
2	cylinderhead screw M4 x 6	S4
2	washer M4	U4
3	power stage	8
6	cylinderhead screw M4 x 10	S5
6	washer M4	U4
6	nut M4	M4
3	adapter board for power stage	9
1	coupling relay	3

- Mount the power supply 7 with screws S4 and washers U4 behind the fan as shown in Fig. 5.

Preparation of the power stages

Dip switches

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

Example:

For the **motor sets** offered by Sorotec for the **Hobby-Line** and the **Basic-Line** with a **nominal current of 4.2 A**, the **542 power amplifiers** from **Lichuan and Leadshine** following position of the DIP switch correctly:

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

i We strongly recommend that you do not change the setting of switches 1 to 3, otherwise the motors can overheat.

However, this switch setting is only an example. When using other motors or amplifiers, the setting must be made using the tables printed on the amplifiers (see Fig. 3).

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. The output stage divides these full steps into 16 micro steps each with the DIP switch setting shown. This then gives 3200 steps per revolution of the motor. With a spindle pitch of 10 mm / revolution, a microstep theoretically corresponds to a travel distance of 0.003125 mm.

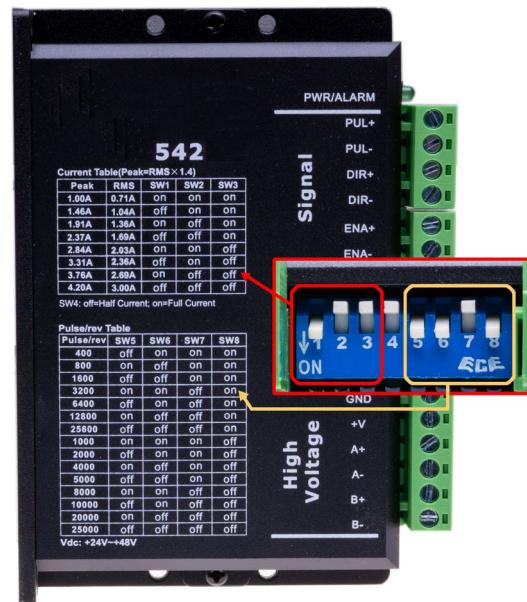


Fig. 3: DIP switch setting for current and resolution, here with the setting for the Hobby Line motor set

Adapter

Terminal strip adapters with RJ45 sockets for the power amplifiers are included in the kit.

- Assemble the adapters as shown in Fig. 4.
- Mount the three power amplifiers with screws S5, washers U4 and nuts M4 in the rear part of the control, as shown in picture 5.



Fig. 4: Mounting the RJ45 adapter on the terminal block

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Control Kit Midi and EdingCNC

When using EdingCNC as software, the following points must be observed when operating the MIDI control:

- The adapter board shown in Figure 5 must be inserted between Eding V5A and the MIDI control. Figure 6 shows the complete signal chain.

In addition, it is possible to connect a tool length sensor to terminal X1 of the adapter, as described in Figure 7, which would otherwise occupy the input for the reference switch of a fourth axis on the Advanced Pro interface. The middle terminal serves as an input for the pulse signal (tachometer) of a spindle.

- The jumpers on the V5A board must be set as shown in Figure 8.
- The jumpers of the Advanced Interface Pro must be set as described on the next page in Figure 10.



Fig. 5: Adapter board with connection cable

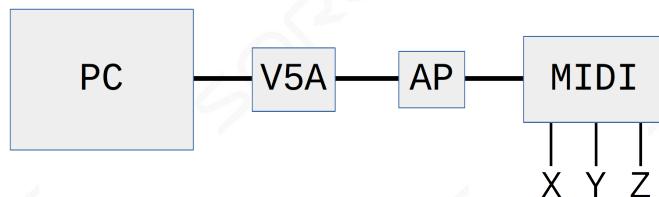


Fig. 6: Signal chain from PC, Eding V5A, adapter board and MIDI control

Connection of additional signals to terminal X1

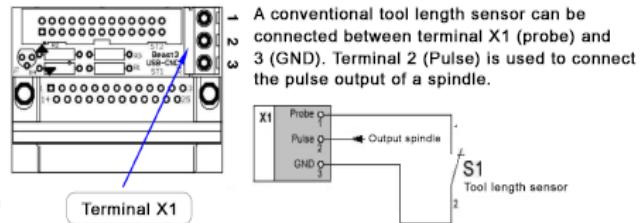


Fig. 7: Assignment of terminal X1

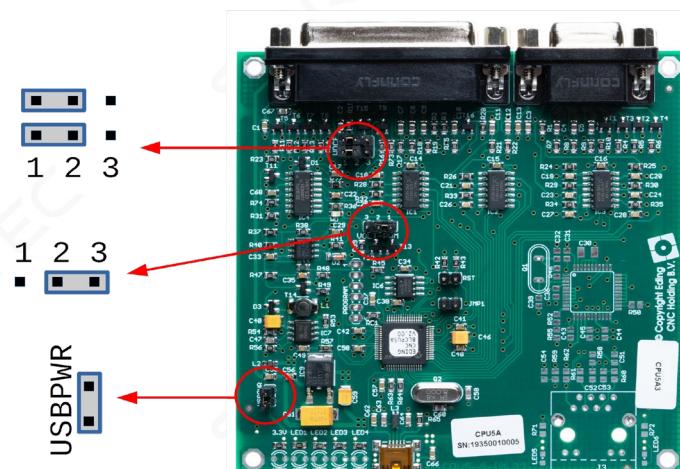


Fig. 8: Jumper setting Eding V5A

Preparation of the interface

Depending on the software used, the Advanced Interface Pro must be adapted by moving jumpers.

Estlcam

For use with Estlcam, set the jumpers as follows:

- 1-2, 4-5, 6-7, 10-11 (see Fig. 9)

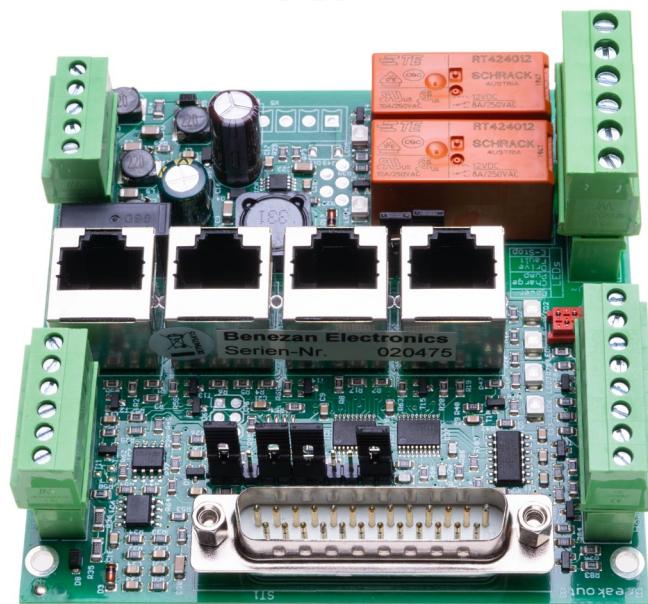


Fig. 9: Jumpers for use with Estlcam

EdingCNC

For use with EdingCNC, set the jumpers as follows:

- 2-9, 4-5, 6-7, 10-11 (see Fig. 10)

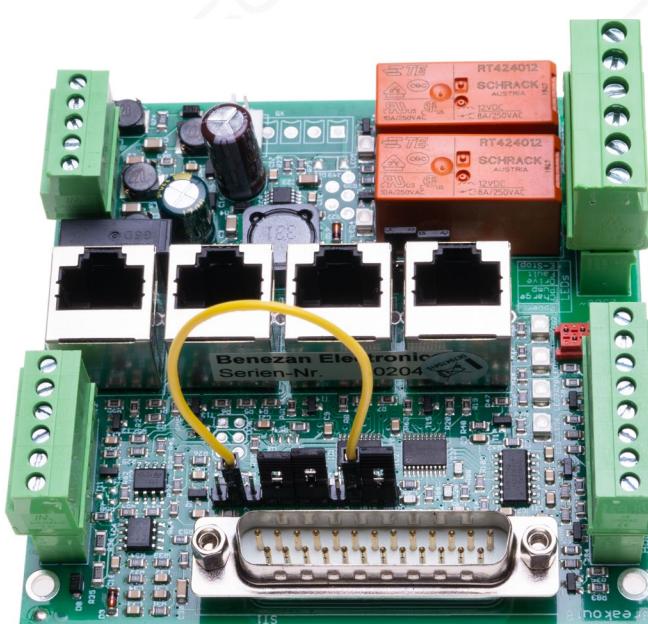


Fig. 10: Jumpers for use with EdingCNC

Coupling relay

The coupling relay **3** is used for the optional control of the milling spindle with a frequency converter. See the „Feed / Supply“ circuit diagram for details.

- Place the coupling relay on the already installed mounting rail, as shown in Fig. 11.

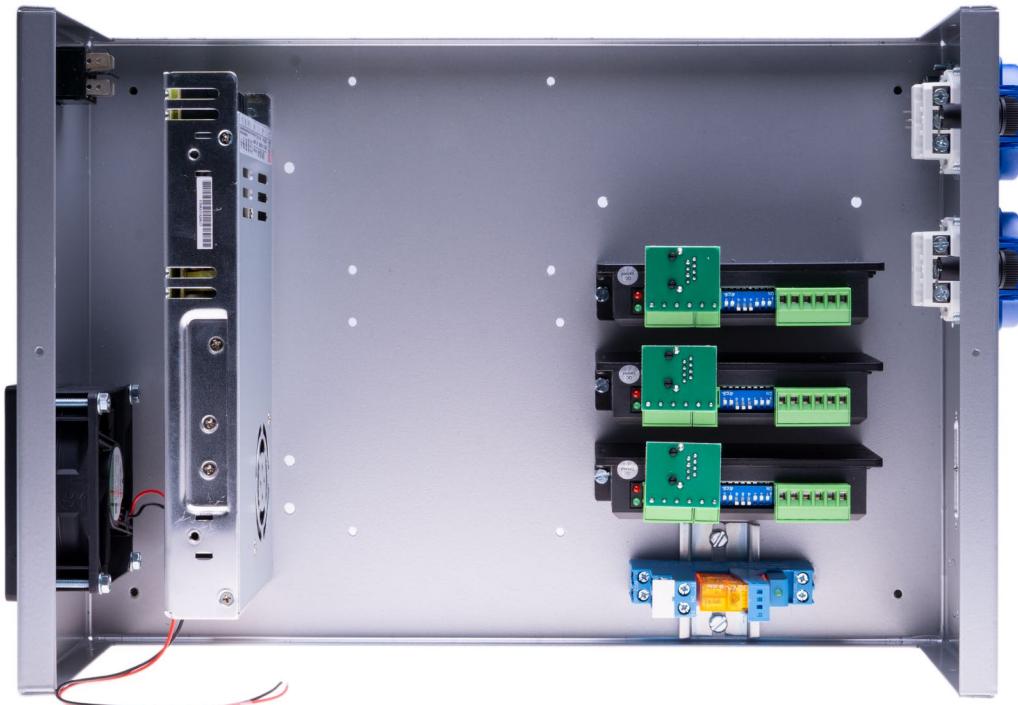


Fig. 11: Housing with internals before the start of the wiring

Wiring

For this construction phase you need:		#
1	Interface Advance Pro	10
4	stand off M3 x 30	S2
4	washer M3	U3
4	nut M3	M3
4	cylinderhead screw M3 x 6	S3
3	socket	17
3	D-Sub-socket 9pole with solder cups	18
3	D-SUB mounting kit	24
6	ring terminal	29
7	blade receptacle	30
2	circular socket	31
2	round plug	32
1	shrinkable tubing	33
1	ferrules	34
PVC core cable according to circuit diagram		

All the information required for wiring is contained in the circuit documentation that you received together with these instructions. In addition to the connections to be created, this applies in particular to:

- Cable cross-sections
- Core colors
- Pinouts from plugs

Please take the time to study the circuit documentation in detail before you start wiring.

In the following, these instructions provide general information, such as for soldering sockets.

In addition, pictures show the gradual completion of the wiring as an example for a sensible laying and bundling of the cables.

Cable ends

Please always use the appropriate equipment for the cable ends for your connections:

- End sleeves for screw terminals
- Flat receptacles for plug connections
- Ring cable lugs for grounding

Assembly of the interface

The interface ⑩ installed in its place prevents access to the connection terminals of the power supply. The following procedure has therefore proven itself:

- Mount the stand offs ⑪ with screws ⑫ on the corners of the board.
- Wire the interface loosely in place in the housing.
- When working on the terminals of the power supply, the interface can simply be bent to the side.
- After completing the wiring, assemble the interface with washers ⑬ and nuts ⑭ on the base plate.

Installation of the motor sockets

The screw connections of the motor sockets ⑯ also need good ground contact because the shield of the motor cables is connected to the housing. Therefore, remove the paint around the three holes for the mounting sockets by one to two millimeters.

Solder connections

Cross-circuits are a common source of errors when soldering connectors and plugs. It is therefore essential to insulate each individual pin with shrink tubing (see Fig. 14).

Twisted lines

To reduce electrical fields, the cables for power supply to the output stages and motors must be twisted in pairs. See also Fig. 15.

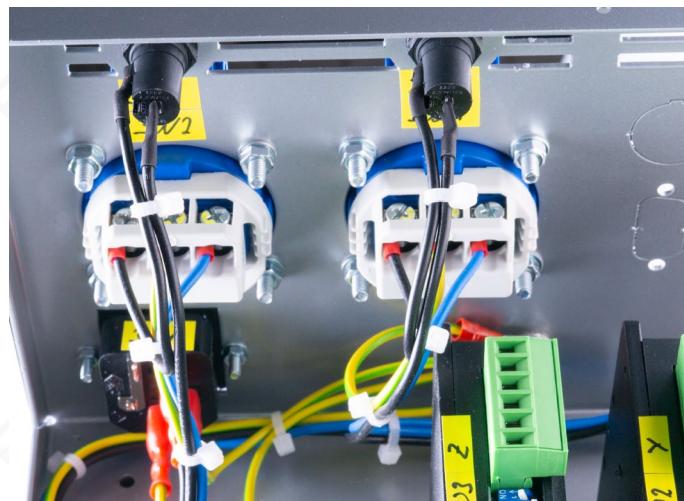


Fig. 12: The sockets for cooling / milling spindle with fusing



Fig. 13: The terminal block on the power supply



Fig. 14: Each pin individually insulated with shrink tubing

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Fig. 15: Power lines are twisted in pairs

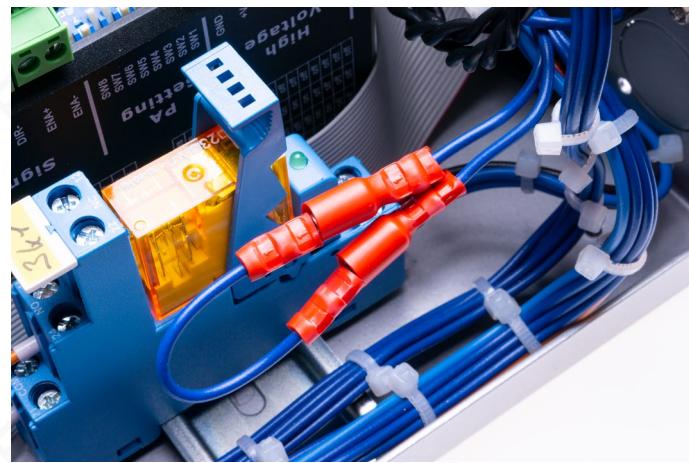


Fig. 16: Jumper with circular plugs / sleeves for optional frequency converter connection

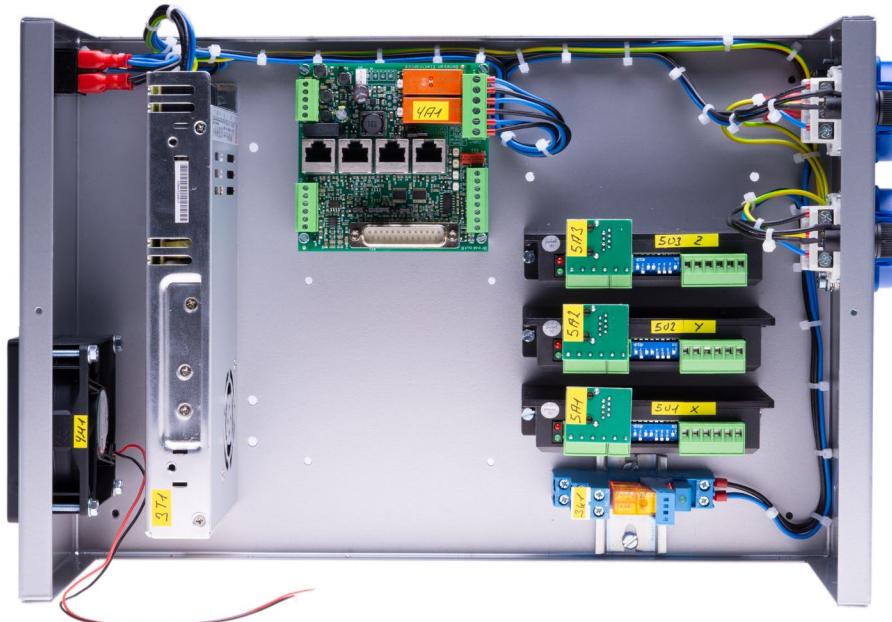


Fig. 17: Basic wiring with mains voltage and ground lines

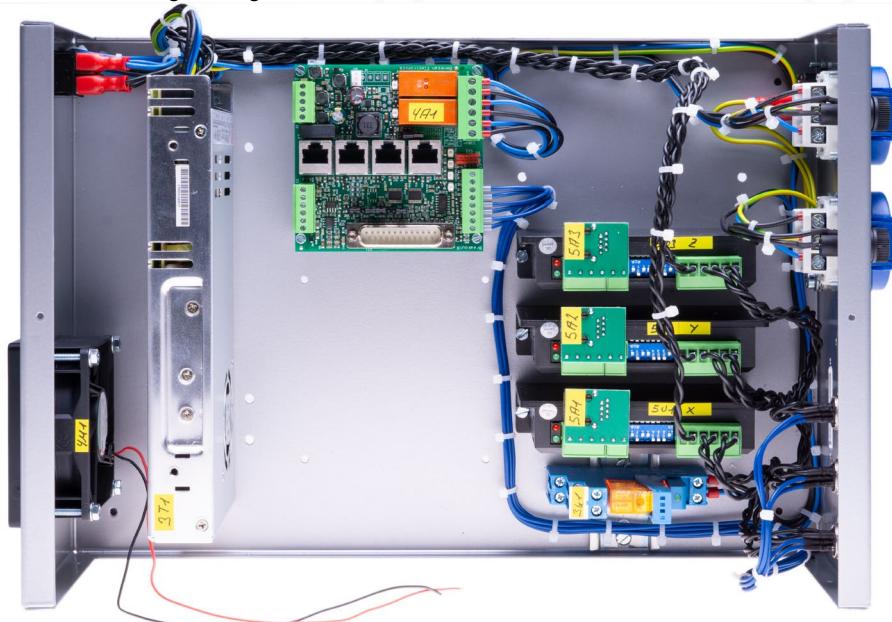


Fig. 18: Power cables to the output stages and the motor connections, reference switch cables (blue)

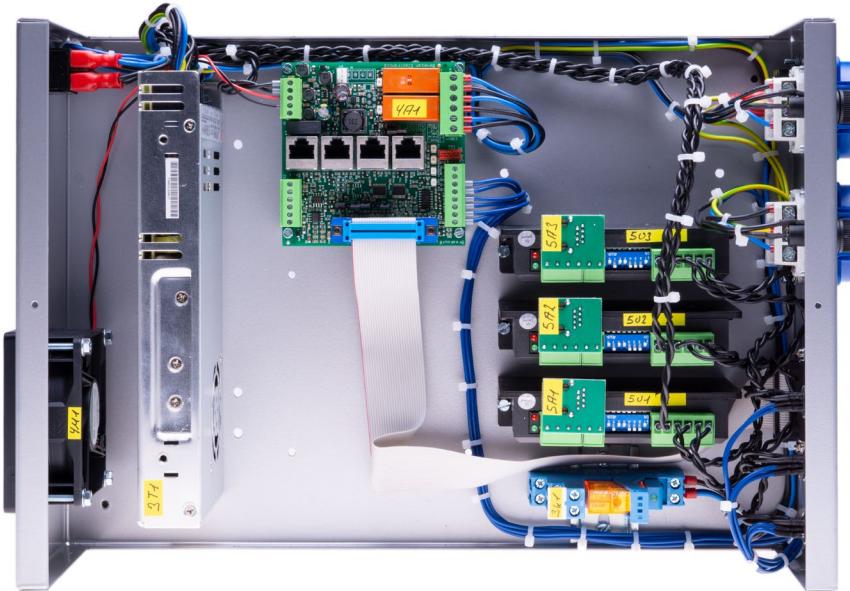


Fig. 19: Fan connected, ribbon cable from interface to rear wall of housing

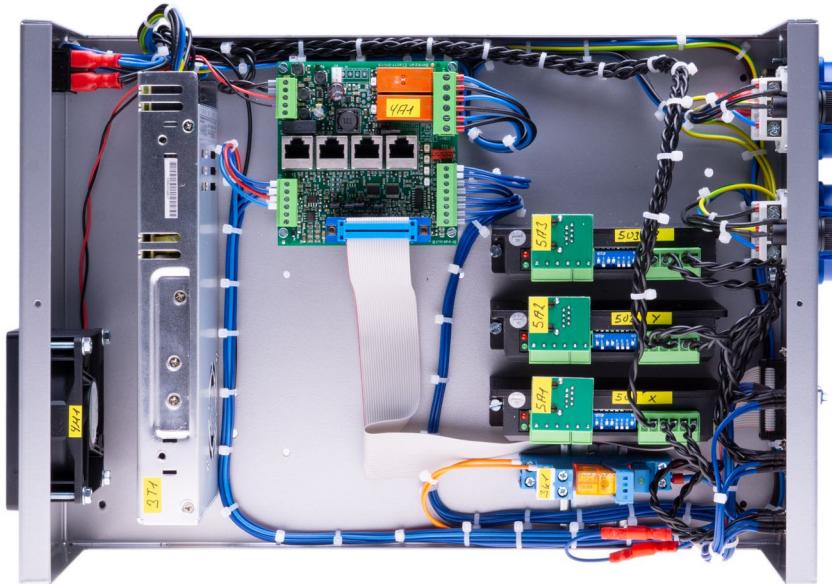


Fig. 20: D-SUB sockets wired, jumper for frequency converter connection

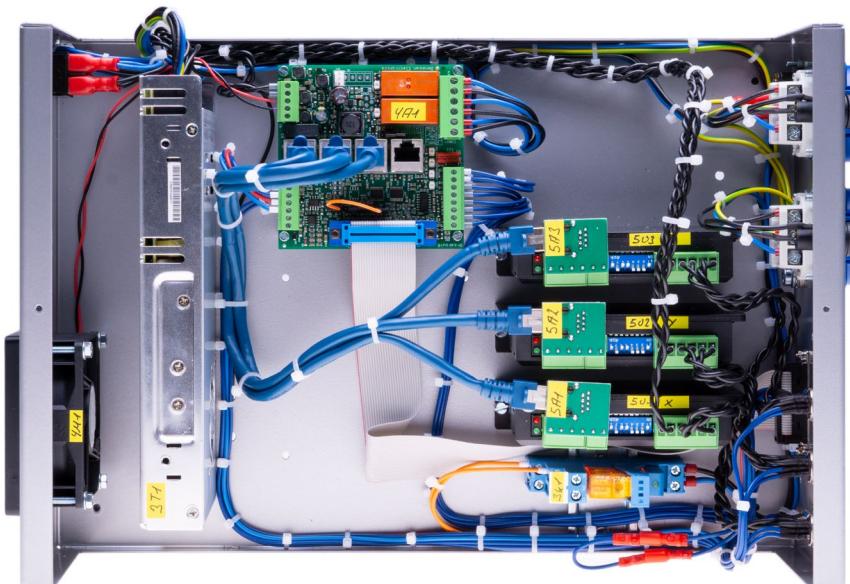


Fig. 21: Finished control with patch cables between the interface and the power amplifiers

Further wiring

For this construction phase you need:		#
1	ribbon cable 25pole	K1
1	D-Sub-socket 25pole	20
1	D-Sub-plug 25pole	21
1	D-SUB mounting kit	24
3	patch cable RJ45	35
1	emergency stop	2
1	D-Sub-plug 9pole	22
1	Housing for D-SUB 9	25
	control line 2 x 0,5 mm	K3

Ribbon cable

The ribbon cable K1 must be provided with a plug 20 and socket 21 to produce the connection cable from the interface to the rear wall of the housing.

i Make sure that the cable is inserted correctly. Slipping or twisting leads to unwanted cross connections.

Usually a special tool is used for the pressing process, the purchase of which is not worthwhile for hobby craftsmen. However, the correct pressing is also possible between the protective jaws of a vice or with a screw clamp on the edge of a table top.

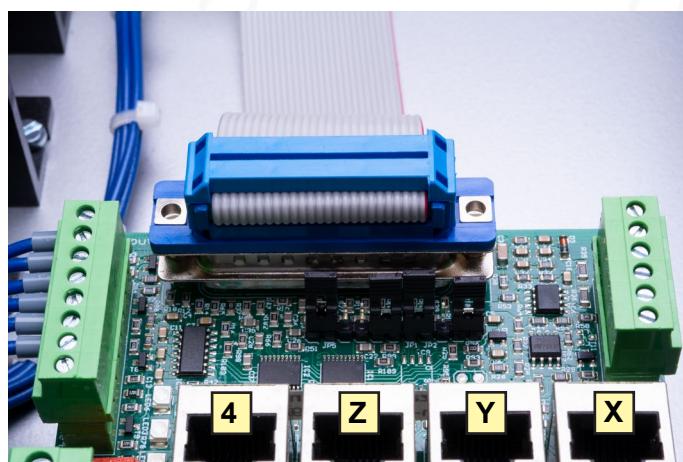


Fig. 22: Ribbon cable with connector, axis assignment of the four outputs

i In any case, test your result with a continuity tester for contact from one end to the other and then for short circuits: every pin against ground, then every pin against every other. Contact faults and short circuits are a common and difficult to find cause of malfunctions.

Patch cable

- Connect the signal outputs (RJ45 sockets) of the interface and the control inputs of the output stages with the patch cables 35.

Pay attention to the correct assignment of the outputs to the axes. The arrangement is printed on the interface, near the relays. For your orientation: The RJ45 socket near the supply terminals represents the X axis, followed by Y and Z (see also Fig. 22).

Emergency stop



- Install the emergency stop switch 2 near the machine so that it is easily accessible.
- Wire the switch to the control line K3.
- Solder the D-Sub connector 22 to the free end of the control line and mount the connector housing 25.
- Connect the emergency stop to the control.

If an emergency stop switch is already available (as for example on all machines in the Hobby Line), you should preferably connect it. The switch included with this kit can then either be omitted or additionally integrated in a series connection.