



Assembly Instructions

Control kit
Benezan PRO 3 axis 4,2 / 5,6 A



ETS.43LEBP.OB.02.PB
ETS.63LEBP.OB.02.PB

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Introduction

We thank you for the trust you have shown in us by purchasing the control kit. We recommend reading these instructions through completely before assembly and then assembling the kit step by step as described.

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:

- Electronics soldering equipment
- Wire stripper
- Crimping pliers for wire end ferrules
- Crimping pliers for cable lugs
- Thread cutter for M4 and M5



Attention Danger!

Before opening the housing, the mains plug must be pulled out!



Attention!

Only carry out the work if you are familiar with the necessary actions familiar and appropriate Tools are in place.

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



Attention Danger!

It is expressly pointed out that the electrical connection is the responsibility of the electrician! 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	Designation	Number	Illustration	Designation	Number
	Sheet steel housing PRO2	1		Interface Advance Pro	1
	Connection panel	1		Sub-D cable 1:1	1
	Elastic adhesive feet	4		LED board with cable	1
	Sticker set	1		IEC connector with line filter, fuse holder and 2 fuses 10 A slow	1
	Wiring duct	3		Fuse holder	3
	Switching power supply 48 V	1		Microfuse 6,3 A slow	2
	Adapterplatine für Endstufe	3		Power switch	1
	Schrittmotor-Endstufe	3		Power cord	1
	Feinsicherung 5 A träge	1		Built-in socket	2
	Coupling relay	1		Fan 80 x 80 x 25 mm 24 V	1



Illustration	Designation	Number
	Fan damper	1
	Dust filter	1
	Built-in socket Binder 6-pole	5
	Cable connector binder 6-pole	5
	Sub-D socket 9 pin	2
	Sub-D connector 9 pin	2
	Sub-D mounting kit	3
	Sub-D housing for 9 pin	2
	Sub-D socket 25-pin	1
	Sub-D connector 25-pin	1








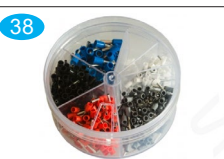



Illustration	Designation	Number
	Ribbon cable 25 pole	0,4 m
	Mounting rail	1
	Ring cable lug	8
	Flat receptacle	7
	Round socket	4
	Round connector	3
	Shrink tubing range	1
	End sleeves range	1
	Emergency stop switch	1
	Control line 2 x 0,5 mm²	3 m
	Patch cord RJ45 0.5 m	3








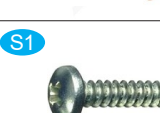





















Illustration	Designation	Number
	PVC core cable 0.25 mm ² violet	2 m
	PVC-core cable 0.50 mm ² dark blue	20 m
	PVC-core cable 0.50 mm ² black	10 m
	PVC-core cable 0.50 mm ² violet	2 m
	PVC-core cable 0.50 mm ² orange	2 m
	PVC-core cable 0.50 mm ² light blue	2 m
	PVC-core cable 0.50 mm ² red	2 m
	PVC-core cable 0.75 mm ² black	10 m
	PVC-core cable 1 mm ² black	10 m
	PVC-core cable 1 mm ² light blue	10 m
	PVC-core cable 1 mm ² green/yellow	10 m
	Pan head screw DIN 7981 M3,5 x 9,5	18

Illustration	Designation	Number
	Cylinderhead screw DIN 84 M3 x 6  M3 x 10  M4 x 6  M5 x 6  M6 x 20 	8 8 4 4 2
	Countersunk screw DIN 965 M3 x 12  M4 x 16  M4 x 40 	2 8 4
	Allen flat head screw DIN 7381 M3 x 6  M4 x 6 	2 6
	Washer DIN 125 M6	3
	Tooth lock washer DIN 6797 M6	10
	Hexagon nut DIN 934 M3  M4  M5  M6 	10 12 4 5
	Spacer sleeve M3 hexagon 10 mm 2 x M3 internal thread	4

Option pack suppression set and emergency stop module

We recommend building the controller with the interference suppression kit to improve the EMC properties and the emergency stop circuit to increase operational safety. The two options are available as a package under the order number ZB.ETS.ENT-NOT.01.

The installation of the options is described in the course of this manual at a suitable place.

Note

Retrofitting the options is possible, but requires more effort because parts of the wiring then have to be reinstalled.



Fig. 1: Option package consisting of an emergency stop module and interference suppression kit

Scope of delivery option package

Interference suppression kit

Illustration	Designation	Number
	Line filter 250 V / 10 A	1
	Pan head screw M4 x 6 with hexagon socket	2
	Ring cable lug	1
	Flat receptacle	4
	Snap ferrite 25 MHz: 151 Ω 100 MHz: 270 Ω	3
	Snap ferrite 25 MHz: 141 Ω 100 MHz: 241 Ω	6

Emergency stop module

Illustration	Designation	Number
	Emergency stop relay	1
	Power contactor 24 V/DC, 4kW 3 x 400 V + 1 Ö	1
	Illuminated pushbutton white	1
	Label frame with label „Reset“	1
	LED element white 12 ... 30 V AC/DC	1
	Contact element normally open	1

Preparation of the housing

For this construction phase you will need:		#
1	Sheet steel housing	1
4	Adhesive feet	3
1	Mounting rail	32
3	Cylinderhead screw M5 x 6	S5
1	Power switch	17
1	Fan	20
1	Fan damper	21
1	Dust filter for fans	22
4	Countersunk screw M4 x 40	S9
4	Nut M4	M4
3	Fuse holder	15
2	Microfuse 6.3 A	16
1	Microfuse 5 A	9
1	IEC built-in connector	14
2	Countersunk screw M3 x 12	S7
2	Nut M3	M3
1	LED board with cable	13
2	Flat headed screw M3 x 6	F1
3	Wiring duct	5
2	Built-in socket	19
8	Countersunk screw M4 x 16	S8
1	Washer M6	U1
5	Tooth lock washer M6	UZ
3	Nut M6	M6

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

- Open (if not already done) the pre-cut installation openings for the power switch **17**, the IEC built-in plug **14** and the three fuse holders **15**.
- Cut the threads for the mounting screws:
 - 8 x M4 for the sockets
 - 6 x M4 for the power stages (optl., see pg. 13)
 - 3 x M5 for the mounting rail (see Fig. 16)
- Remove all burrs and sharp edges from the installation openings.

- Stick the rubber feet **3** into the four corners on the bottom of the case. Lateral distance approx. 3 mm each.
- Check and, if necessary, correct the length of the mounting rail **32** - approx. 16 cm.
- Mount the support rail with screws **S5** in place in the front part of the housing (see Fig. 16).
- With the „0“ facing up, slide the power switch **17** into the rectangular opening on the front of the chassis until the edge of the switch is flush. The switch is self-retaining, a screw connection is not necessary.
- Mount the fan **20** and fan damper **21** with bolts **S9** and nuts **M4** behind the front grille opening with the connector cable down. Place the damper on the inside between the fan and the housing and the grid cover on the outside. Pay attention to the direction of flow: The cool air should be blown into the housing!
- Push the cover frame **22** with the inserted dust filter onto the grille cover of the fan.
- Install the IEC built-in plug **14** with screws **S8** and nuts **M3** in the opening provided on the back.
- Mount the LED board **13** in place on the front of the device with screws **F1**.
- Lay the self-adhesive wiring duct **5**. Use the course shown in Figure 16 as a guide.
- Mount the two built-in sockets **19** with screws **S7**.
- Now install the three fuse holders **15** in the holes below the sockets and next to the built-in plug.
- Equip the fuse holders next to the sockets (F1 and F2) with a 6.3 A microfuse **16** each.
- Equip the fuse holder next to the built-in plug (F3) with the 5 A micro fuse **9**.

Optional components

i Note

The area around the components shown in the pictures may differ from your specific structure.

- Mount the line filter **O1** with the flat head screws **O2** in the center of the rear of the housing (see Fig. 2).
- Place the emergency stop module **P1** on the mounting rail (see Fig. 3).
- Also plug the power contactor **P2** onto the mounting rail.
- Screw the illuminated pushbutton **P3** to the label holder **P4** in the hole on the front of the housing.
- Assemble the LED element **P5** and the contact element **P6** to the illuminated pushbutton as shown in Fig. 4.



Fig. 2: Line filter in front of the output panel

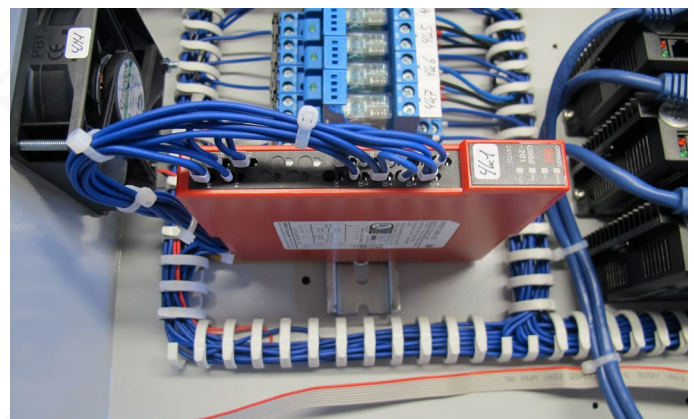


Fig. 3: Emergency stop module on mounting rail



Fig. 4: Assembly of button, LED element, contact element

Grounding screws

For this construction phase you need:		#
2	Cylinderhead screw M6 x 20	S6
3	Washer M6	U1
10	Toothed washer M6	UZ
5	Nut M6	M6



Caution!

Poor grounding is a common and difficult to detect source of errors. Carry out the work with special care.

The holes for the earthing points are located on the bottom of the housing and on the rear wall (see also Fig. 13). The screws installed here must have good conductive contact with the housing plate.

- **Remove the paint a millimeter or two around the hole.**
- Mount the grounding screws as shown in Fig. 5 to 7.
- Die Erdungsschraube des Gehäusedeckels wird vor dem Schließen des Gehäuses mit dem Erdungspunkt am Boden verbunden.

i Note

Earthing cables are connected to screws with ring cable lugs between tooth lock washers.

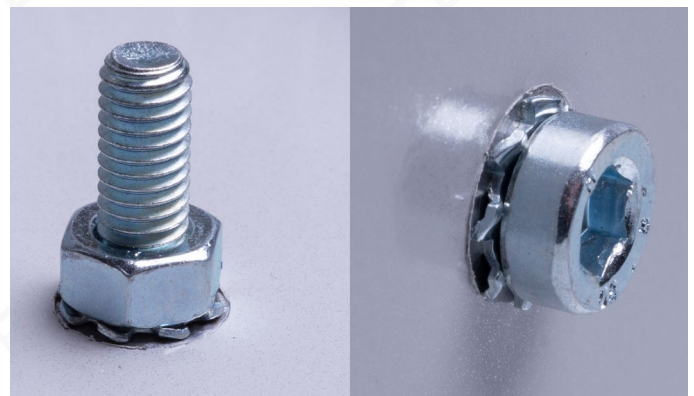


Fig. 5: Ground screw on the floor (left) and on the rear wall.



Fig. 6: Earthing screw, rear wall, outside.



Fig. 7: Earthing screw cover

Power supply and Stages

For this construction phase you need:		#
1	Power supply 48 V	6
2	Cylinderhead screw M4 x 6	S4
3	Power stage	8
6	Flathead screw M4 x 6	F2
6	Nut M4 (optional, see page 13)	M4
3	Adapter board for power stage	7
1	Coupling relay	10

- Mount the 48 V power supply **6** with screws **S4** as shown in picture 23.

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 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. 8).

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.

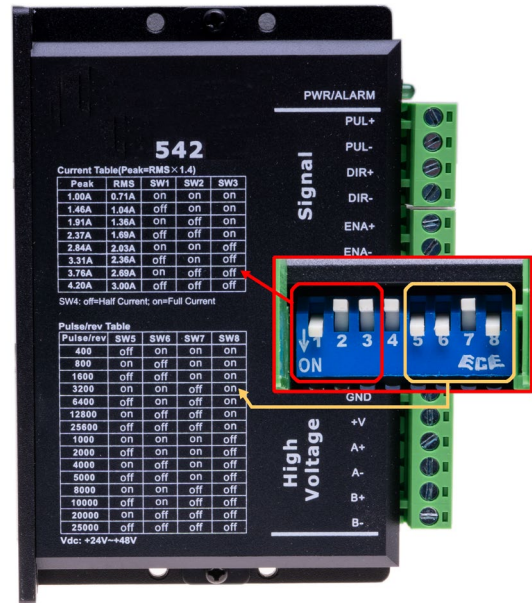


Fig. 8: DIP switch setting for current and resolution, here with the setting for the Hobby Line motor set on a 542 output stage.

Adapter

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

- Assemble the adapters **7** as shown in Fig. 9.
- For assembling the power stages see page 13.



Fig. 9: Mounting the RJ45 adapter on the terminal block

Interface Advanced Pro and EdingCNC

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

- The adapter board shown in Fig. 10 must be inserted between the Eding V5A and the MIDI control. Fig. 11 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 Fig. 12, 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 Fig. 12.
- The jumpers of the Interface Advanced Pro must be set as described in Fig. 13.



Attention!

Deviating circuit diagram!

For use with adapter board and EdingCNC, use the circuit diagram labeled ETS-NCPRO2-IF-DM542/556EU-PB3-ADP in the table on page 1 and at the bottom of the „Project“ title block on all following pages.

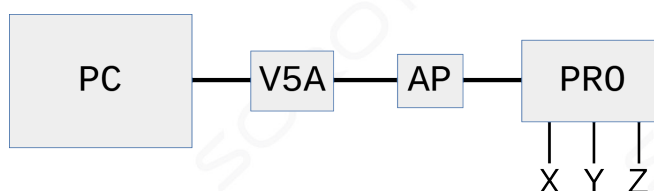


Fig. 11: Signal chain from PC, Eding V5A, adapter board and PRO control

Connection of additional signals to terminal X1

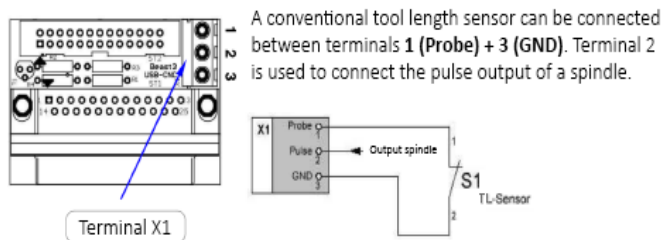


Fig. 12: Assignment of terminal X1



Fig. 10: Adapter board with connection cable

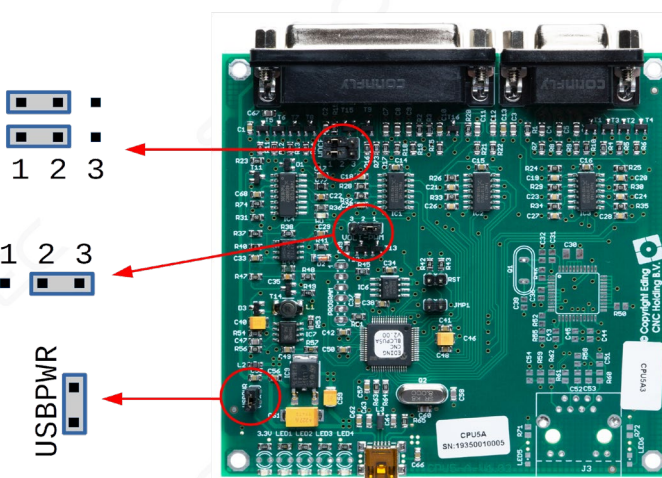


Fig. 13: Jumper-Setting Eding V5A

Preparation of the interface

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

Estlcam

For use with Estlcam, insert the Jumpers as follows:

- 1-2, 4-5, 6-7, 10-11 (see Fig. 14)

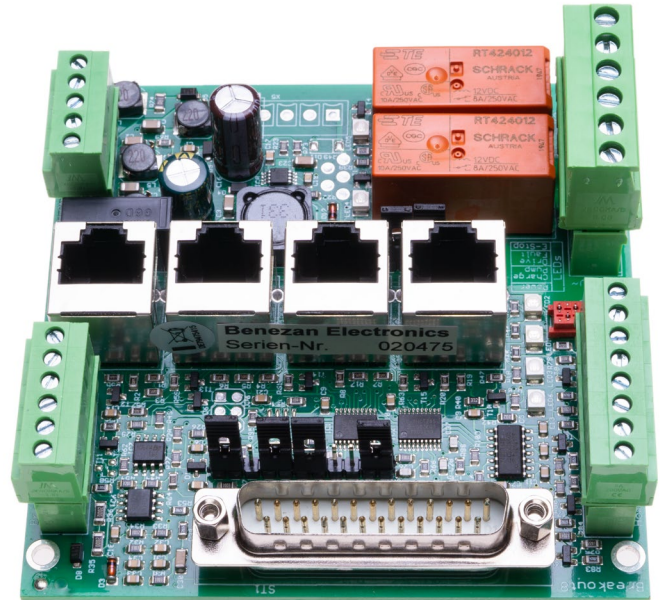


Fig. 14: Jumpering for use with Estlcam

EdingCNC

For use with EdingCNC set the jumpers as follows:

- 2-9, 4-5, 6-7, 10-11 (see Fig. 15)

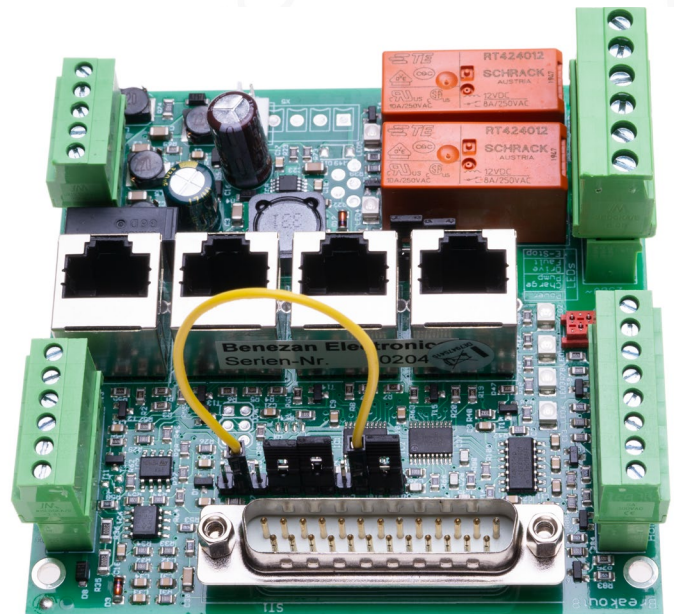


Fig. 15: Jumper setting for use with EdingCNC

Coupling relay

The coupling relays **10** is connected upstream of the sockets for milling spindle and cooling. See the „Feed / Supply“ circuit diagram for details.

- Place the coupling relays on the mounting rail as shown in Fig. 23.

Wiring

For this construction phase you need:		#
1	Connection panel	2
8	Pan head screw	S1
5	Socket 6-pole	23
6	Ring cable lug	33
7	Flat receptacle	34
2	Round socket	35
2	Round connector	36
1	Shrinkable tubing	37
1	Ferrules	36
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 (ferrules) for screw terminals
- Flat receptacles for plug connections
- Ring cable lugs for grounding

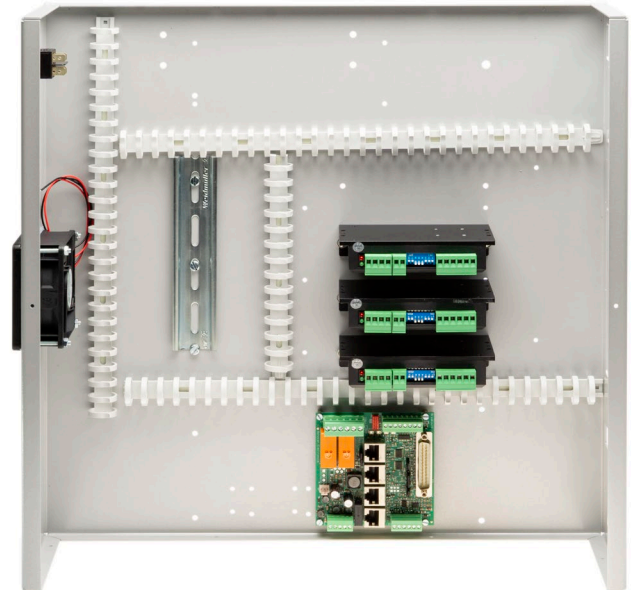


Fig. 16: Housing with internals before the start of the wiring



Fig. 17: The sockets for cooling and milling spindle



Fig. 18: The terminal block on the power supply

Mounting the sockets

Mount the connection panel **2** with screws **S1** in front of the opening on the rear of the housing. For wiring the sockets **23**, it has proven useful to first roughly cut the cables to length, solder them outside the housing and only then install the sockets. Please also note the following information on soldered connections.

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. 19).

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. 21.

Option snap ferrites

The hinged ferrites contained in the option package are used to suppress alternating electrical fields also. Clip two black **O6** and one white **O5** snap ferrite onto each of the three twisted motor cables. Figure 22 shows the correct arrangement.



Fig. 19: Each pin individually insulated with shrink tubing

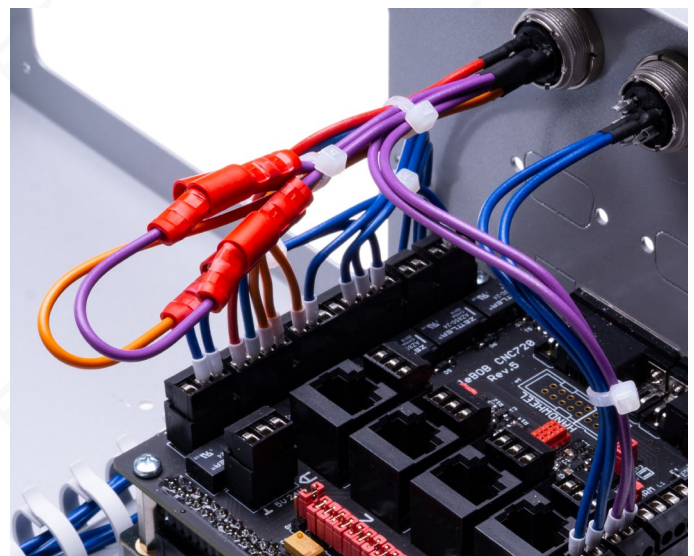


Fig. 20: Jumper with circular plugs / sleeves for optional frequency converter connection

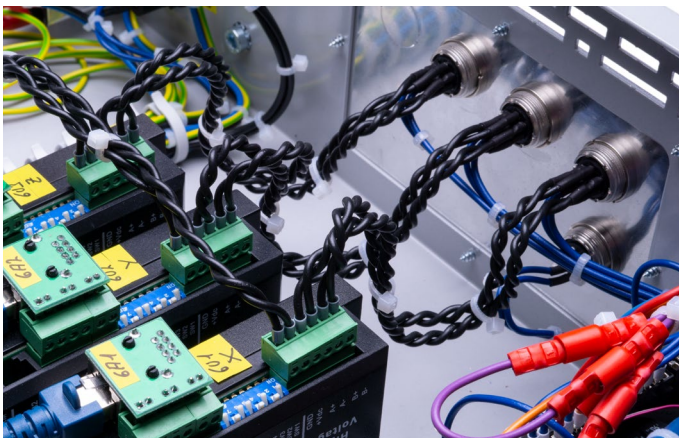


Fig. 21: Power lines are twisted in pairs

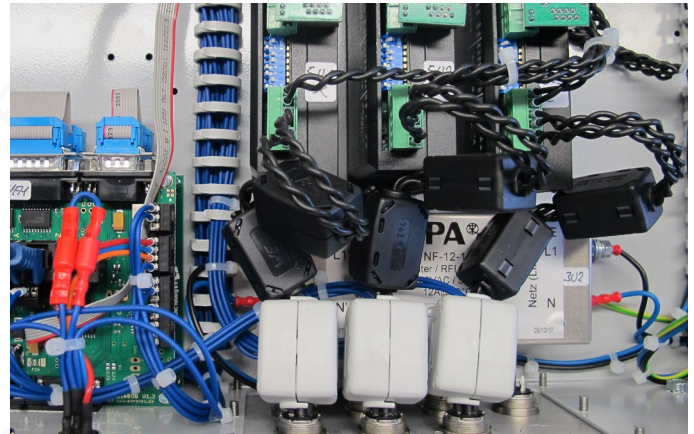


Fig. 22: Optional folding ferrites on the motor cables

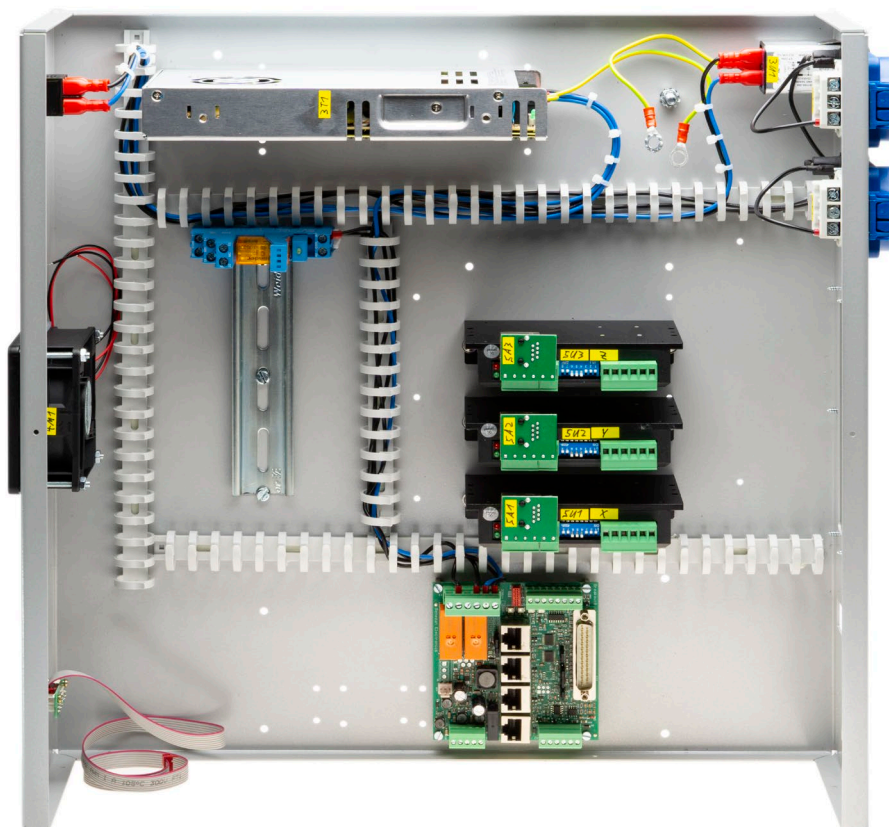


Fig. 23: Basic wiring with mains voltage and ground lines

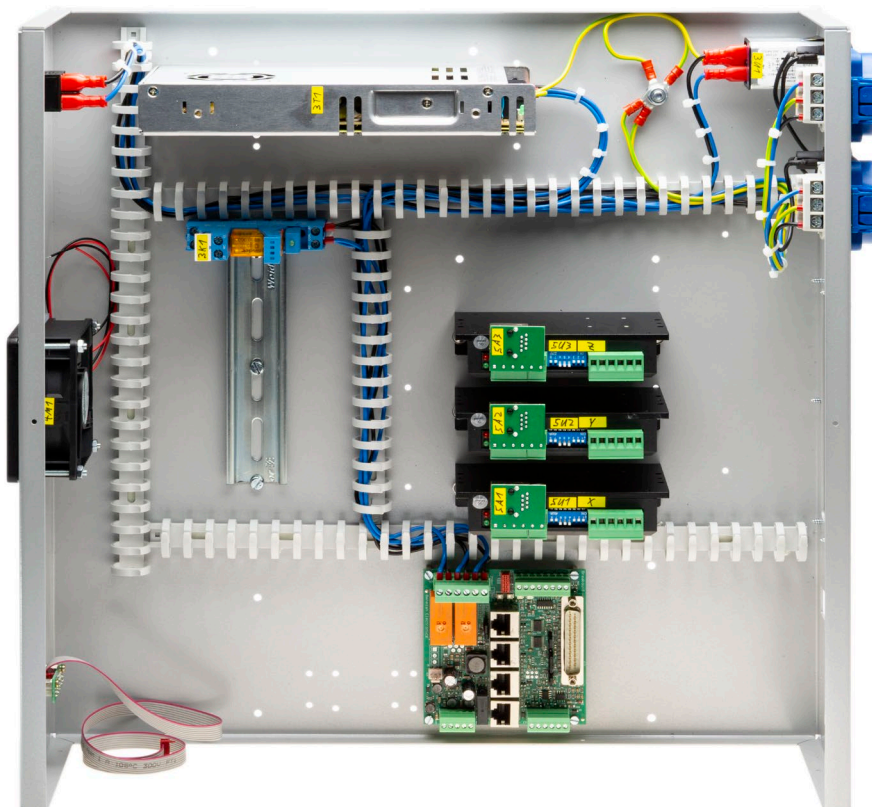


Fig. 24: Outlets connected

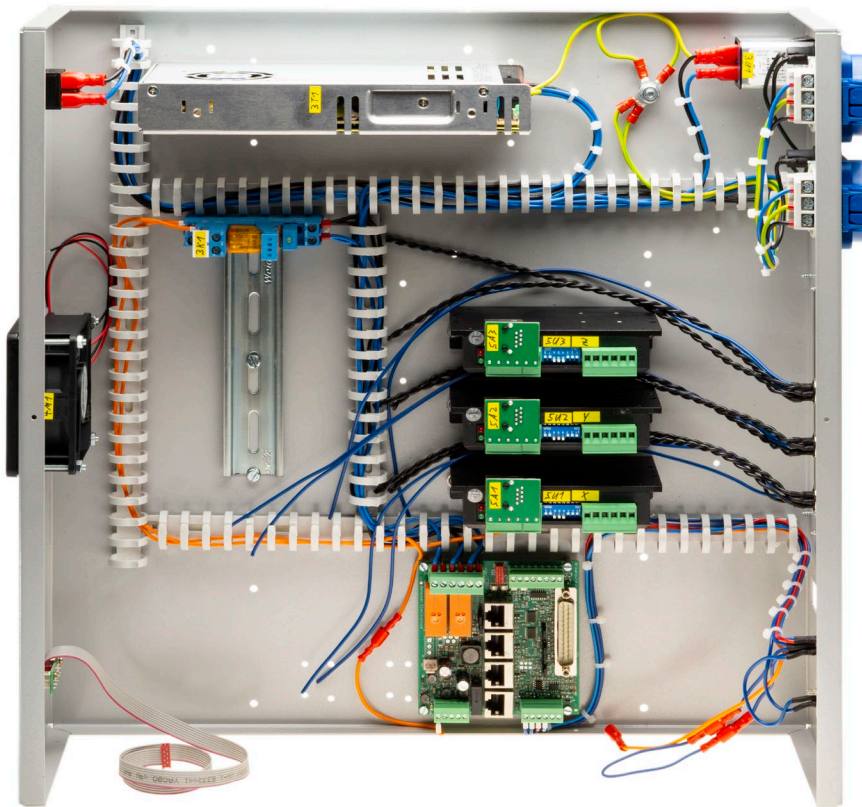


Fig. 25: Connection of coupling relay and controller. Connection sockets prepared, bottom right jumper for FU connection

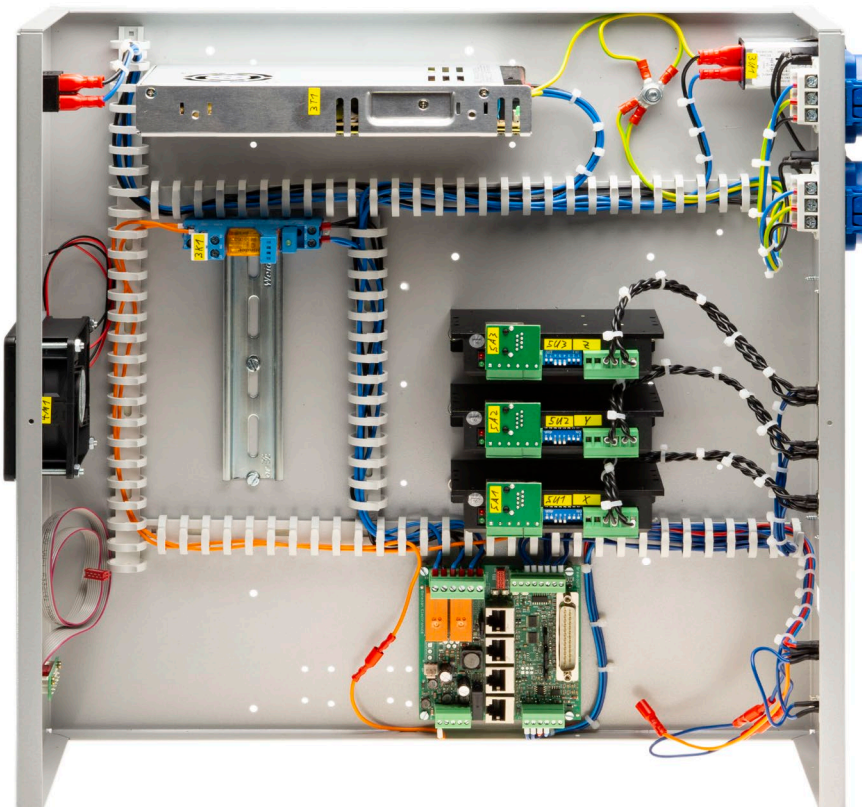


Fig. 26: Power amplifiers and connection sockets connected.

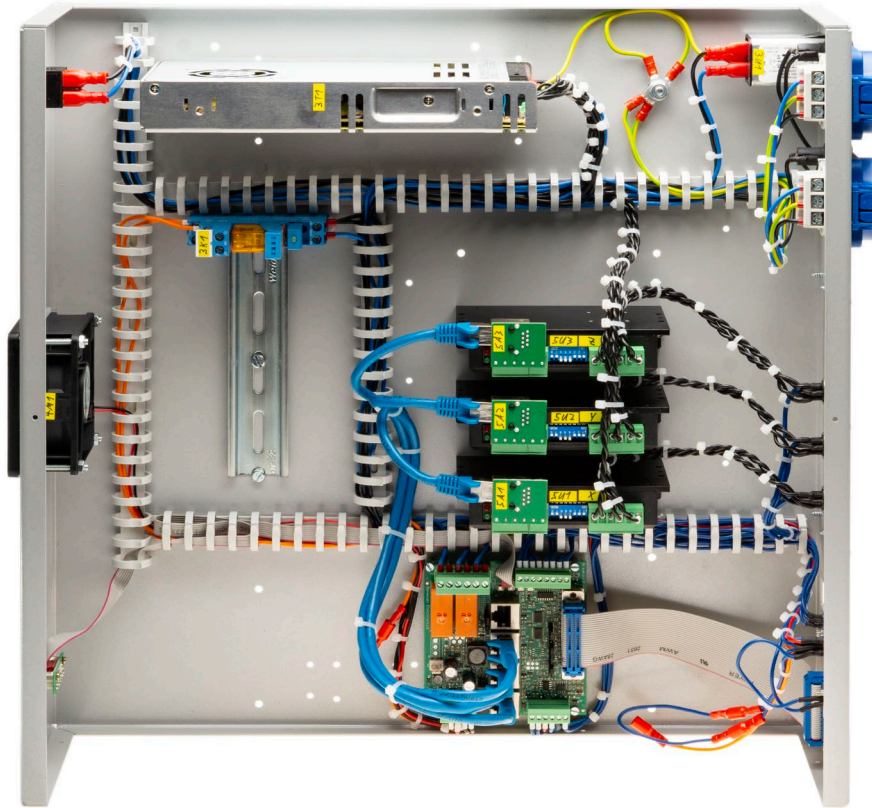


Fig. 27: Complete control with patch cables between interface and power amplifiers



Fig. 28: Rear side of the fully assembled controller

Further wiring

For this construction phase you need:		#
1	Sticker	4
3	Patch cable RJ45	K2
1	Emergency stop	35
	Control line 2 x 0,5 mm	K1
1	Cable connector 6-pole	25

- Mark the connections on the back of the housing with the corresponding stickers (Fig. 28).

Patch cable

- Connect the signal outputs (RJ45 sockets) of the interface and the control inputs of the output stages with the patch cables K2.

Pay attention to the correct assignment of the outputs to the axes. The arrangement is printed on the breakout board.

Emergency stop



- Install the emergency stop switch 35 near the machine so that it is easily accessible.
- Wire the switch to the control line K1.
- Solder the cable connector 25 to the free end of the control line.
- Connect the emergency stop to the control.

i Note

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.