

# SOROTEC

## Assembly Instructions

### Control kit PRO ITG 3 axes Benezan



ETS.S3JMCBP.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



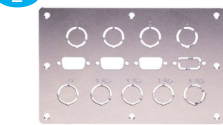


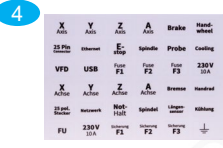










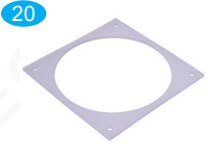
Illustration	Designation	Number	Illustration	Designation	Number
	Sheet steel housing PRO2	1		Relay board	1
	Connection panel	1		IEC connector with line filter, fuse holder and 2 fuses 10 A slow	1
	Elastic adhesive feet	4		Fuse holder	3
	Sticker set	1		Microfuse 6.3 A slow	2
	Wiring duct	3		Microfuse 5 A slow	1
	Switching power supply 48 V	1		Power switch	1
	Coupling relay	1		Power cord	1
	Interface Advance PRO	1		Built-in socket	2
	Sub-D cable 1:1	1		Fan 80 x 80 x 25 mm 24 V	1
	LED board with cable	1		Fan damper	1

Illustration	Designation	Number	Illustration	Designation	Number
	Dust filter	1		Sub-D socket 25-pin	1
	Built-in socket Binder 2-pole	3		Sub-D connector 25-pin	1
	Built-in socket Binder 3-pole	3		Round connector	3
	Built-in socket Binder 6-pole	2		Round socket	4
	Cable connector binder 2-pole	3		Flat receptacle	7
	Cable connector binder 3-pole	3		Ring cable lug	8
	Cable connector binder 6-pole	2		End sleeves range	1
	Sub-D socket 9 pin	5		Shrink tubing range	1
	Sub-D connector 9 pin	5		Emergency stop switch	1
	Sub-D mounting kit	3		Control line 2 x 0,5 mm <sup>2</sup>	3 m
	Sub-D housing for 9 pin	5		Patch cord RJ45 0,5 m	3














Illustration	Designation	Number
 <b>K3</b>	Ribbon cable 25 pole	0.4 m
 <b>L1</b>	PVC core cable 0.25 mm² violet	2 m
 <b>L2</b>	PVC core cable 0.50 mm² dark blue	20 m
 <b>L3</b>	PVC core cable 0.50 mm² black	10 m
 <b>L4</b>	PVC core cable 0.50 mm² violet	2 m
 <b>L5</b>	PVC core cable 0.50 mm² orange	2 m
 <b>L6</b>	PVC core cable 0.50 mm² light blue	2 m
 <b>L7</b>	PVC core cable 0.50 mm² red	2 m
 <b>L8</b>	PVC-Aderleitung 0.75 mm² black	10 m
 <b>L9</b>	PVC core cable 1 mm² black	10 m
 <b>L10</b>	PVC core cable 1 mm² light blue	10 m
 <b>L11</b>	PVC core cable 1 mm² green/yellow	10 m

Illustration	Designation	Number
 <b>TS</b>	Mounting rail	0.16 m
 <b>S1</b>	Pan head screw DIN 7981 M3,5 x 9,5	18
 <b>S2</b> <b>S3</b>	Cylinderhead screw DIN 84 M3 x 6 <b>S2</b> M5 x 6 <b>S3</b>	16 3
 <b>S4</b>	Cylinderhead screw DIN 6912 M6 x 20	2
 <b>S5</b> <b>S6</b> <b>S7</b>	Countersunk screw DIN 965 M3 x 12 <b>S5</b> M4 x 16 <b>S6</b> M4 x 40 <b>S7</b>	2 8 4
 <b>S8</b> <b>S9</b>	Allen flat head screw DIN 7381 M3 x 6 <b>S8</b> M4 x 6 <b>S9</b>	6 4
 <b>U1</b>	Washer DIN 125 M6	3
 <b>UZ</b>	Tooth lock washer DIN 6797 M6	10
 <b>M3</b> <b>M4</b> <b>M5</b> <b>M6</b>	Hexagon nut DIN 934 M3 <b>M3</b> M4 <b>M4</b> M5 <b>M5</b> M6 <b>M6</b>	2 12 3 5
 <b>D1</b>	Spacer sleeve M3 hexagon 10 mm 2 x M3 internal thread	8

## Preparation of the housing

For this construction phase you will need:		#
1	Sheet steel housing	1
4	Adhesive feet	3
1	Mounting rail	TS
3	Cylinderhead screw M5 x 6	S3
1	Power switch	16
1	Fan	19
1	Fan damper	20
1	Dust filter for fans	21
4	Countersunk screw M4 x 40	S7
4	Nut M4	M4
3	Fuse holder	13
2	Microfuse 6.3 A	14
1	Microfuse 5 A	15
1	IEC built-in connector	12
2	Countersunk screw M3 x 12	S5
2	Nut M3	M3
1	LED board with cable	10
2	Flat headed screw M3 x 6	S8
3	Wiring duct	5
2	Built-in socket	18
8	Countersunk screw M4 x 16	S6

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 **16**, the IEC built-in plug **12** and the three fuse holders **13**.
- Cut the threads for the mounting screws:  
8 x M4 for the sockets  
3 x M5 for the mounting rail (see Figure 12)
- 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. 8 mm each.
- Mount the DIN rail **TS** cut to 16 cm with the screws **S3** in its place in the front part of the housing (see Figure 12).
- Slide the power switch **16** with the „0“ upwards into the rectangular opening on the front of the housing until the edge of the switch is flush. The switch is self-locking, screwing is not necessary.
- Mount the fan **19** and the fan damper **20** with screws **S7** and nuts **M4** with the connection cable pointing downwards behind the grille opening on the front. Place the damper on the inside between the fan and the housing and the grille cover on the outside. Pay attention to the direction of flow: The cool air should be blown into the housing!
- Slide the cover frame **21** with the inserted dust filter onto the grille cover of the fan.
- Mount the IEC built-in connector **12** with screws **S5** and nuts **M3** in the opening provided on the rear.
- Mount the LED board **10** in its place in the front of the device with screws **S8**.
- Lay the self-adhesive wiring duct **5**. Use the course shown in Figure 12 as a guide.
- Mount the two built-in sockets **18** with screws **S6**.
- Now build the three fuse holders **13** into 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 fine fuse **14** each.
- Equip the fuse holder next to the built-in connector (F3) with the 5 A microfuse **14**.

## Grounding screws

For this construction phase you will need:		#
2	Cylinderhead screw M6 x 20	S4
3	Washer M6	U1
10	Tooth lock washer M6	UZ
5	Nut M6	M6



### Danger!

Poor grounding is a common and difficult 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 Figure 12). The screws installed here must have good conductive contact with the housing plate.

- **Remove the paint from one to two millimeters around the holes.**
- Mount the grounding screws as shown in pictures 1 to 3.
- The earthing screw of the housing cover is connected to the earthing point on the floor before the housing is closed.

### **i** Note

*The connection of earthing cables to screws is made with ring cable lugs between toothed lock washers.*

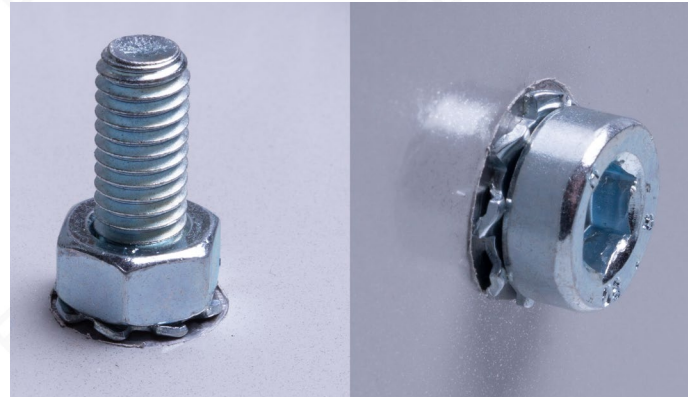


Fig. 1: Earthing screw on the floor (left) and on the rear wall



Fig. 2: Grounding screw rear wall outside

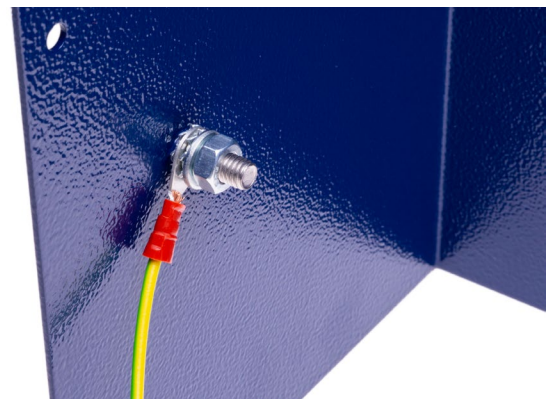


Fig. 3: Ground screw cover



## Power supply and coupling relay

For this construction phase you will need:		#
1	Switching power supply 48 V	6
4	Flat headed screw M3 x 6	S8
1	Coupling relay	7

- Assemble the 48 V power supply **6** with screws **S8**, as shown in Figure 22.

The coupling relay **7** is used to optionally control the milling spindle with a frequency converter. See circuit diagram „Infeed / Supply“ for details.

- Place the coupling relay on the mounting rail as shown in Figure 12.

## Preparing the motors

### **i** Note

The settings described here refer, for example, to the JMC drive motors preferably used by Sorotec. The configuration of motors from other manufacturers can differ in scope and procedure.

The configuration is based on the tables printed on the motors (see figure). We recommend setting the DIP switches of the output stages integrated in the motors as follows:

### Resolution

A stepper motor performs 200 steps of 1.8 ° per revolution. With the DIP switch setting shown, the output stage divides these full steps into 16 micro steps each. This then results in 3200 steps per revolution of the motor. With a spindle pitch of 10 mm / revolution, one microstep corresponds theoretically to a travel distance of 0.003125 mm.

**If another resolution is selected, it must be changed accordingly in the software setting.**

### Triggering and direction of rotation

The switch S5 determines whether a motor step is triggered at the beginning or at the end of a switching pulse. To avoid step losses, the position Pulse end / S5 On has proven itself („falling edge“, „down edge“).

The switch S6 determines the basic direction of rotation: Off for CCW (counterclockwise) and On for CW (clockwise).

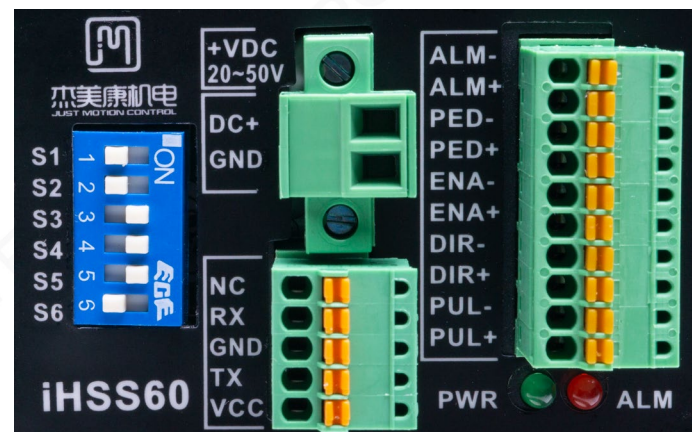


Fig. 4: DIP switch on the output stage integrated in the motor

Pulse/rev Table				
Pulse/rev	Sw1	Sw2	Sw3	Sw4
Default	on	on	on	on
800	off	on	on	on
1600	on	off	on	on
3200	off	off	on	on
6400	on	on	off	on
12800	off	on	off	on
25600	on	off	off	on
51200	off	off	off	on
1000	on	on	on	off
2000	off	on	on	off
4000	on	off	on	off
5000	off	off	on	off
8000	on	on	off	off
10000	off	on	off	off
20000	on	off	off	off
40000	off	off	off	off

Sw5: off=up edge, on=down edge  
Sw6: Motor DIR, off=CCW, on=CW

Fig. 5: Table with switch positions



## 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 Figure 6 must be inserted between the Eding V5A and the MIDI control. Figure 7 shows the complete signal chain.



Fig. 6: Adapter board with connection cable

In addition, it is possible to connect a tool length sensor to terminal X1 of the adapter, as described in Figure 8, 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 9.
- The jumpers of the Interface Advanced Pro must be set as described on the next page in Figure 11.

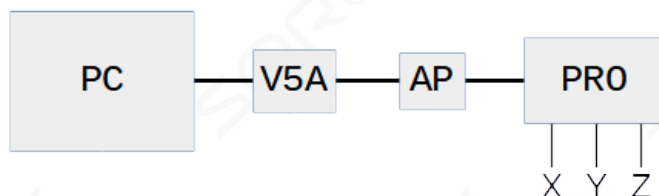


Fig. 7: Signal chain from PC, Eding V5A, adapter board and PRO control

### Connection of additional signals to terminal X1

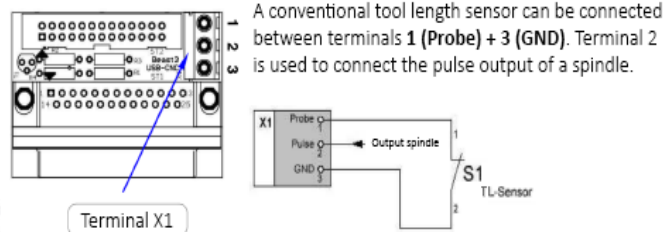


Fig. 8: Signal chain from PC, Eding V5A, adapter board and PRO control

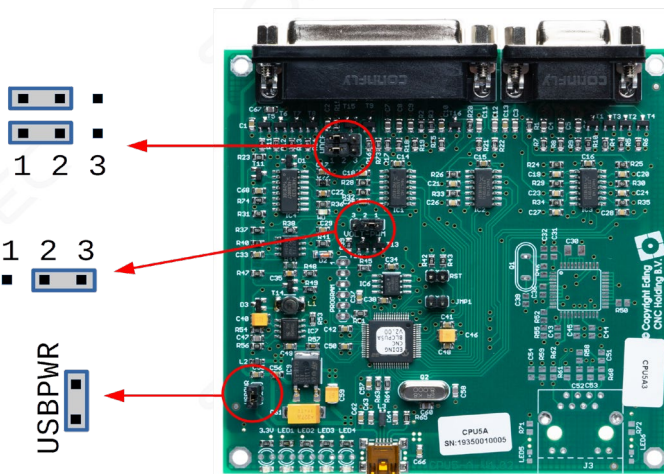


Fig. 9: Jumper-Setting Eding V5A

## 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 figure 10)

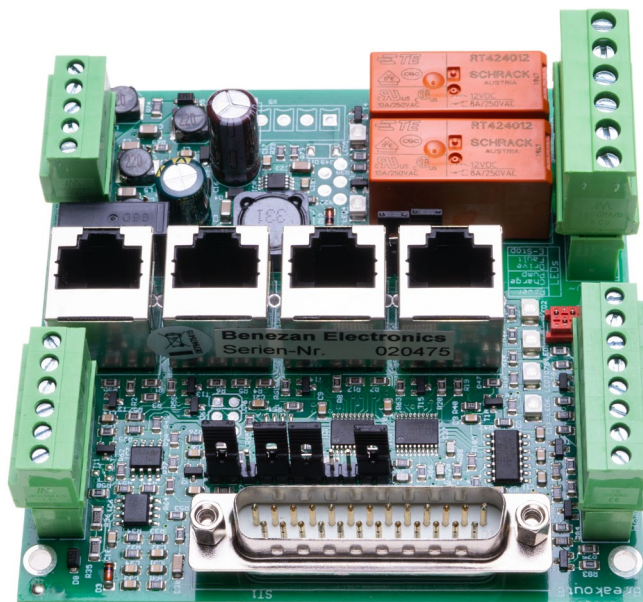


Fig. 10: Jumpering for use with Estlcam

### EdingCNC

For use with EdingCNC set the jumpers as follows:

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

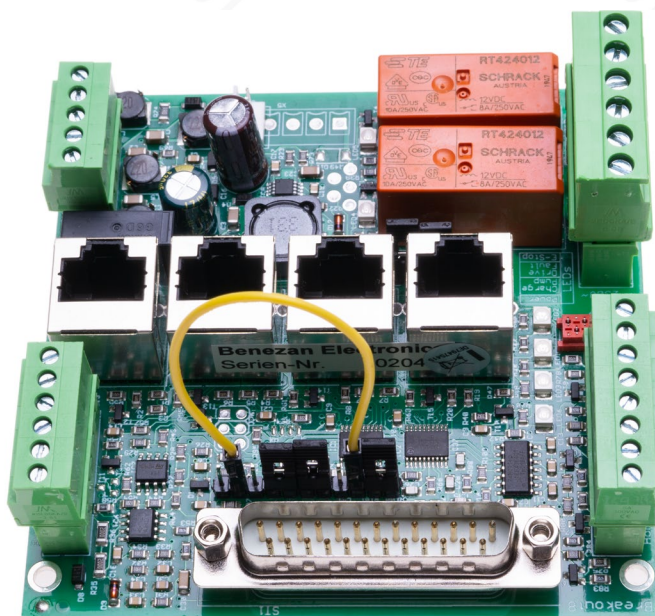


Fig. 11: Jumper setting for use with EdingCNC

## Relay board and interface

For this construction phase you will need:		#
1	Relay board	11
1	Interface Advanced Pro	8
16	Flat headed screw M3 x 6	S2
8	Spacer sleeve	D1

- Mount the relay board **11** und das Interface **8** with 8 screws **S2** ueach and four spacer sleeves **D1**, each, as shown in Figure 12.

## Wiring

For this construction phase you will need:		#
1	Connection panel	2
8	Pan head screw	S1
2	6-pole built-in socket	24
3	3-pole built-in socket	23
3	2-pole built-in socket	22
5	D-Sub socket 9-pin with solder cup	28
5	D-Sub connector 9-pin with solder cup	29
5	D-Sub mounting kit	30
8	Ring cable lug	37
7	Flat receptacle	36
4	Round socket	35
3	Round connector	34
1	Shrink tubing	39
1	End sleeves	38
3	Patch cable RJ45	K2
	PVC core cable according to circuit diagram	



Fig. 12: Gehäuse mit Einbauten vor Beginn der Verkabelung

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

- Cable cross-sections
- Wire colors
- Pinouts of connectors

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

These instructions provide general information - on how to solder sockets, for example.

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



## Line ends

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

- Wire end sleeves for screw terminals
- Flat receptacles for plug connections
- Ring cable lugs for earthing

## Assembly of the installation sockets

Mount the connection panel **2** with screws **S1** in front of the opening on the rear of the housing. For wiring the built-in sockets **24** and **26** it has proven useful to first roughly cut the patch cables **K2** to length, solder them outside the housing and only then install the sockets. Also note the following note on soldered connections.

## Solder connections

Cross-shorts are a frequent source of errors in soldered connections on plugs and sockets. It is therefore essential to isolate each individual pin with heat shrink tubing (see Figure 15).

## Twisted cables

To reduce electrical fields, the cables for powering the motors must be twisted in pairs. See also Figure 15.



Fig. 13: Sockets for cooling and milling spindle, fuse protection, built-in plug with line filter

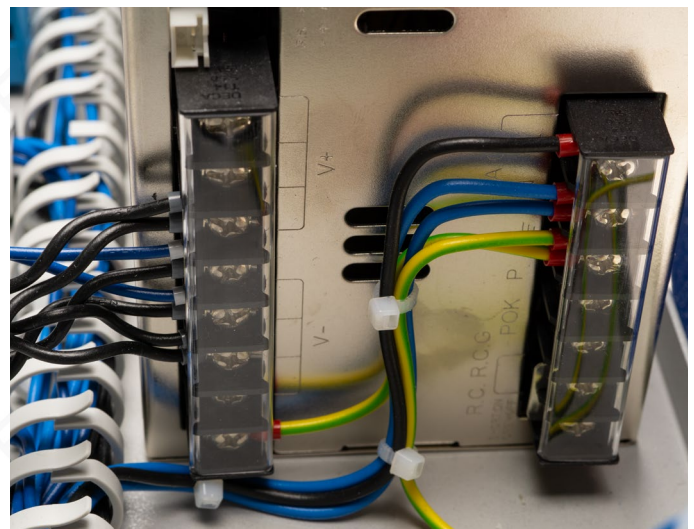


Fig. 14: Terminal strips on the power supply

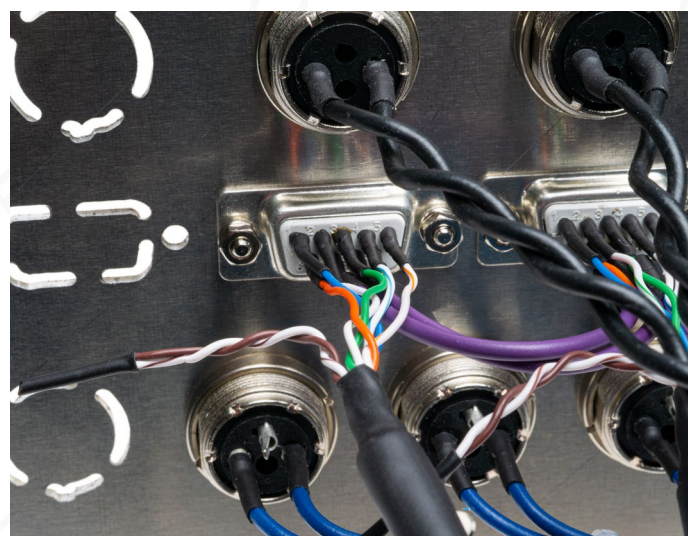


Fig. 15: Each pin individually isolated with shrink tubing, power cables twisted

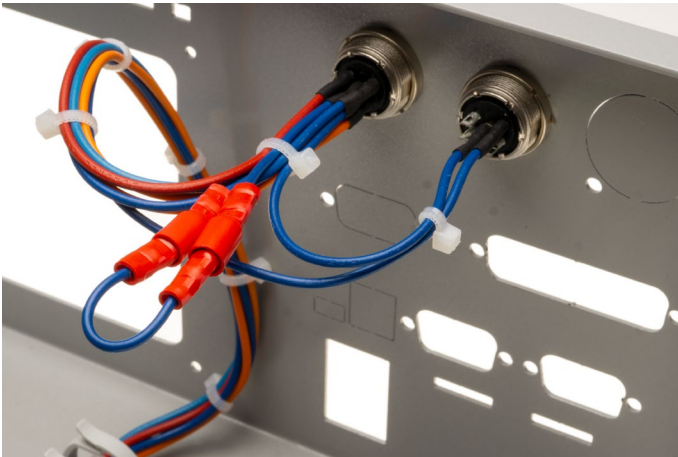


Fig. 16: Jumper with round plugs / sleeves for optional frequency converter connection

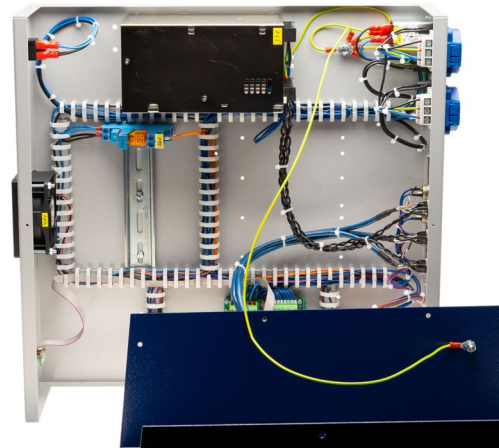


Fig. 17: Ground connection of cover and housing

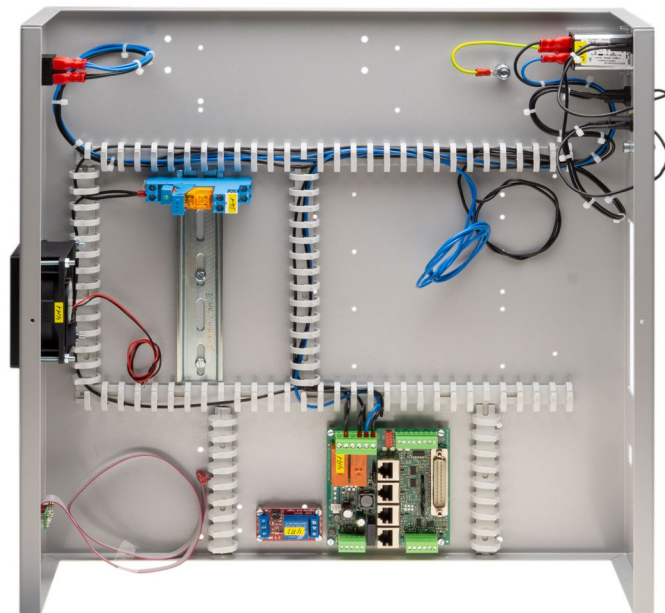


Fig. 18: Basic cabling with mains voltage supply via switches and fuses

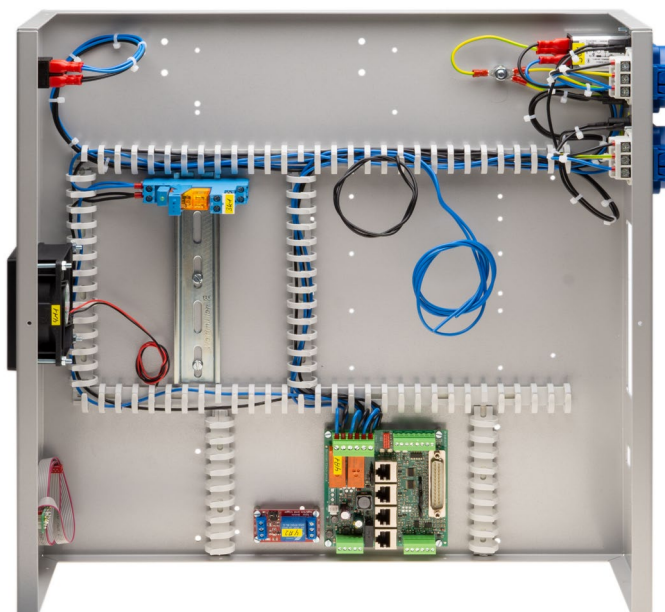


Fig. 19: Sockets connected via fuses



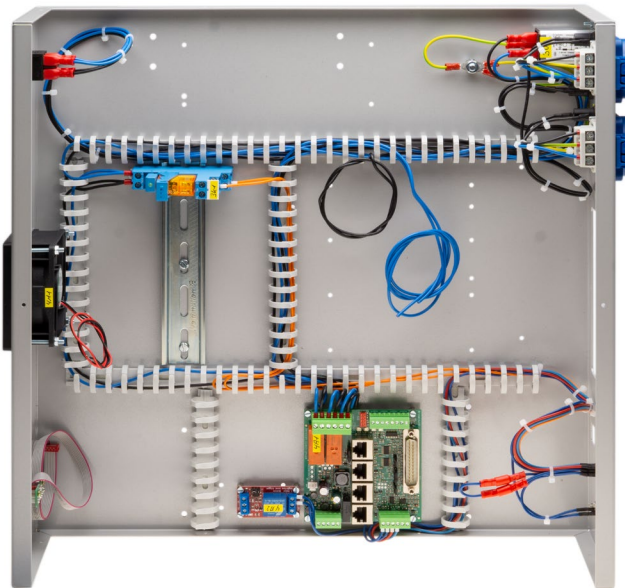


Fig. 20: Jumper for frequency converter connection and emergency stop wiring



Fig. 21: Power supply cabling and axis connections

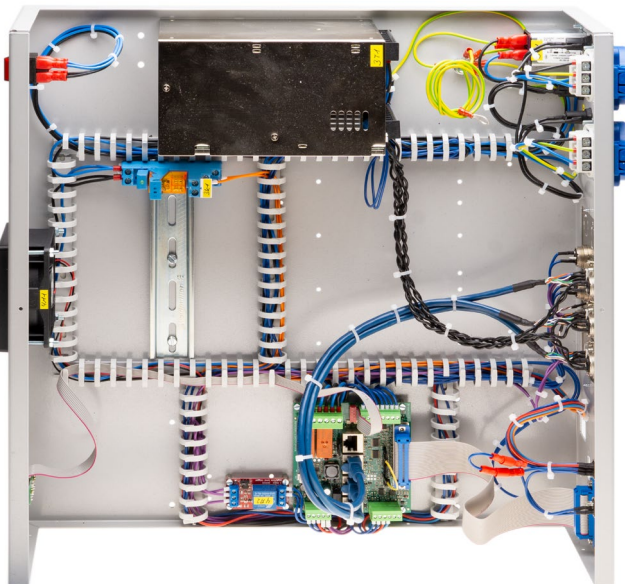


Fig. 22: Ribbon cable with D-Sub socket on the rear wall of the housing



## Further wiring

For this construction phase you will need:		#
1	Ribbon cable 25pole	K3
1	D-sub socket 25pole	32
1	D-sub connector 25pole	33
1	D-Sub mounting kit	30
1	6-pole cable connector	27
1	Emergency stop switch	40
	Control line 2 x 0.5 mm	K1

**i** In any case, test your result with a continuity tester for contact from one end to the other and then for short circuits: each pin to ground, then each pin to each other. Contact failures and short circuits are a common and hard-to-find cause of malfunction.

### Ribbon cable

To produce the connection cable from the interface to the rear wall of the housing, the ribbon cable **K3** must be provided with a plug **33** and socket **32**.

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

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

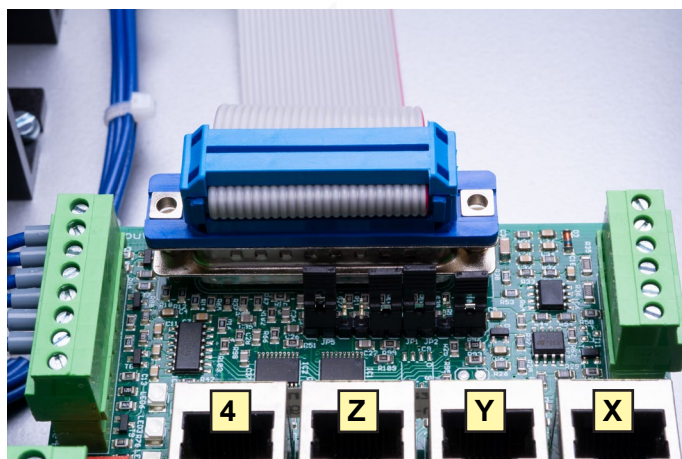


Fig. 23: Ribbon cable with plug, axis assignment of the four outputs

### Emergency stop switch



- Mount the emergency stop switch **40** so that it is easily accessible near the machine.
- Wire the switch to the control line **K1**.
- Solder the cable connector **27** to the free end of the control line and mount the connector housing.
- Connect the emergency stop to the control.

If an emergency stop switch is already available (such as on all machines in the Hobby Line), you should preferably connect it. The switch enclosed with this kit can either be left out or integrated in a series connection.