



Installation Manual

Simple BOB CNC720 Breakoutboard

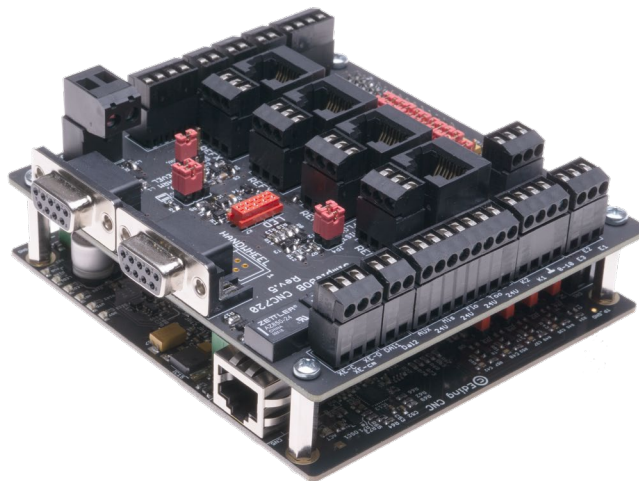


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1. Revision history

File-Version	Date	Modification	Author
1.0.0	14.07.2020	Initial version	Sorotec GmbH (SS)
1.0.1	22.04.2021	Addition „remove plugs“ (5.1)	Sorotec GmbH (GN)
1.0.2	05.05.2023	Supplement JP12 bootloader, configuration drive alarm with NC circuit	Sorotec GmbH (SS)

2. Safety notice

The Simple BOB CNC720 may only be installed and put into operation by electro-technical qualified personnel. Please read the operating instructions carefully and follow all instructions exactly. Improper installation or operation of the device can damage the electronics or the machine and endanger the health of the operating personnel.

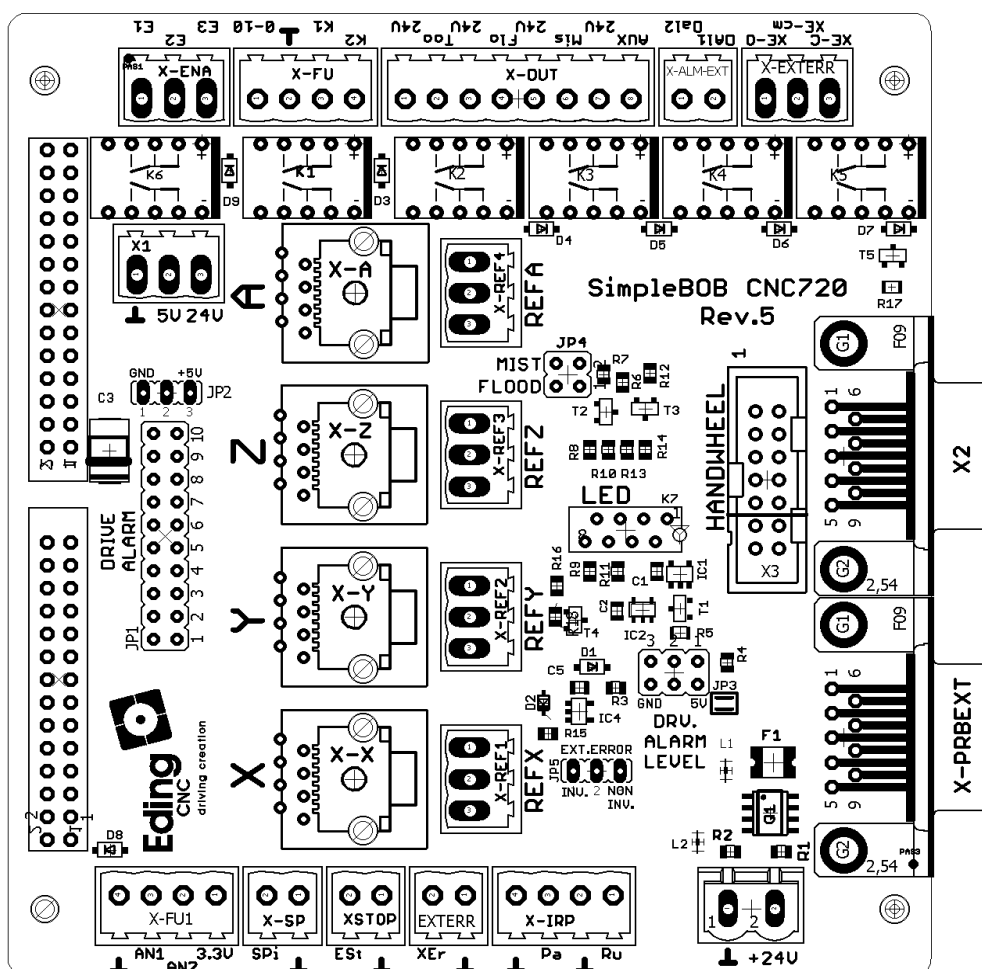


Depending on the hazard potential of the machine, additional safety measures may be required, such as door locking and standstill monitoring. Such safety functions usually have to be implemented purely electromechanically with external circuits (not included in the scope of delivery) and must not only depend on software and PC hardware. The system manufacturer who assembles the Simple BOB CNC720 and other components to form the overall system, and the system operator are responsible for compliance with the statutory provisions.

3. Connections

The Simple BOB CNC720 provides access to all available functions of the EdingCNC720 controller.

3.1 Graphical overview of the connections



3.2 Tabular overview of the connections

X2 – SUB-D 9-pole female (Connection for handwheel)

PIN	Description
1	IN RUN - Start signal input
2	IN PAUSE - Pause signal input
3	
4	
5	IN HANDWHEEL A - Encoder Signal A
6	IN HANDWHEEL B - Encoder Signal B
7	+5V - Supply voltage +5 V/DC
8	GND
9	

X-PRBEXT – SUB-D 9-pole female (Tool length sensor)

PIN	Description
1	GND
2	IN PROBE - Signal tool length sensor
3	+24V - Supply voltage +24 V/DC
4	
5	
6	
7	
8	
9	

X-X, X-Y, X-Z, X-A – RJ45 sockets (Motor driver control outputs)

PIN	Description
1	ENABLE - Enable drivers +5 V/DC
2	GND - Enable signal
3	STEP - Pulse signal
4	+5V
5	DIR - Direction signal
6	+5V
7	ALM OUT - Alarm supply +5 V / GND
8	ALM IN - Alarm input

X-OUT – Connection terminal 8-pole (Relay outputs)

No	Description
1	24V - Supply voltage +24 V/DC
2	TOO - Spindle on/off (GND)
3	24V - Supply voltage +24 V/DC
4	FLO - Flood cooling on/off
5	24V - Supply voltage +24 V/DC
6	MIS - Mist cooling on/off
7	24V - Supply voltage +24 V/DC
8	AUX - programmable output on/off

X-REF (1 - 4) – Connection terminal 3-pole (Reference switch inputs)

No	Description
1	+24V - Supply voltage +24 V/DC
2	IN HOME - Reference switch input
3	GND

X-ENA – Connection terminal 3-pole (Relay K1 Enable, Watchdog - potential-free)

No	Description
1	E1 - Normally open contact (NO)
2	E2 - Common connection
3	E3 - Normally closed contact (NC)

X1 – Connection terminal 3-pole (Voltage tap)

No	Description
1	GND
2	5V - Supply voltage +5 V/DC
3	24V - Supply voltage +24 V/DC

X-FU – Connection terminal 4-pole (Control of frequency converter)

No	Description
1	0-10 - Analog output 0..10V
2	GND - Analog output Ground
3	K1 - VFD start (contact potential free)
4	K2 - VFD start (contact potential free)

X-PWR – Connection terminal 2-pole (Power supply 24V)

No	Description
1	GND - Supply voltage Ground / 0V
2	+24V - Supply voltage +24 V/DC

X-SP – Connection terminal 2-pole (Spindle speed)

No	Description
1	GND
2	SPI - Actual speed VFD/ Spindle

X-IRP – Connection terminal 2-pole (Internal Run/ Pause)

No	Description
1	RU - Start signal CNC program
2	GND
3	PA - Stop signal CNC program
4	GND

X-EXTERR – Connection terminal 3-pole (Relay External Error - potential-free)

No	Description
1	XE-O - Normally open contact (NO)
2	XE-CM - Common connection
3	XE-C - Normally closed contact (NC)

X-FU1 – Connection terminal 4-pole (Analog signals)

No	Description
1	3.3V - Supply voltage +3,3 V/DC
2	AN2 - Analog input 2
3	AN1 - Analog input 1
4	GND

X-ALM-EXT – Connection terminal 2-pole (Antriebsfehler extern)

No	Description
1	DAL2 - Alarm supply voltage +5 V / GND
2	DAL1 - Alarm input

XSTOP – Connection terminal 2-pole (Emergency stop)

No	Description
1	GND
2	EST - Emergency stop input

EXTERR – Connection terminal 2-pole (External error)

No	Description
1	GND
2	XER - External error input

4. Functional description

4.1 Power supply (X-PWR)

The Simple BOB 720 is supplied with a DC voltage at the terminal **X-PWR**. By placing the Simple BOB 720 correctly on the EdingCNC720 controller board, the controller is supplied directly by the Simple BOB 720. Please also read the EdingCNC manual in the actual version for further informations.



Pay attention to the polarity when connecting the supply voltage!

4.2 Motor driver control outputs (X-X, X-Y, X-Z, X-A)

The Simple BOB 720 can control up to 4 motor driver. The control signals for the drivers are provided via the RJ45 sockets (**X-X, X-Y, X-Z, X-A**). Standard patch cables are to be used as connection cables. All connections must be connected 1:1. You can find the assignment in the table overview of the connections.

4.3 Reference switch inputs (X-REF 1 - 4)

Up to four reference switches (mechanical switches or inductive sensors) can be connected at the Simple BOB 720. The reference switch inputs are connected at the 3-pole connection terminals (**X-REF1, X-REF2, X-REF3, X-REF4**). Either normally closed (NC) or normally open (NO) contacts are possible as reference switches. The polarity is set according to the type in the configuration of the EdingCNC software. A supply voltage of 24V/DC is available for the reference switches.

When connecting **inductive proximity switches**, sensors with an operating voltage between **10 - 30V/DC** of type **NPN** or **PNP** must be used, depending on the setting of the jumpers (**JP6-9**) on the CPU CNC720. Alternatively, simple mechanical switches can be installed. The home and ground pin of the respective connection terminal must be closed or opened via the switch depending on the used type of switch.



Mixed operation of NPN and PNP sensors is not possible. That means, either all sensors are from type NPN or PNP. Also the switching logic can only be either normally closed or normally open. The CPU CNC720 is set by default for NPN sensors.

4.4 Relay outputs (X-OUT)

With the Simple BOB 720 up to 4 relays can be controlled:

- **TOOL** => Spindle on/ off
- **FLOOD** => Controlling of a flood cooling
- **MIST** => Controlling of a mist cooling
- **AUX** => programmable output via macro file

The Simple BOB 720 has several relays on the board. Relay **K6** is switched depending on the Enable signal, Relay **K1** is switched synchronously with the output **Tool** for the spindle. The relay outputs are designed for 24V/DC voltage levels.

Make sure that the relays have a **coil voltage** of **24V/DC** and a built-in or externally connected **revocery diode**.

The relay outputs switches ground, if they are activated by the software. That means +24V are permanently applied to the relay coils (connection A1) and the relevant output is connected to the negative pole (connection A2) of the coil.



No consumers such as e.g. a solenoid valve may be connected directly!

4.5 Watchdog (X-ENA)

With the Simple BOB 720, the watchdog functionality of the EdingCNC CPU720 can be used to switch off motor drivers, holding brakes and other actuators as long as the EdingCNC is not in the „Ready-state“. Please read the activation of the watchdog in the manual of your EdingCNC. For this purpose, the potential-free changeover contact of the on-board relay **K6** is brought out on the 3-pin connector **X-ENA**, to which a relay or contactor can be connected, which is switched depending on the state of the EdingCNC 720. Terminal **E2** is the common connection, terminal **E1** the normally open and terminal **E3** the normally closed. In case of an error or if the watchdog does not supply a valid signal, the „*DRIVE-ENABLED*“ signal is also deactivated at the controlling outputs from the axes.



The watchdog is not a replacement for a real emergency stop circuit!

4.6 Emergency stop (XSTOP)

An emergency stop button or a contact of an electromechanical emergency stop circuit must be connected to the 2-pole terminal **XSTOP**. The behavior, normally closed or normally open circuit, can be configured in the EdingCNC software, taking care of **wire break safety**. The emergency stop input signals an emergency stop to the software, which then deactivates all outputs.



The watchdog is not a replacement for a real emergency stop circuit and must not be used as this!

4.7 Speed control / Analog output (X-FU)

An analog signal 0..10V is output via the 4-pin connector **X-FU**, which can be used to control the speed of a frequency converter.

In addition, the start / stop signal is forwarded to the frequency converter via the potential-free contact of terminals 3 and 4 (K1 + K2).

4.8 Handwheel (X2)

EdingCNC has the option of connecting a handwheel for manual control of the milling machine.
(You can find suitable handwheels in our shop).

The Simple BOB 720 connects the handwheel to the 9-pin SUB-D socket **X2** outward. Please refer to your handwheel manual for more information.

4.9 Tool length sensor (X-PRBEXT)

When using a tool length sensor, this is connected to the 9-pin SUB-D socket **X-PRBEXT** at pins 1, 2 and 3. The connection depends on the sensor type (mechanical or inductive NPN / PNP) and the configuration of the jumper **JP3** on the EdingCNC 720. In the **delivery state**, the input of the controller is set to **NPN logic**. (see also jumper settings EdingCNC CPU 720 Chapter 5.3.1).

It can be used sensors as well with normally closed as normally open circuit.

4.10 External drive error (X-ALM-EXT)

In addition to the inputs via the RJ45 socket of the axes, the **X-ALM-EXT** connection terminal offers a connection option for drive monitoring. Depending on the jumper setting **JP2** on the Simple BOB 720, either **GND** or **5V/DC** is switched.

4.11 External error input (EXTERR)

For monitoring attachments, pneumatics, etc., these can be connected to the **EXTERR** connection terminal. The signaling devices must all have the same switching logic (normally closed/ normally open) and must either be mechanical switches or optocouplers. In the software, depending on the logic setting at HIGH or LOW level, the program is interrupted, the outputs are switched off and an error message is generated.

4.12 External error output / Relay (X-EXTERR)

If there is an external error (see 4.11 External error) or a triggered axis error (function DriveError see 4.2 and 4.10), the built-in relay **K5** is switched. The potential-free changeover contact of this relay is brought out to the terminal **X-EXTERR**, with which the respective switching states can be monitored and evaluated. Terminal **XE-CM** is the common connection, terminal **XE-O** the normally open and terminal **XE-C** the normally closed.

4.13 Voltage tap (X1)

The supply voltages **24V/DC**, **5V/DC** and **GND** for the internal wiring can be tapped at terminal **X1**.

4.14 Analog signals (X-FU1)

The **X-FU1** terminal offers the option of processing the two analog signals available from the CPU for various applications. The supply voltage of **3.3V/DC** and **GND** can be tapped directly here.

4.15 Internal Run / Pause (X-IRP)

Optionally, buttons for starting and stopping a CNC program, macros, etc. can be connected via the 4-pin internal run / pause connection terminal **IRP**.

The buttons are already integrated in the handwheels from our shop. This connection option is intended for the attachment of additional buttons / switches.

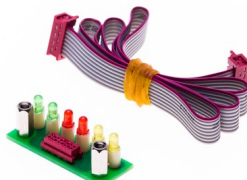
When connecting additional buttons, these should be implemented with closing contacts and the GND should be switched to the relevant input. The signal is forwarded directly to EdingCNC software.

4.16 Spindle speed measurement (X-SP)

The actual spindle speed can be reported back to EdingCNC via the Simple BOB 720. The connection is available using the 2-pin connector **X-SP**. For more information, please read the manual of your respective EdingCNC.

4.17 External status LEDs

The red Micro-Match connector **LED** can be used to connect external LEDs with the appropriate mating connector and a ribbon cable to display the different stages and errors. **LED status boards** with the matching mating connector are available in our shop ready for connection. The following stages will be issued:

LED		Description	Optional LED-Board
1	grün	Power supply switched on	
2	grün	Ready for use (Watchdog)	
3	rot	Error	
4	rot	Emergency stop	
5	gelb	Switching state Tool/ Spindle	
6	gelb	Switching state Cooling (mist cooling or flood cooling or both)	

4.18 Holding brake

When using ball screws with a small pitch, smooth-running servomotors or very heavy Z-Axes, an electro-mechanical holding brake should be used to prevent the vertical axis from dropping by itself when the drive is switched off. Such **brakes** are usually operated with **24V/DC**. They are blocked without voltage and open when the voltage is switched on.

The brake must always be released as soon as the motors are energized, which can be achieved by using the **X-ENA** connection terminal.

(see description of Watchdog 4.5)

5. Installation



Note:

Check the configuration of your EdingCNC CPU720 and set the jumpers as described in section 5.3.1 Jumper settings EdingCNC CPU720 before installing the Simple BOB 720 on the controller.



Wiring:

Make sure there is a sufficient cable cross-section when wiring. When using stranded wires, end sleeves must be used!

5.1 Installation on the EdingCNC CPU720

The Simple BOB CNC 720 will be mounted as a piggyback on the EdingCNC CPU720. Use the supplied spacer sleeves. First remove any redundant plugs, then connect the Simple BOB and the controller correctly and secure the plug connection by screwing the supplied screws into the spacer sleeves.

5.2 Installation of the spindle control

5.2.1 Milling spindle without frequency converter (e.g. Suhner UAD 25RF)

When using a milling spindle without a frequency converter, you can use the relay output **Tool** to switch a 24V relay with 230V contacts. Somit können Sie Ihre Frässpindel bequem aus der EdingCNC Software bzw. Ihrem Fräsprogramm starten und stoppen. In EdingCNC, the relay output **Tool** is directly linked to the **G-Codes M03** and **M05**. Further information can be found in the manual for your control software.

5.2.2 HF spindle with frequency converter

When using an HF spindle with frequency converter, connect the output signal **X-FU** 0-10V to your frequency converter. In addition, connect the connections **X-FU** K1 and K2 to the enable signal of your frequency converter in order to start or stop it. Take the corresponding connections from the manual of your frequency converter. The connections K1 and K2 are switched via the relay **K1** located on the Simple BOB 720. The relay output **Tool** is also switched synchronously. Here you can optionally switch additional devices if required.

5.3 Jumper settings



Note:

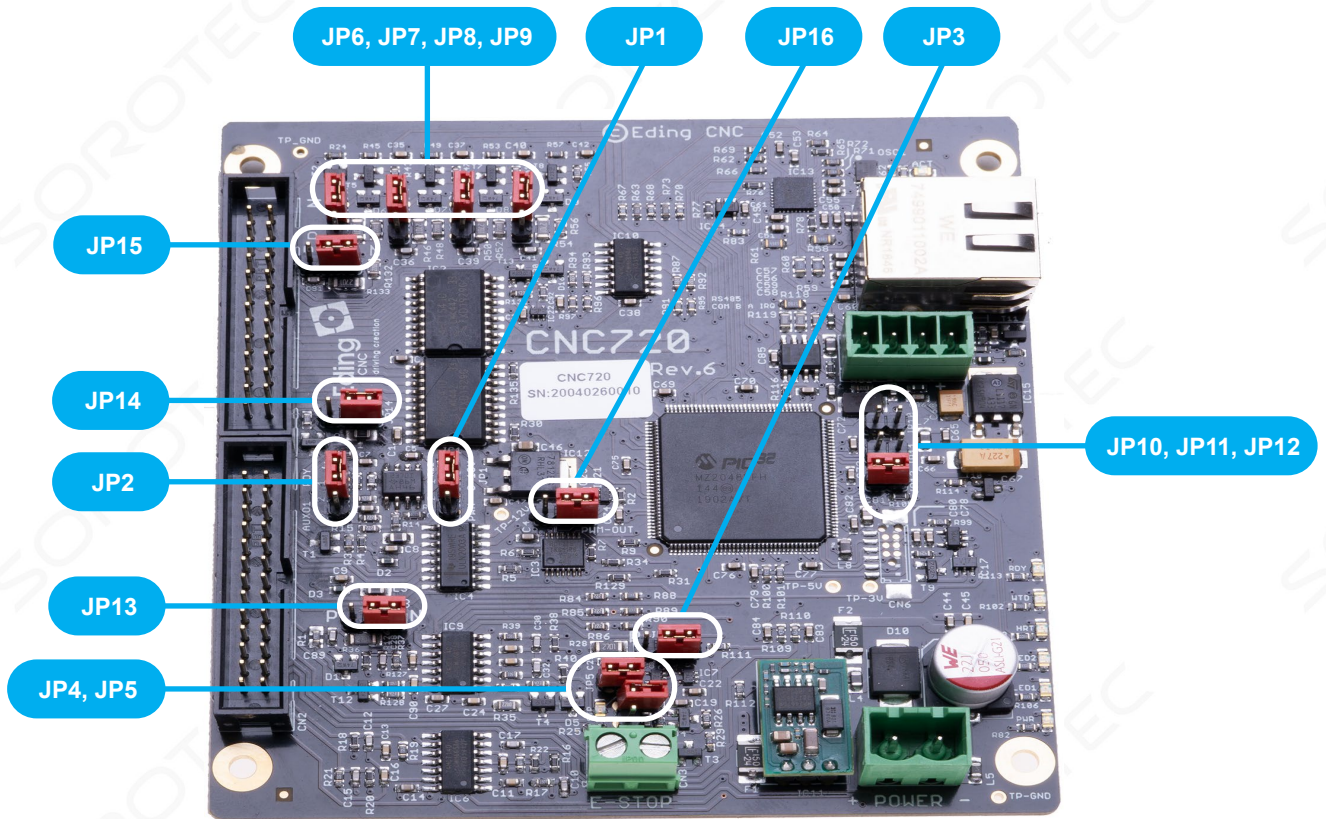
When setting the reference switch inputs (**JP6 - JP9**) it must be noted that mixed operation of NPN and PNP sensors is not possible. I.e. either all jumpers must be set to the **P** or **N** position (see 5.3.1 Jumper settings EdingCNC CPU720).



Emergency stop (E-STOP):

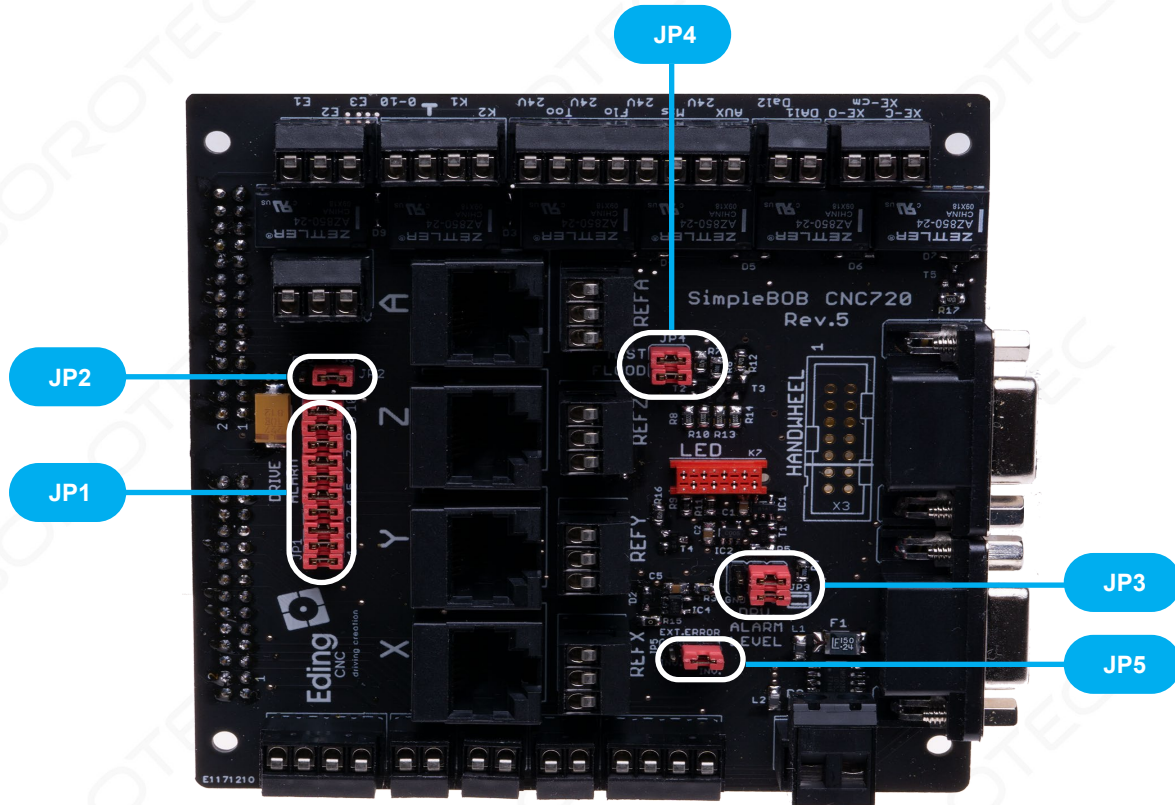
In the delivery state, the emergency stop button that must be connected is bridged by the bypass jumper JP4 (position ON). This bridging must be switched off by removing the jumper! (see 5.3.1 Jumper settings EdingCNC CPU720)

5.3.1 Jumper settings EdingCNC CPU720



Jumper	Description	Mode	Setting / Annotation
JP1	Output speed control signal	0-10V / PWM	0-10V, control VFD
JP2	Behavior of the speed control output	RDY / AUX01	RDY, active with system ready
JP3	Input Probe / Tool length sensor	P-PNP / N-NPN	N (NPN), depending on sensor
JP4	Input E-STOP bridging (Bypass)	ON / OFF	OFF, Input E-STOP active
JP5	Hardware E-STOP active / inactive	ON / OFF	ON, connected E-STOP active
JP6	Reference switch Axis 1 (HOME1)	P-PNP / N-NPN	N (NPN), depending on sensor
JP7	Reference switch Axis 2 (HOME2)	P-PNP / N-NPN	N (NPN), depending on sensor
JP8	Reference switch Axis 3 (HOME3)	P-PNP / N-NPN	N (NPN), depending on sensor
JP9	Reference switch Axis 4 (HOME4)	P-PNP / N-NPN	N (NPN), depending on sensor
JP10	Reserved (currently no use)	ON / OFF	OFF
JP11	Start CPU with the default IP 172.22.2.100	ON / OFF	OFF
JP12	Skip bootloader for programming	ON / OFF	ON
JP13	Input external error	P-PNP / N-NPN	N (NPN)
JP14	Behavior of output AUX01 during E-STOP	ON / OFF	OFF (1+2), turn off output
JP15	Input drive alarm (DRVALM)	P-PNP / N-NPN	N (NPN)
JP16	Behavior of output PWM during E-STOP	ON / OFF	OFF (1+2), turn off output

5.3.2 Jumper settings Simple BOB 720



Jumper	Description	Mode	Setting / Annotation
JP1	Drive Alarm settings (DRVALM) (see <i>Adjustment of the drive alarm</i>)	ON / OFF	all ON , Axis 1 - 4 activated, depending on the connected drivers
JP2	Supply of drive alarm	GND / +5V	+5V , alarm output axes 5V
JP3	Drive Alarm Level (JP3.1 up) / Power supply error relay drive alarm (JP3.2 down)	GND / +5V	JP3.1 +5V, JP3.2 +5V , Drive alarm signal standard, supply error relay 5V
JP4	LED indication for MIST and FLOOD	ON / OFF	all ON , LED active when the MIST or FLOOD output
JP5	Setting external error / error relay	INV. / NON INV.	NON INV. , non inverted, depending on the connection and the setting in the software



Note:

The supply of the drive alarm (JP2) and the settings for the supply of the error relay (JP3.2), should always be set the same. Either both to the left (supply with GND) or both to the right (supply with +5V). In delivery state the signal is not inverted in the standard (JP3.1), i.e. in case of an axis alarm the alarm outputs of the output stages/inputs of the Drive Alarm are closed (wiring NO normally open contact). If the inputs of the drive alarm are opened in the event of a fault (NC NC contact), the signal must be inverted (JP3.1 to GND position, see also page 15 „Equivalent circuit diagram of alarm connection“).

Adjustment of the drive alarm (JP1)

The alarms of the drives can be detected and evaluated with the inputs of the RJ45 sockets (PIN 7 + 8) or via the additional terminal **X-ALM-EXT**, provided the used driver has an alarm output. Depending on the connected driver, its output is either a normally closed or a normally open, which can be set using the jumper strip **JP1** Jumper 1 - 10.

Belegung der Jumperleiste JP1:

Jumper	Description	Connection
JP1 + JP2	Alarm X-Axis	X-X
JP3 + JP4	Alarm Y-Axis	X-Y
JP5 + JP6	Alarm Z-Axis	X-Z
JP7 + JP8	Alarm A-Axis	X-A
JP9 + JP10	Alarm additional terminal	X-ALM-EXT



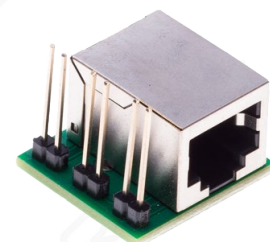
Note:

Mixed operation of NC and NO contacts for the alarm is not possible.

The detection and indication of the drive alarm in the **software must be activated**, The detection and indication of the drive alarm in the software must be activated, otherwise only the hardware is switched off and the **software continues to run unhindered**.

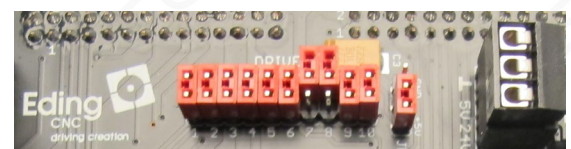
Currently, this setting must be made manually in the **cnc.ini** file directly in the EdincCNC installation directory by setting the entry **driveErrorInputSenseLevel = 0**.

The alarm evaluation must be deactivated on drivers without an alarm output that are connected with the opposite displayed adapters.
For reasons of compatibility with other manufacturers, PINs 7 and 8 are bridged internally in the adapters.



Connection adapter

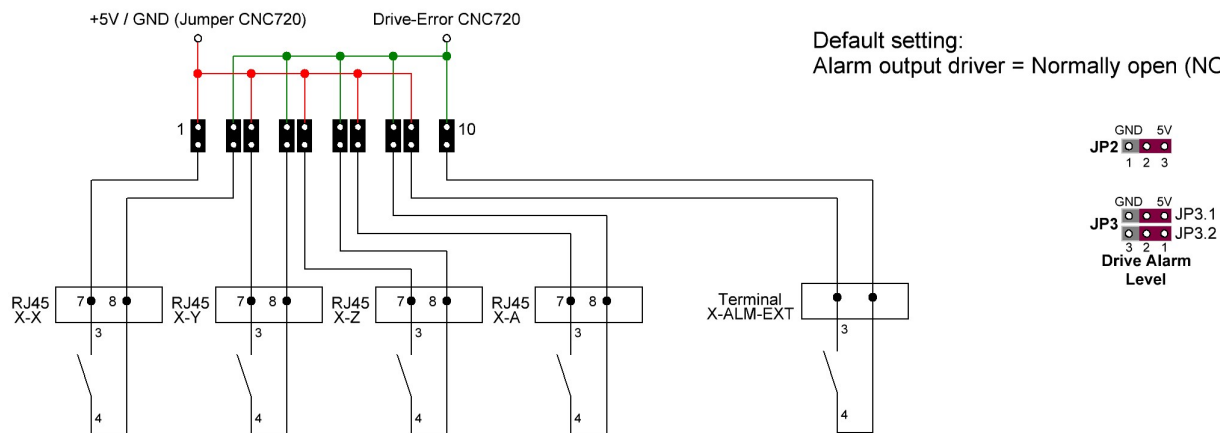
The illustration opposite shows an alarm configuration with 3 motor drivers (axes **X, Y, Z** -> **JP1-JP6** active), which have an normally open alarm output and a fourth motor driver without an alarm output which was connected to axis A with the connection adapter (**JP7 + JP8** inactive).



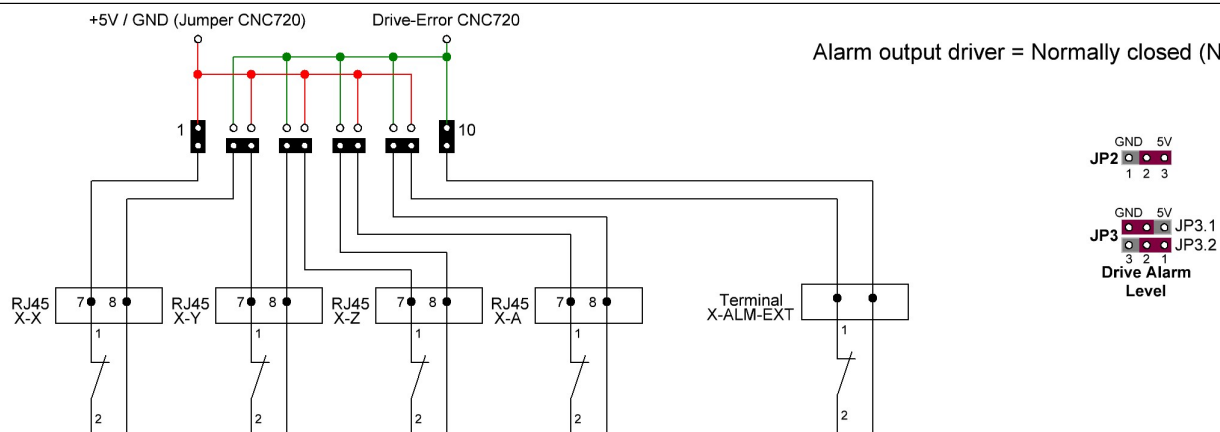
A-Axis JP7 + JP8 inactive,
no alarm evaluation

Equivalent circuit diagram alarm connection jumper JP1

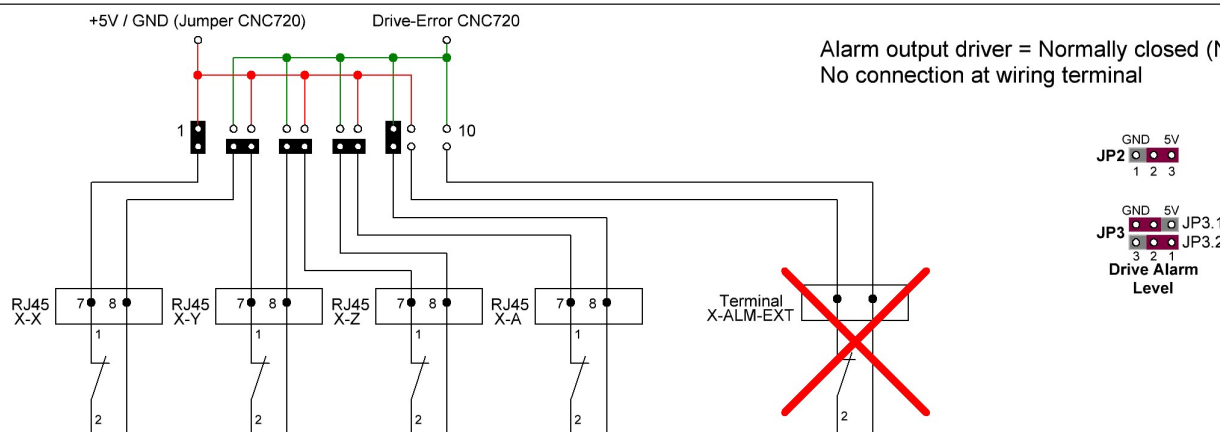
Default setting:
Alarm output driver = Normally open (NO)



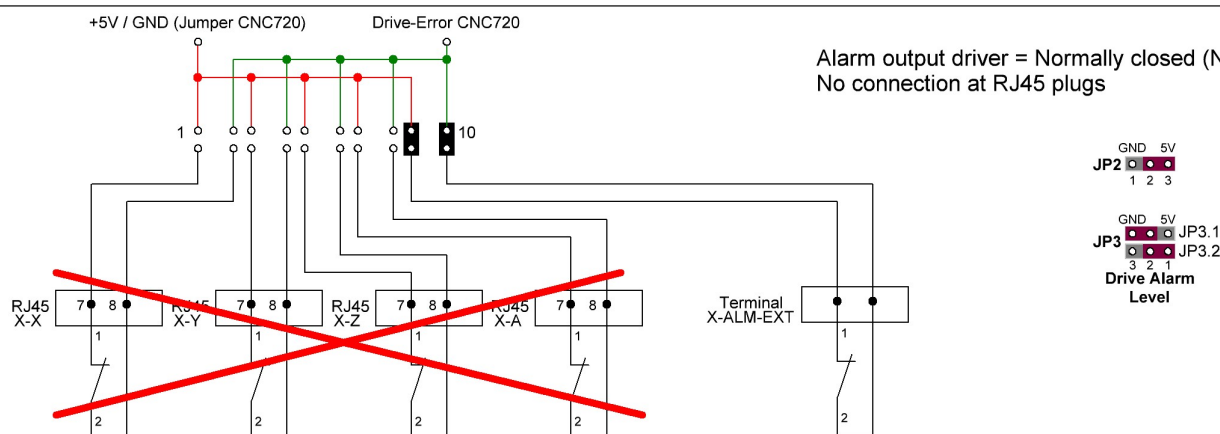
Alarm output driver = Normally closed (NC)



Alarm output driver = Normally closed (NC)
No connection at wiring terminal



Alarm output driver = Normally closed (NC)
No connection at RJ45 plugs



6. Technical specifications


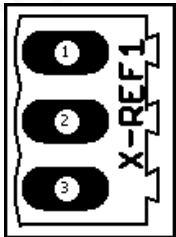


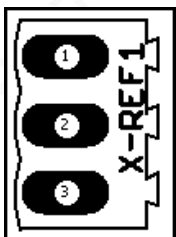
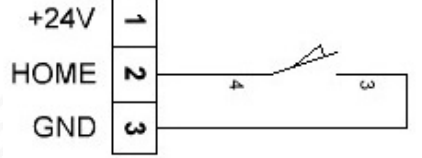

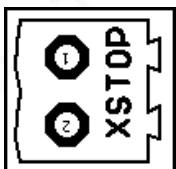
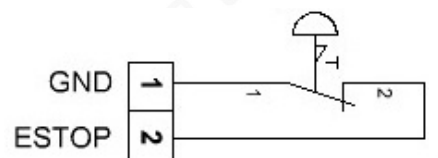

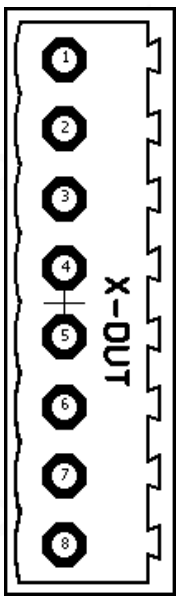
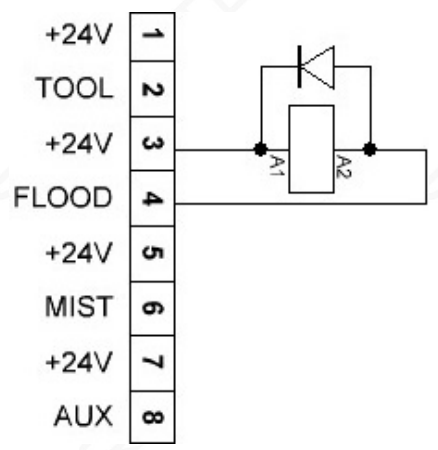
6.1 Electrical connection values

Parameter	min.	max.	Unit
Operating voltage (nominal 24V)	22,8	24,3	V
Power consumption (without external consumers)	0,1	3	W
Ambient temperature	0	+50	°C
5V additional power supply	4,8	5,2	V
5V current additional power supply	0	1500	mA
24V relay outputs voltage	22,0	24,3	V
24V relay outputs current (one output)	0	250	mA
24V relay outputs current (sum of all outputs)	0	400	mA
Voltage of actuated inputs (internal Pullup 10kOhm against 24V)	0	0,7	V
Voltage of non actuated inputs	5	24	V
Full level analog output	9,8	10	V
Current load rating analog output	0	10	mA
Linearity error analog output	-	1	%
Threshold for Watchdog-Frequency (switch off)	5	10	kHz
Threshold for Watchdog-Frequency (operation)	10	20	kHz
Signal voltage Enable/ Step/ Dir (TTL)	-	5	V
Driver current Step/ Dir outputs	-	15	mA
Step frequency Step outputs	5	400	kHz

6.2 Dimensions

Description	Width	Length	Height	Unit
Dimension of the board without plugged EdingCNC CPU	100	107	35	mm
Dimensions with attached EdingCNC CPU	100	107	40	mm
Hole spacing for fastening bolts	92	92	-	mm
Hole diameter	3,2	-	-	mm

7. Connection examples

Component	Terminal	Connection
Inductive reference sensor 		
Mechanical reference switch 		
Emergency stop 		
Coupling relay 		

8. Start-up and troubleshooting

8.1 Start-up check list

Check the following points again before switching on:

Are the EdingCNC CPU720 and the Simple BOB CNC720 correctly plugged together and the spacer bolt screwed correctly?

- Are all terminal blocks correctly aligned in their slots?
- Is the 24V/DC power supply connected with the correct polarity?
- Are the motor drivers correctly engaged with the patch cables in the RJ45 sockets?
- Is the emergency stop switch connected and the bypass jumper on the CPU720 removed?
- Are the connected cables neatly provided with wire end ferrules and there are no protruding wires?

If all the requirements are met, you can establish the connection to the PC, switch on the supply voltage and start the EdingCNC control software.

8.2 Troubleshooting

The following table provides an overview of the most common errors and their possible causes.

Nr.	Symptom	Reason
1	The PWR LED on the CPU does not light up	Power supply 24V/DC not connected or connected incorrectly
2	Motors are not activated / energized	a) Check the power supply of the motors b) Check the connection of the Enable-Signal c) Check the software setting „Amp Enable“
3	Motors does not rotate	a) Check the connection of the step signal b) Step and Dir possibly exchanged c) Step frequency in the software chosen to high. Most drivers has a max. clock frequency of 200kHz
4	Emergency stop does not work	a) Check the connection of terminal XSTOP b) Bypass-Jumper JP4 plugged at CPU
5	Reference switches are not recognized	a) Check the connection and the type of the sensors b) Check Jumper settings JP6-JP9 at CPU
6	Frequency converter does not start or speed cannot be controlled	a) Check the connection of terminal X-FU to the VFD b) Check software setting „Invert I/O“ from „Tool“ and „PWM1“ c) No start command or nominal speed set from program or „MDI-Form“
7	LED 1 „PWR“ does not light up (green) (optional LED-Board)	Power supply 24V/DC not connected or connected incorrectly (see error 1)
8	LED 2 „Watchdog“ doesn't light up (green) (optional LED-Board)	a) No connection to PC b) Control was not activated with „Reset“
9	LED 3 „Error“ light up (red) (optional LED-Board)	a) Check connection of external error and drive error b) Check jumper settings of the alarms c) External error or drive error actuated
10	LED 4 „E-STOP“ light up (red) (optional LED-Board)	a) Emergency stop switch not connected or connected incorrectly b) Emergency stop switch is actuated