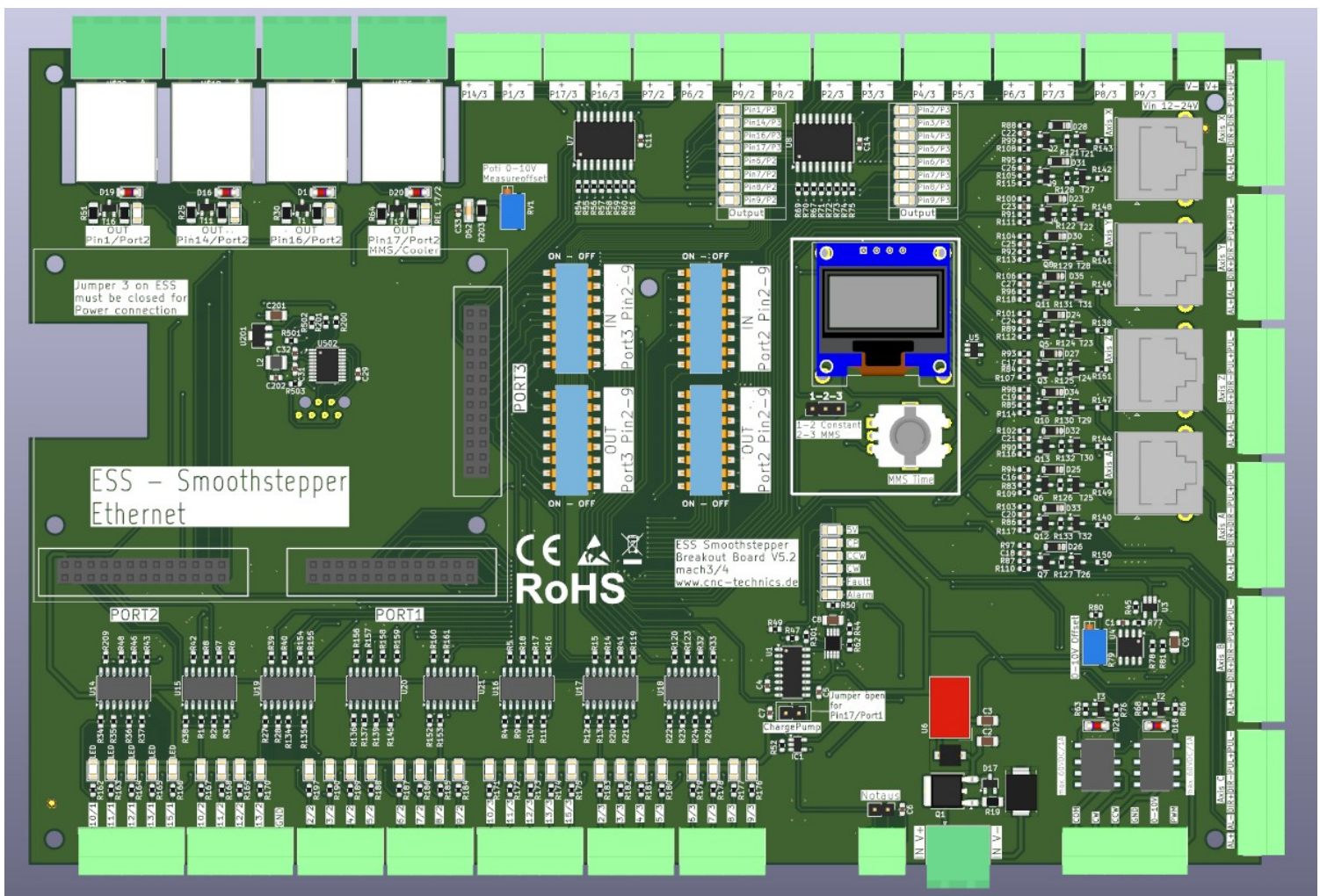


## Breakoutboard Mach4 Rev5.2 for ESS Smoothstepper



### Manual

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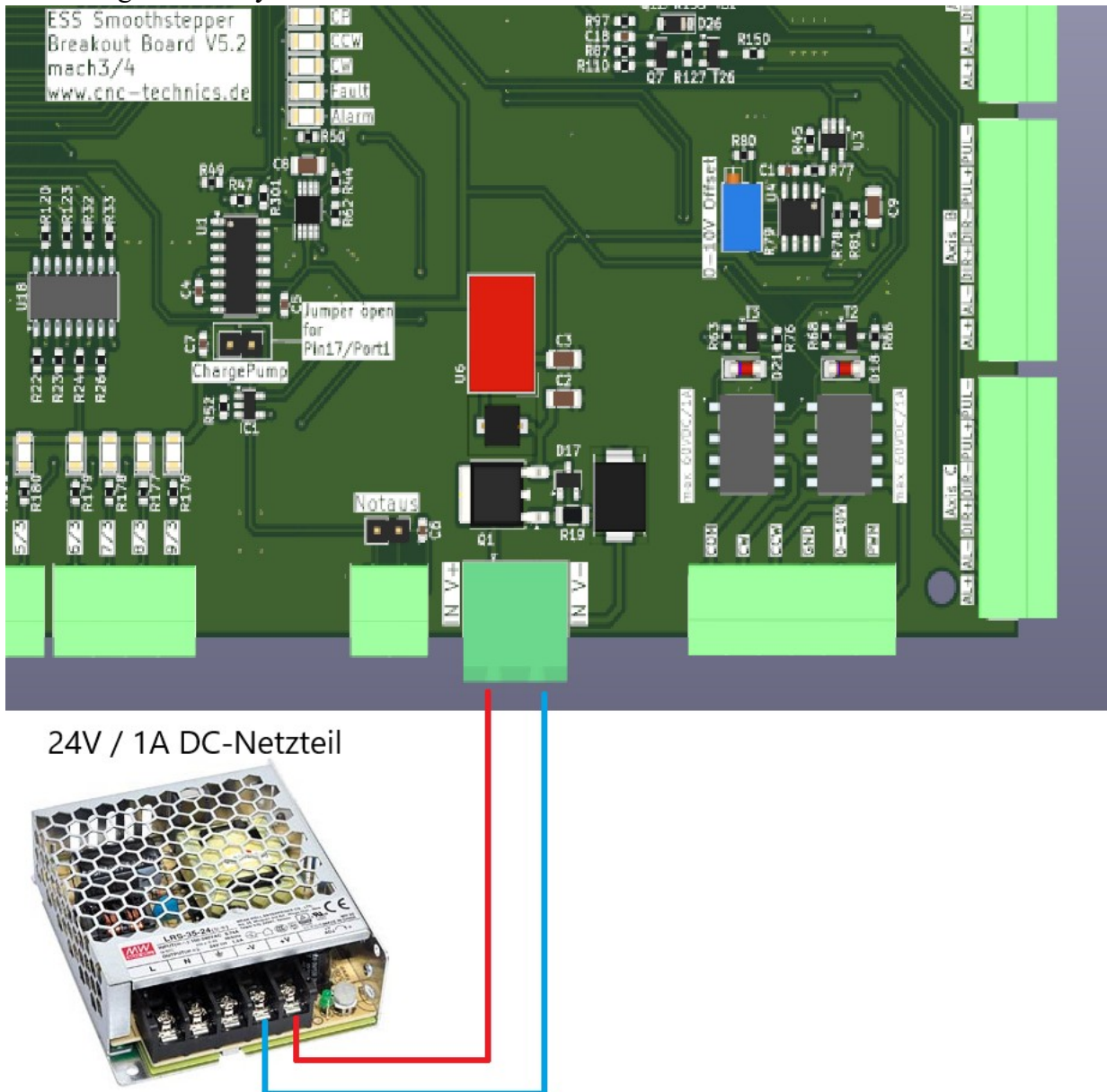
|                                   |    |
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# Instruction

This user manual contains instructions for assembling and using the breakout board.

**It is absolutely essential that 230V connections be made by a qualified electrician.**

This operating manual has been prepared with care. However, should you find any errors, we would be grateful for your feedback.



**Please read the "Charge Pump" section first; it's for switching the board on and off.**

# Breakout Board Description

The breakout board enables the operation of up to six stepper motor or servo drivers with the ESS Smoothstepper.

This requires the Mach3/Mach4 control software (not included). The board has various inputs and outputs that can be individually configured, allowing for many different configurations. Depending on the selected configuration, additional functions are available, such as control of a frequency converter via an analog signal of 0-10V or a PWM signal of 0-5V, reference switches, spindle direction relays, three relay outputs, alarm inputs, and a charge pump signal. All signals are protected by optocouplers.

# Configurations

Inputs and outputs that are fixed and cannot be changed via the DIP switches.

## Port1:

Inputs: Pin 10,11,12,13,15 (NPN)

Outputs: Pin 1 (Spindle PWM),  
Pin 2 (Axis X- Step), Pin 3 (Axis X-Dir)  
Pin 4 (Axis Y- Step), Pin 5 (Axis Y-Dir)  
Pin 6 (Axis Z- Step), Pin 7 (Axis Z-Dir)  
Pin 8 (Axis A- Step), Pin 9 (Axis A-Dir)  
Pin 14 (CW Relais)  
Pin 16 (CCW Relais)  
Pin 17 (Charge Pump)

## Port2:

Inputs: Pin 2,3,4,5,6,7,8,9,10,11,12,13 (NPN)

Outputs: Pin 6,7,8,9  
Pin 2 (Axis B- Step), Pin 3 (Axis B-Dir)  
Pin 4 (Axis C- Step), Pin 5 (Axis C-Dir)  
Pin 1 (Relais)  
Pin 14 (Relais)  
**Pin 15 Alarminput**  
Pin 16 (Relais)  
Pin 17 (Relais) duration, timed 0-10s

## Port3:

Inputs: Pin 2,3,4,5,6,7,8,9,10,11,12,13,15 (NPN)

Outputs: Pin 2,3,4,5,6,7,8,9,14,16,17

## Pin switching 2-9 Port 2 or 3 to **inputs** or **outputs**

There are 8-pin DIP switches on board SW1-4. They are also labeled on the board. All 8 pins of the switches must always be set within a DIP switch block.

For example, if you want to use pins 2-9 of port 2 as an input, port 2 (IN) must be set to ON and port 2 SW3 (OUT) to OFF.

With all pins 2-9 set to output, Port 2 (OUT) must be ON and Port 2 (IN) OFF.

W9 Ethernet SmoothStepper (ESS) Configuration - v260

Info General Motors Spindle Laser Pins Config Input Signals Output Signals Homing Probing Backlash HC

1) Set the pins Active High (Red Arrow Up) or Active Low (Green Arrow Down).  
 2) Give the Pins you are using an Alias: {P#-#} DESCRIPTION (This is the {Port#-Pin#} for the pin and a description of it). This makes it MUCH EASIER to identify which pins do what in the Input and Output signal tabs.  
 3) Assign Noise Filtering, in us, for each input pin, if needed (see the 'Info' tab for more details).  
 4) A Feed Hold or Stop (Stop, EStop, Disabled or Limit) event can set the Output state to 'Force ON', 'Force OFF', or 'No Change'. 'No Change' means that the output is controlled by Mach4. With 'Force ON' and 'Force OFF' the ESS will force that desired state.  
 5) Pins are always enabled, only Signals can be enabled or disabled. Connect pins as needed on the Input and Output signal tabs.

Port 2 Pins 2-9 Direction    Port 3 Pins 2-9 Direction  
 Inputs     Outputs     Inputs     Outputs

|             | DIR | Active High/Low | Alias or Name | Noise Filtering | Stop State | Feed Hold State |
|-------------|-----|-----------------|---------------|-----------------|------------|-----------------|
| Port1-Pin1  | Out | ↑               | Spindel       | ----            | No Change  | No Change       |
| Port1-Pin2  | Out | ↑               | StepX         | ----            | No Change  | No Change       |
| Port1-Pin3  | Out | ↑               | DirX          | ----            | No Change  | No Change       |
| Port1-Pin4  | Out | ↑               | StepY         | ----            | No Change  | No Change       |
| Port1-Pin5  | Out | ↑               | DirY          | ----            | No Change  | No Change       |
| Port1-Pin6  | Out | ↑               | StepZ         | ----            | No Change  | No Change       |
| Port1-Pin7  | Out | ↑               | DirZ          | ----            | No Change  | No Change       |
| Port1-Pin8  | Out | ↑               | StepA         | ----            | No Change  | No Change       |
| Port1-Pin9  | Out | ↑               | DirA          | ----            | No Change  | No Change       |
| Port1-Pin10 | In  | ↑               | {P1-10}       | 0.00            | ----       | ----            |
| Port1-Pin11 | In  | ↑               | {P1-11}       | 0.00            | ----       | ----            |
| Port1-Pin12 | In  | ↑               | {P1-12}       | 0.00            | ----       | ----            |
| Port1-Pin13 | In  | ↑               | {P1-13}       | 0.00            | ----       | ----            |
| Port1-Pin14 | Out | ↑               | Relais CCW    | ----            | No Change  | No Change       |
| Port1-Pin15 | In  | ↑               | {P1-15}       | 0.00            | ----       | ----            |
| Port1-Pin16 | Out | ↑               | Relais CW     | ----            | No Change  | No Change       |
| Port1-Pin17 | Out | ↑               | Charge Pump   | ----            | No Change  | No Change       |
| Port2-Pin1  | Out | ↑               | Relais 1-2    | ----            | No Change  | No Change       |
| Port2-Pin2  | Out | ↑               | StepB         | ----            | No Change  | No Change       |
| Port2-Pin3  | Out | ↑               | DirB          | ----            | No Change  | No Change       |
| Port2-Pin4  | Out | ↑               | StepC         | ----            | No Change  | No Change       |
| Port2-Pin5  | Out | ↑               | DirC          | ----            | No Change  | No Change       |
| Port2-Pin6  | Out | ↑               | {P2-6}        | ----            | No Change  | No Change       |
| Port2-Pin7  | Out | ↑               | {P2-7}        | ----            | No Change  | No Change       |
| Port2-Pin8  | Out | ↑               | {P2-8}        | ----            | No Change  | No Change       |
| Port2-Pin9  | Out | ↑               | {P2-9}        | ----            | No Change  | No Change       |
| Port2-Pin10 | In  | ↑               | {P2-10}       | 0.00            | ----       | ----            |

OK    Cancel

w9 Ethernet SmoothStepper (ESS) Configuration - v260

Info General Motors Spindle Laser Pins Config Input Signals Output Signals Homing Probing Backlash HC

1) Set the pins Active High (Red Arrow Up) or Active Low (Green Arrow Down).  
 2) Give the Pins you are using an Alias: {P#-#} DESCRIPTION (This is the {Port#-Pin#} for the pin and a description of it).  
 This makes it MUCH EASIER to identify which pins do what in the Input and Output signal tabs.  
 3) Assign Noise Filtering, in us, for each input pin, if needed (see the 'Info' tab for more details).  
 4) A Feed Hold or Stop (Stop, EStop, Disabled or Limit) event can set the Output state to 'Force ON', 'Force OFF', or 'No Change'.  
 'No Change' means that the output is controlled by Mach4. With 'Force ON' and 'Force OFF' the ESS will force that desired state.  
 5) Pins are always enabled, only Signals can be enabled or disabled. Connect pins as needed on the Input and Output signal tabs.

Port 2 Pins 2-9 Direction:  Inputs  Outputs  
 Port 3 Pins 2-9 Direction:  Inputs  Outputs

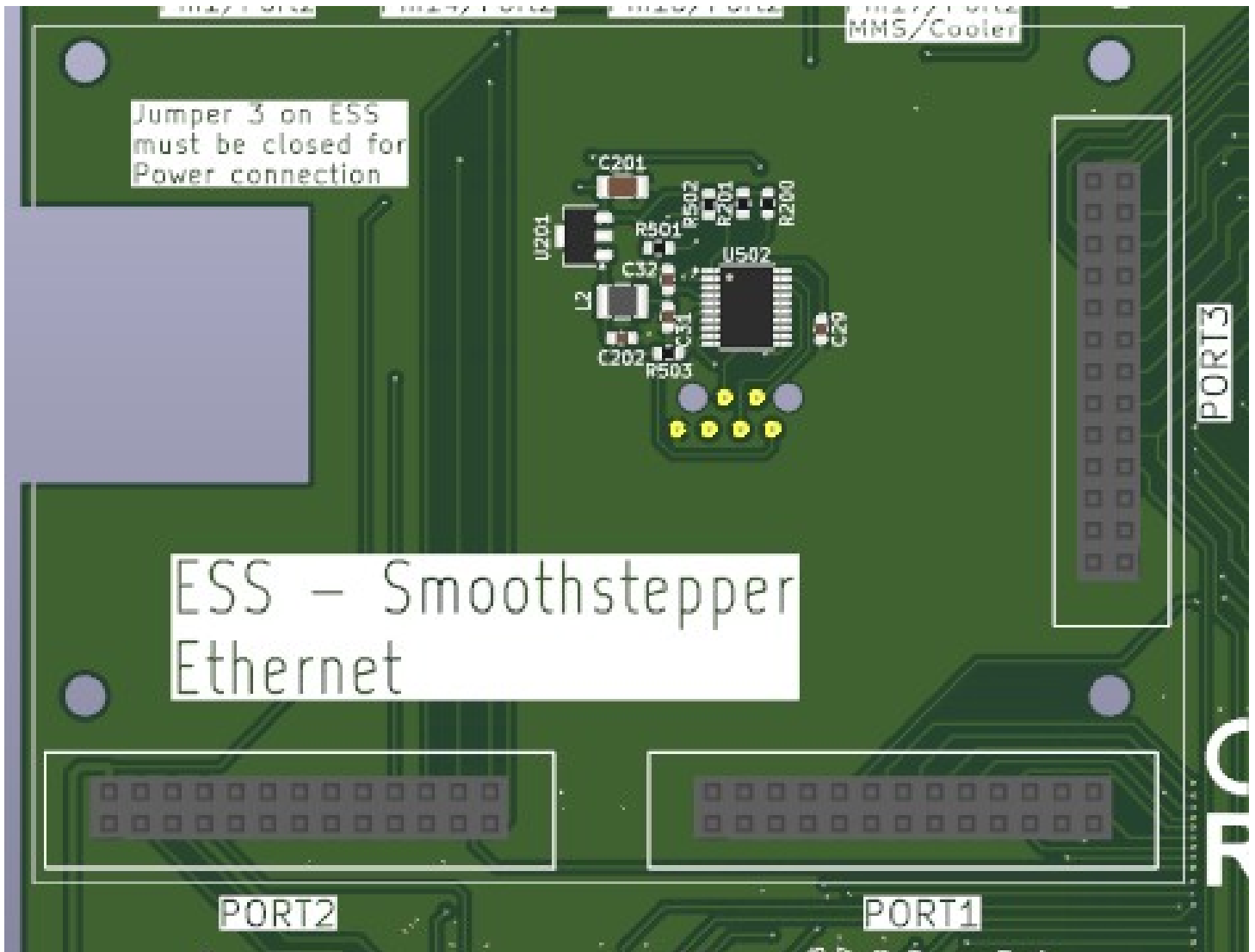
|             | DIR | Active High/Low | Alias or Name | Noise Filtering | Stop State | Feed Hold State |
|-------------|-----|-----------------|---------------|-----------------|------------|-----------------|
| Port2-Pin8  | Out | ↑               | {P2-8}        | -----           | No Change  | No Change       |
| Port2-Pin9  | Out | ↑               | {P2-9}        | -----           | No Change  | No Change       |
| Port2-Pin10 | In  | ↑               | {P2-10}       | 0.00            | -----      | -----           |
| Port2-Pin11 | In  | ↑               | {P2-11}       | 0.00            | -----      | -----           |
| Port2-Pin12 | In  | ↑               | {P2-12}       | 0.00            | -----      | -----           |
| Port2-Pin13 | In  | ↑               | {P2-13}       | 0.00            | -----      | -----           |
| Port2-Pin14 | Out | ↑               | Relais 14-2   | -----           | No Change  | No Change       |
| Port2-Pin15 | In  | ↑               | {P2-15}       | 0.00            | -----      | -----           |
| Port2-Pin16 | Out | ↑               | {P2-16}       | -----           | No Change  | No Change       |
| Port2-Pin17 | Out | ↑               | Relais 17-2   | -----           | No Change  | No Change       |
| Port3-Pin1  | Out | ↑               | {P3-1}        | -----           | No Change  | No Change       |
| Port3-Pin2  | Out | ↑               | {P3-2}        | -----           | No Change  | No Change       |
| Port3-Pin3  | Out | ↑               | {P3-3}        | -----           | No Change  | No Change       |
| Port3-Pin4  | Out | ↑               | {P3-4}        | -----           | No Change  | No Change       |
| Port3-Pin5  | Out | ↑               | {P3-5}        | -----           | No Change  | No Change       |
| Port3-Pin6  | Out | ↑               | {P3-6}        | -----           | No Change  | No Change       |
| Port3-Pin7  | Out | ↑               | {P3-7}        | -----           | No Change  | No Change       |
| Port3-Pin8  | Out | ↑               | {P3-8}        | -----           | No Change  | No Change       |
| Port3-Pin9  | Out | ↑               | {P3-9}        | -----           | No Change  | No Change       |
| Port3-Pin10 | In  | ↑               | {P3-10}       | 0.00            | -----      | -----           |
| Port3-Pin11 | In  | ↑               | {P3-11}       | 0.00            | -----      | -----           |
| Port3-Pin12 | In  | ↑               | {P3-12}       | 0.00            | -----      | -----           |
| Port3-Pin13 | In  | ↑               | {P3-13}       | 0.00            | -----      | -----           |
| Port3-Pin14 | Out | ↑               | {P3-14}       | -----           | No Change  | No Change       |
| Port3-Pin15 | In  | ↑               | {P3-15}       | 0.00            | -----      | -----           |
| Port3-Pin16 | Out | ↑               | {P3-16}       | -----           | No Change  | No Change       |
| Port3-Pin17 | Out | ↑               | {P3-17}       | -----           | No Change  | No Change       |

OK Cancel

# Commissioning

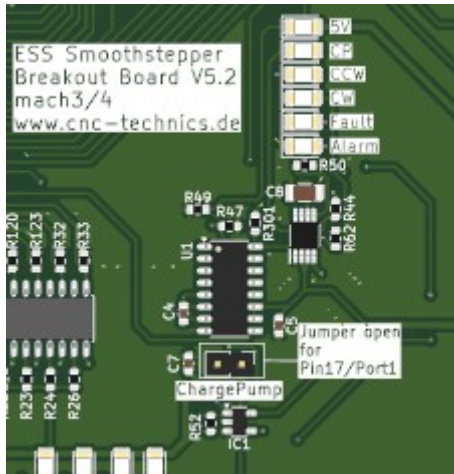
## Installation of the Smoothstepper

- ➔ The Smoothstepper is screwed onto the 4 spacer bolts using M3 screws.
- ➔ Close jumper 3 on the ESS so that the ESS is supplied with power.



# Charge Pump – Switching ON the board

This setting can be enabled or disabled (software activation of the BOB via Mach4).



If the jumper is SET, the board is activated without protection, and all voltages and controls are retained even if Mach4 performs a reset.

If the jumper is NOT set, the breakout board is controlled by Mach4 via the 12.5 kHz signal. This means that when the Mach4 program is started, the board is also active.

To achieve this, the following settings must be configured in Mach3:

W9 Ethernet SmoothStepper (ESS) Configuration - v253

Info | General | Motors | Spindle | Laser | Pins Config | Input Signals | Output Signals | Homing | Probing | Backlash | HC

1) An Output Pin (or Alias) may only be assigned to a single Output Signal.  
 2) An Output Signal may have up to 3 Output Pins (or Aliases) assigned to it:  
 \* When enabled in this window, only 'Mapped Pin1' will be enabled and mapped into Mach.  
 \* 'Mapped Pin2' and 'Mapped Pin3' will still receive the same Output Signal as 'Mapped Pin1', but will not be referenced in Mach.

|                           | Enable                              | Mach Mapping | Pin1 Mapping | Pin2 Mapping | Pin3 Mapping |
|---------------------------|-------------------------------------|--------------|--------------|--------------|--------------|
| Motor 0 Step              | <input checked="" type="checkbox"/> | ESS-only     | X-Step       |              |              |
| Motor 0 Dir               | <input checked="" type="checkbox"/> | ESS-only     | X-Dir        |              |              |
| Motor 1 Step              | <input checked="" type="checkbox"/> | ESS-only     | Y-Step       |              |              |
| Motor 1 Dir               | <input checked="" type="checkbox"/> | ESS-only     | Y-Dir        |              |              |
| Motor 2 Step              | <input checked="" type="checkbox"/> | ESS-only     | Z-Step       |              |              |
| Motor 2 Dir               | <input checked="" type="checkbox"/> | ESS-only     | Z-Dir        |              |              |
| Motor 3 Step              | <input checked="" type="checkbox"/> | ESS-only     | A-Step       |              |              |
| Motor 3 Dir               | <input checked="" type="checkbox"/> | ESS-only     | A-Dir        |              |              |
| Motor 4 Step              | <input type="checkbox"/>            | ESS-only     |              |              |              |
| Motor 4 Dir               | <input type="checkbox"/>            | ESS-only     |              |              |              |
| Motor 5 Step              | <input type="checkbox"/>            | ESS-only     |              |              |              |
| Motor 5 Dir               | <input type="checkbox"/>            | ESS-only     |              |              |              |
| Motor 0 Enable            | <input type="checkbox"/>            |              |              |              |              |
| Motor 1 Enable            | <input type="checkbox"/>            |              |              |              |              |
| Motor 2 Enable            | <input type="checkbox"/>            |              |              |              |              |
| Motor 3 Enable            | <input type="checkbox"/>            |              |              |              |              |
| Motor 4 Enable            | <input type="checkbox"/>            |              |              |              |              |
| Motor 5 Enable            | <input type="checkbox"/>            |              |              |              |              |
| Laser PWM/XY Vel PWM      | <input type="checkbox"/>            | ESS-only     |              |              |              |
| Spindle Motor PWM         | <input checked="" type="checkbox"/> | ESS-only     | Spindel      |              |              |
| Spindle Motor Dir         | <input type="checkbox"/>            | ESS-only     |              |              |              |
| Spindle On                | <input type="checkbox"/>            |              |              |              |              |
| Spindle Fwd               | <input checked="" type="checkbox"/> | ESS          | CW-Relais    |              |              |
| Spindle Rev               | <input checked="" type="checkbox"/> | ESS          | CCW-Relais   |              |              |
| Alarm                     | <input type="checkbox"/>            |              |              |              |              |
| Charge Pump               | <input checked="" type="checkbox"/> | ESS-only     | CP           |              |              |
| Coolant, Flood (M08, M09) | <input checked="" type="checkbox"/> | ESS          | Relais 1     |              |              |
| Coolant, Mist (M07, M09)  | <input checked="" type="checkbox"/> | ESS          | Relais 14    |              |              |
| Current Hi/Low            | <input type="checkbox"/>            |              |              |              |              |

OK Cancel

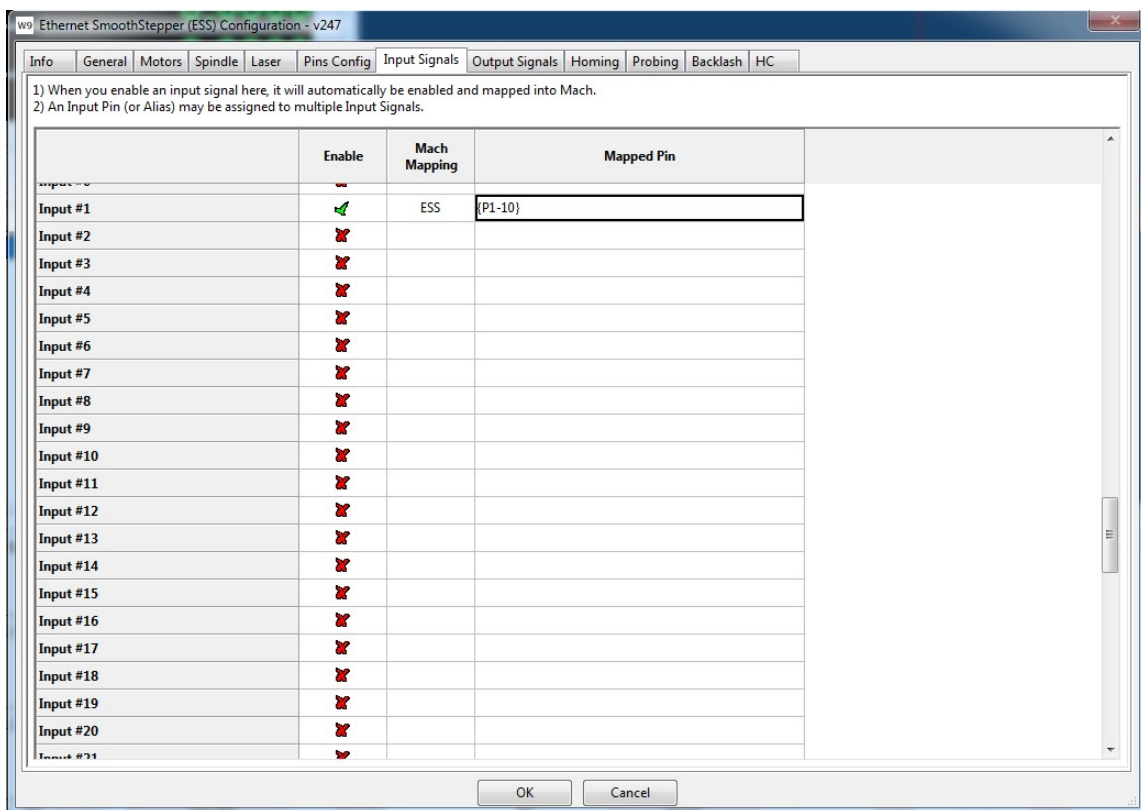
# Inputs

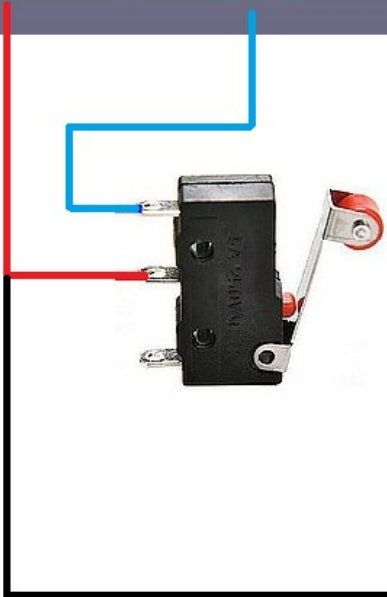
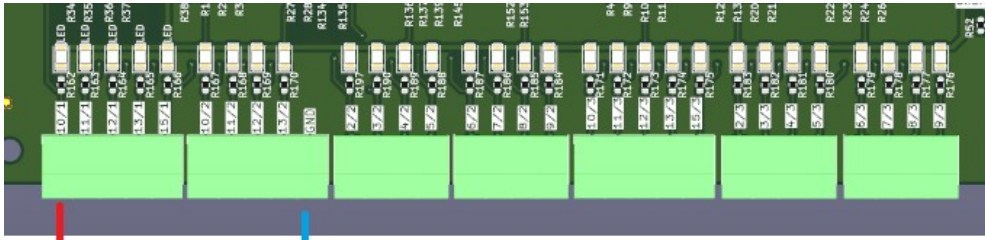
Each entrance port is marked with its own PIN number.



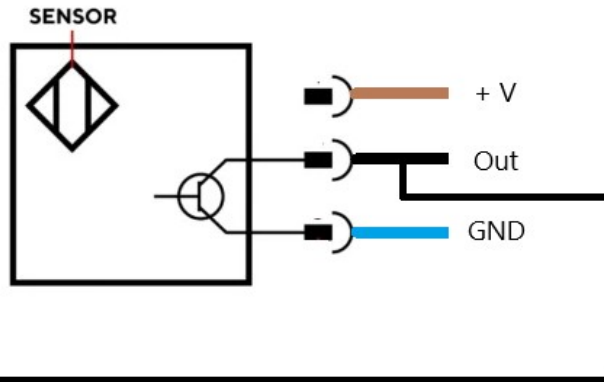
The limit switch or NPN sensor (output is a black wire) is connected to ground (GND). When the limit switch is activated, it switches to ground, and Mach4 detects a response at the input.

**This can all be observed in the ESS plugin menu under Data Monitoring.**





## NPN 3-WIRE STANDARD



# Outputs

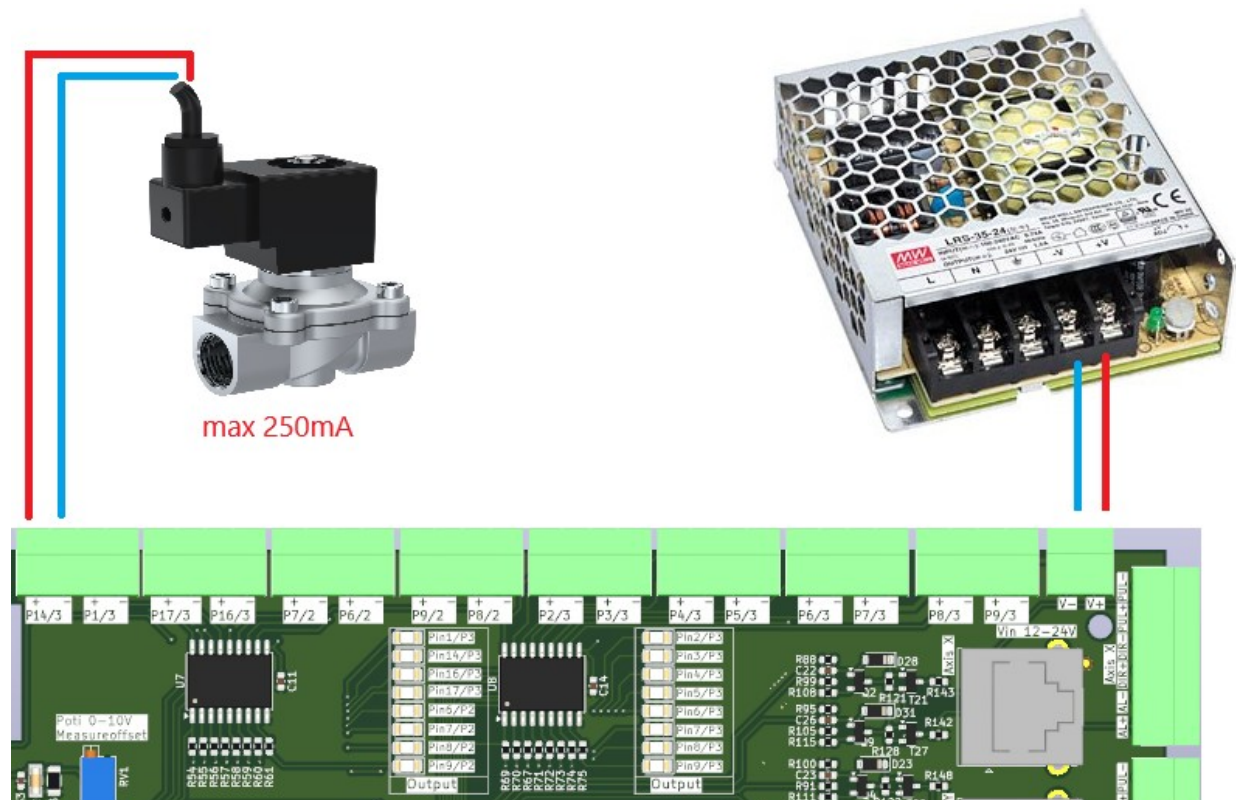
Like the input ports, each output port is also assigned a pin number and a corresponding output.

The output port must be supplied with a voltage (which can also come from the power supply used to power the board) that will then be output at the respective switched output. Mixed voltages are not possible. 12-24V can be applied to the port, and this will switch the voltage. The voltage is then present at the respective port, and the ground is switched in addition.

The LED arrays indicate the switched state.

A maximum of 250mA per output is available for switching.

If higher currents are needed for switching, inexpensive relay modules can be connected.



# Integrating outputs into Mach4

The port number and PIN number are entered, and the "enabled" checkbox is checked to activate the output.

w9 Ethernet SmoothStepper (ESS) Configuration - v253

Info General Motors Spindle Laser Pins Config Input Signals Output Signals Homing Probing Backlash HC

1) An Output Pin (or Alias) may only be assigned to a single Output Signal.  
 2) An Output Signal may have up to 3 Output Pins (or Aliases) assigned to it:  
 \* When enabled in this window, only 'Mapped Pin1' will be enabled and mapped into Mach.  
 \* 'Mapped Pin2' and 'Mapped Pin3' will still receive the same Output Signal as 'Mapped Pin1', but will not be referenced in Mach.

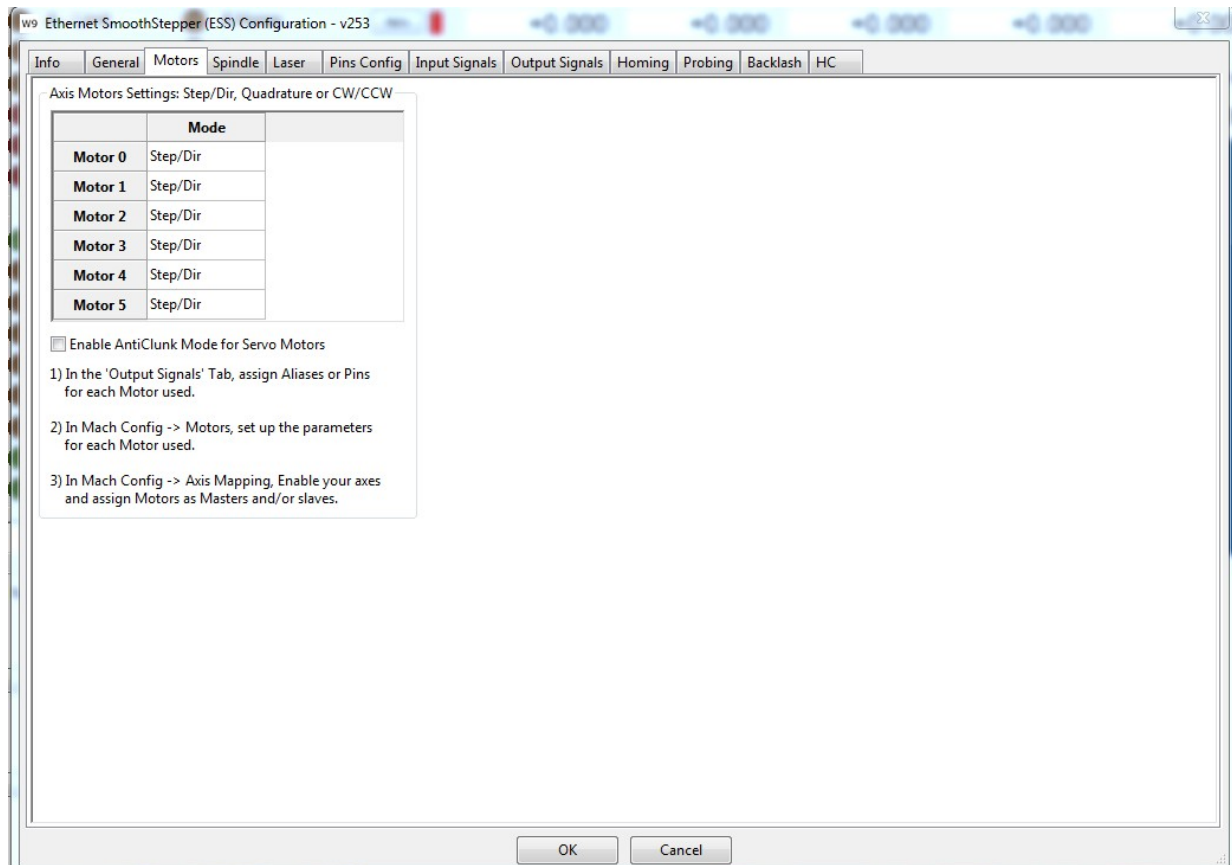
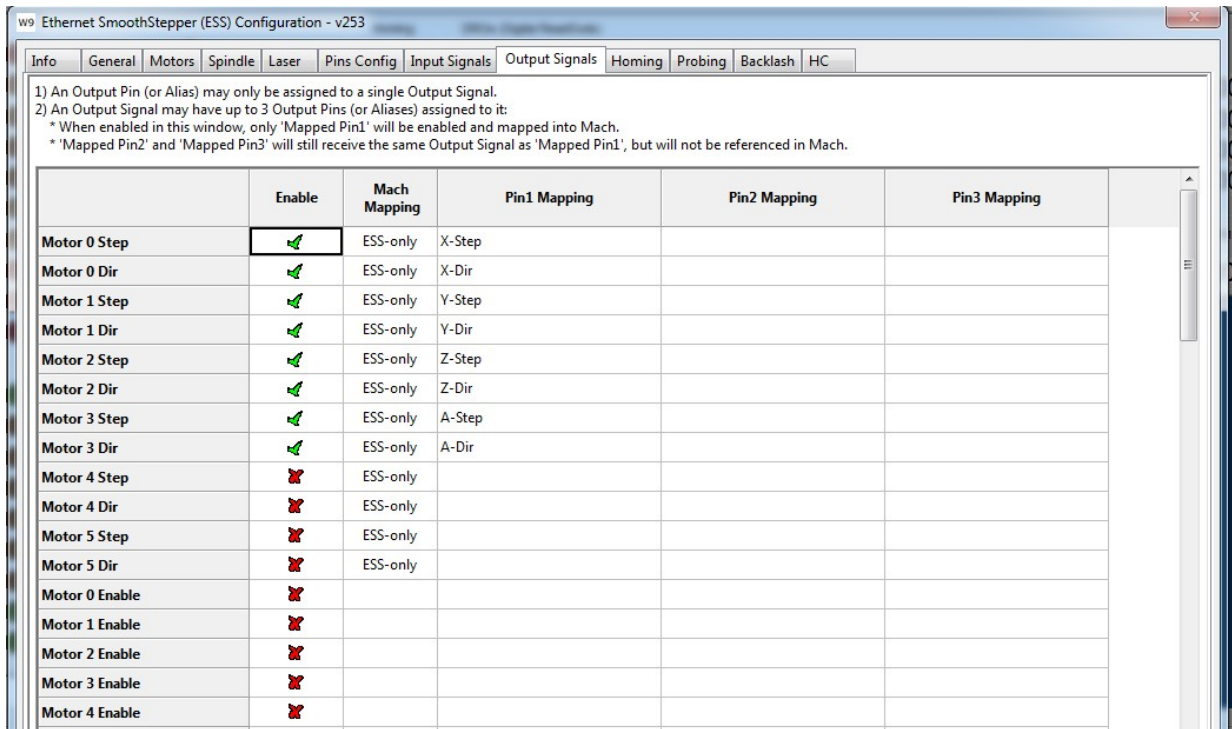
|                           | Enable                              | Mach Mapping | Pin1 Mapping | Pin2 Mapping | Pin3 Mapping |
|---------------------------|-------------------------------------|--------------|--------------|--------------|--------------|
| Motor 0 Step              | <input checked="" type="checkbox"/> | ESS-only     | X-Step       |              |              |
| Motor 0 Dir               | <input checked="" type="checkbox"/> | ESS-only     | X-Dir        |              |              |
| Motor 1 Step              | <input checked="" type="checkbox"/> | ESS-only     | Y-Step       |              |              |
| Motor 1 Dir               | <input checked="" type="checkbox"/> | ESS-only     | Y-Dir        |              |              |
| Motor 2 Step              | <input checked="" type="checkbox"/> | ESS-only     | Z-Step       |              |              |
| Motor 2 Dir               | <input checked="" type="checkbox"/> | ESS-only     | Z-Dir        |              |              |
| Motor 3 Step              | <input checked="" type="checkbox"/> | ESS-only     | A-Step       |              |              |
| Motor 3 Dir               | <input checked="" type="checkbox"/> | ESS-only     | A-Dir        |              |              |
| Motor 4 Step              | <input type="checkbox"/>            | ESS-only     |              |              |              |
| Motor 4 Dir               | <input type="checkbox"/>            | ESS-only     |              |              |              |
| Motor 5 Step              | <input type="checkbox"/>            | ESS-only     |              |              |              |
| Motor 5 Dir               | <input type="checkbox"/>            | ESS-only     |              |              |              |
| Motor 0 Enable            | <input type="checkbox"/>            |              |              |              |              |
| Motor 1 Enable            | <input type="checkbox"/>            |              |              |              |              |
| Motor 2 Enable            | <input type="checkbox"/>            |              |              |              |              |
| Motor 3 Enable            | <input type="checkbox"/>            |              |              |              |              |
| Motor 4 Enable            | <input type="checkbox"/>            |              |              |              |              |
| Motor 5 Enable            | <input type="checkbox"/>            |              |              |              |              |
| Laser PWM/XY Vel PWM      | <input type="checkbox"/>            | ESS-only     |              |              |              |
| Spindle Motor PWM         | <input checked="" type="checkbox"/> | ESS-only     | Spindel      |              |              |
| Spindle Motor Dir         | <input type="checkbox"/>            | ESS-only     |              |              |              |
| Spindle On                | <input type="checkbox"/>            |              |              |              |              |
| Spindle Fwd               | <input checked="" type="checkbox"/> | ESS          | CW-Relais    |              |              |
| Spindle Rev               | <input checked="" type="checkbox"/> | ESS          | CCW-Relais   |              |              |
| Alarm                     | <input type="checkbox"/>            |              |              |              |              |
| Charge Pump               | <input checked="" type="checkbox"/> | ESS-only     | CP           |              |              |
| Coolant, Flood (M08, M09) | <input checked="" type="checkbox"/> | ESS          | Relais 1     |              |              |
| Coolant, Mist (M07, M09)  | <input checked="" type="checkbox"/> | ESS          | Relais 14    |              |              |
| Current Hi/Low            | <input type="checkbox"/>            |              |              |              |              |

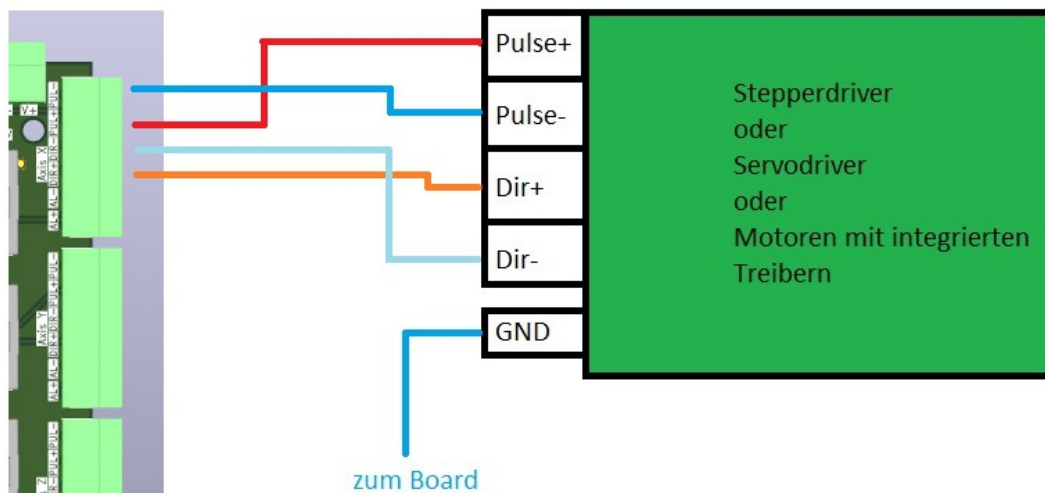
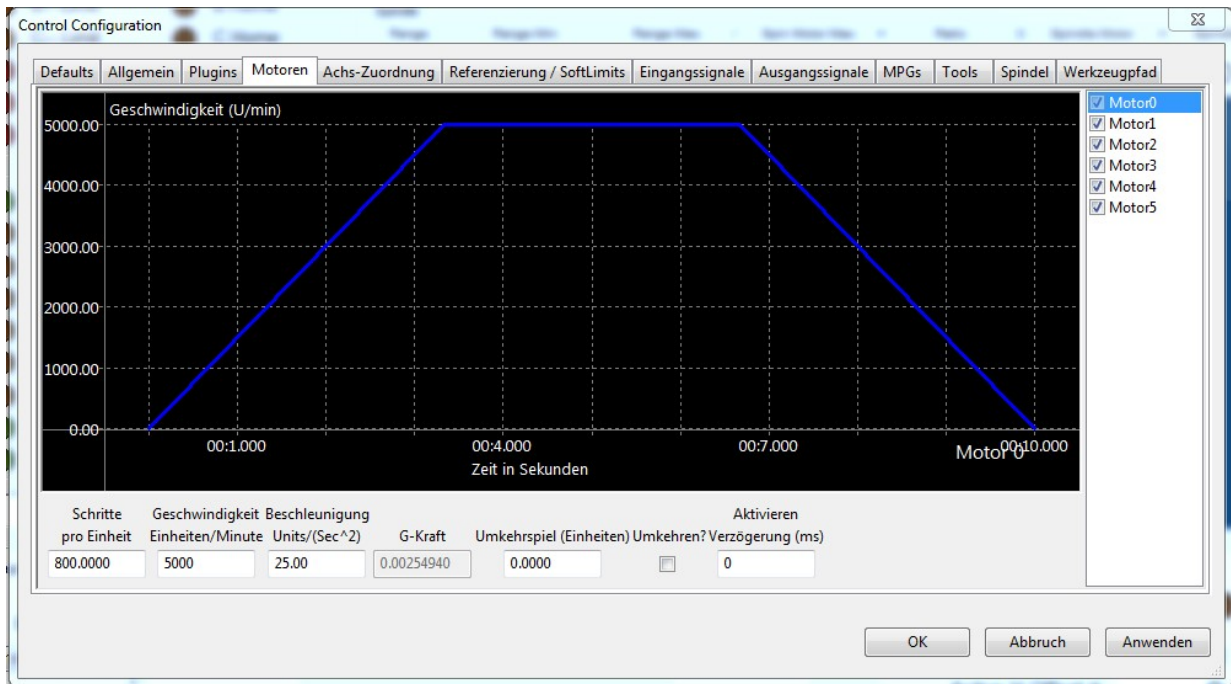
OK Cancel

# Setting axes in Mach4

These are fixed values that should not be changed.

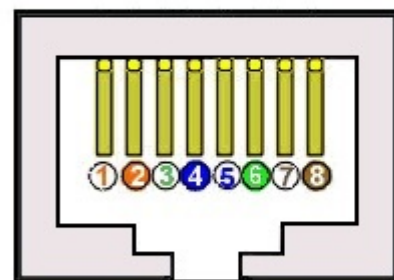
If axes B and C are not needed, they can be deactivated using switch SW3, and pins 2-9 on port 2 can be used as inputs.





### Buchse

- 1 - NC
- 2 - GND
- 3 - Dir-
- 4 - Dir+
- 5 - Puls-
- 6 - Puls +
- 7 - Alarm +
- 8 - GND

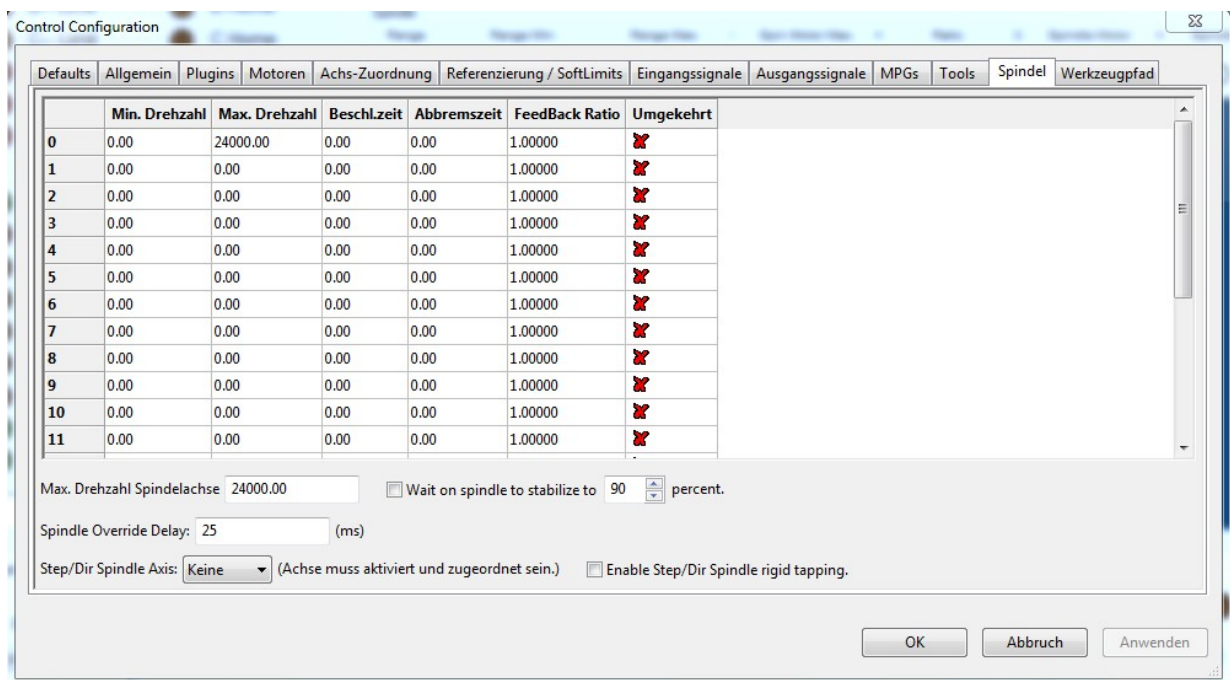
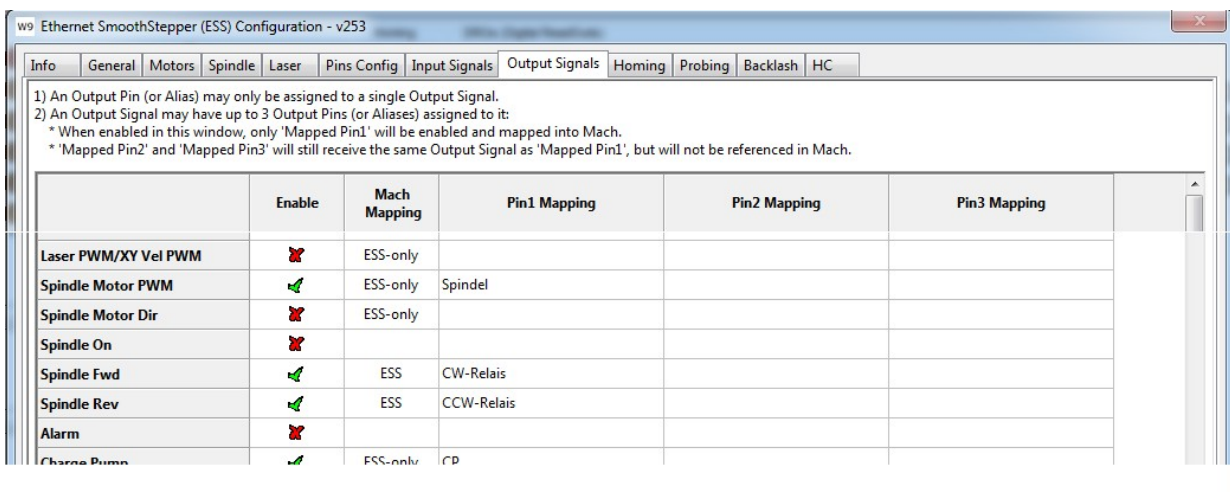


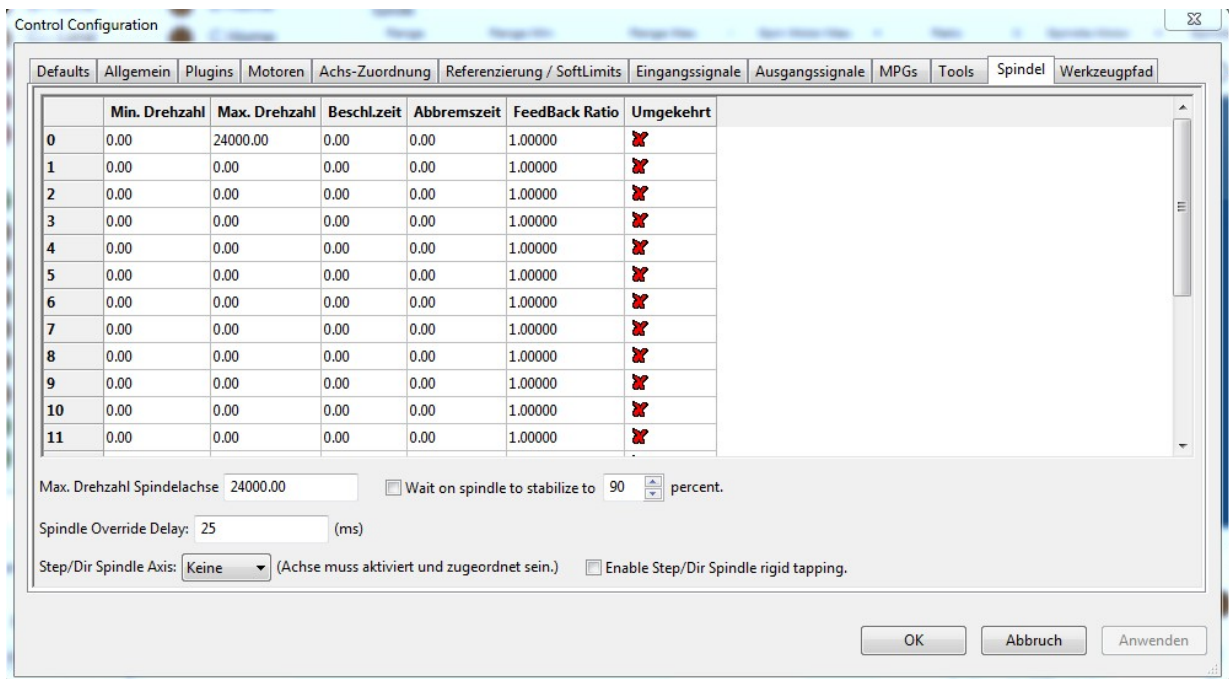
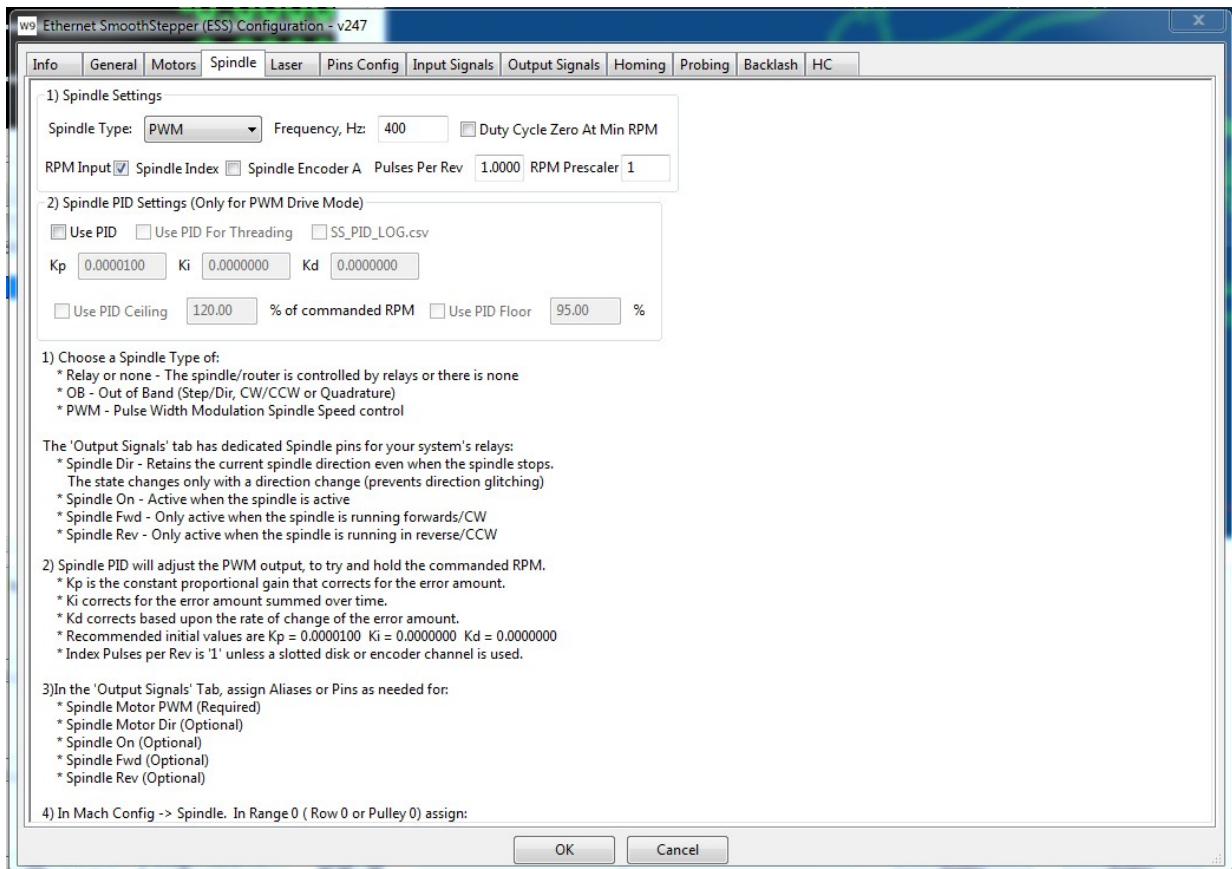
# Setting the spindle in Mach4

Port 1 / Pin 1 is the analog output for the spindle speed.  
The PWM output is also available.

A VFD frequency converter can be connected to the spindle output for the analog signal.

The potentiometer R13 is set so that a 5V PWM output from the PC results in a 10V analog signal. If a longer cable is connected to the frequency converter, the values should be compared again at the highest speed and the potentiometer adjusted if necessary.





Datei Anzeigen Configure Diagnostische Wizard Bediener Hilfe  
 Programmlauf Werkzeugwege Maschinenkoordinaten Tastermenu Nullpunkte Trace

**Ausgangs Signale**  
 Alarm Programm Ende High/low Digitalisierer  
 M0 Enable X++ Limit X- Limit X Home  
 M1 Enable Y++ Limit Y- Limit Y Home  
 M2 Enable Z++ Limit Z- Limit Z Home  
 M3 Enable A++ Limit A- Limit A Home  
 M4 Enable B++ Limit B- Limit B Home  
 M5 Enable C++ Limit C- Limit C Home  
 Ausgang 0 Ausgang 1 Ausgang 2 Ausgang 3  
 Ausgang 4 Ausgang 5 Ausgang 6 Ausgang 7  
 Ausgang 8 Ausgang 9 Charge Pump 1 Charge Pump 2

**Eingangs Signale**  
 Notaus Limit Override Timing Index  
 Eingang 0 M0++ Limit M0-- Limit M0 Home  
 Eingang 1 M1++ Limit M1-- Limit M1 Home  
 Eingang 2 M2++ Limit M2-- Limit M2 Home  
 Eingang 3 M3++ Limit M3-- Limit M3 Home  
 Eingang 4 M4++ Limit M4-- Limit M4 Home  
 Eingang 5 M5++ Limit M5-- Limit M5 Home  
 Probe Probe 1 Probe 2 Probe 3  
 THC On THC Up THC Down Spin At Speed

**Machine State:** Idle

**Homing**  
 DR0s (Digital ReadOuts)  

| Aktuelle Position | Maschinen Koordinaten | Work Offset | G92 Offset | Head Shift | Work Shift | Tool Offset |
|-------------------|-----------------------|-------------|------------|------------|------------|-------------|
| Ref X             | -1.310                | +0.000      | +1.310     | +0.000     | +0.000     | +0.000      |
| Ref Y             | +0.000                | +0.000      | +0.000     | +0.000     | +0.000     | +0.000      |
| Ref Z             | +0.000                | +0.000      | +0.000     | +0.000     | +0.000     | +0.000      |
| Ref A             | +0.000                | +0.000      | +0.000     | +0.000     | +0.000     | +0.000      |
| Ref B             | +0.000                | +0.000      | +0.000     | +0.000     | +0.000     | +0.000      |
| Ref C             | +0.000                | +0.000      | +0.000     | +0.000     | +0.000     | +0.000      |

**Spindel**  

| Reichweite | Reichweite Min. | Reichweite Max. | Spindel Motor Max. | Übersetzung | X Spindel Motor RPM | Spindel | X Rückkopplungsfaktor | genaue RPM |
|------------|-----------------|-----------------|--------------------|-------------|---------------------|---------|-----------------------|------------|
| 0          | 0               | 24000           | 24000              | 1.000       | 24000               | 24000   | 1.00000               | 0          |

**G Code MDI**  
 (Empty text area for G-code input)

**Control**  
 Cycle Start Gcode  
 Feed Hold  
 Stop  
 Pause  
 Trounce

**Vorschub (G01)**  
 0.00 FRO%  
 250% +/-  
 100% +/-

**Eilgang (G00)**  
 RRO%  
 100% +/-  
 50% +/-  
 0% +/-

**Programm Optionen**  
 Aktuelle Datei: \_\_\_\_\_ Laufzeit: 00:00:00.00  
 Lade G Code Lade letzten G Code Lade Hilfsprogramme Load Last Wizard  
 Bearbeite G Code Schließe G Code **Schriften Gravieren**  
 Auf Anfang G Code Start ab Zeile Setze nächste G Code Linie **Anleitungen laden**  
 Aktualisiere Werkzeugweg Linie: 0 **Arbeitsraum An/Aus**

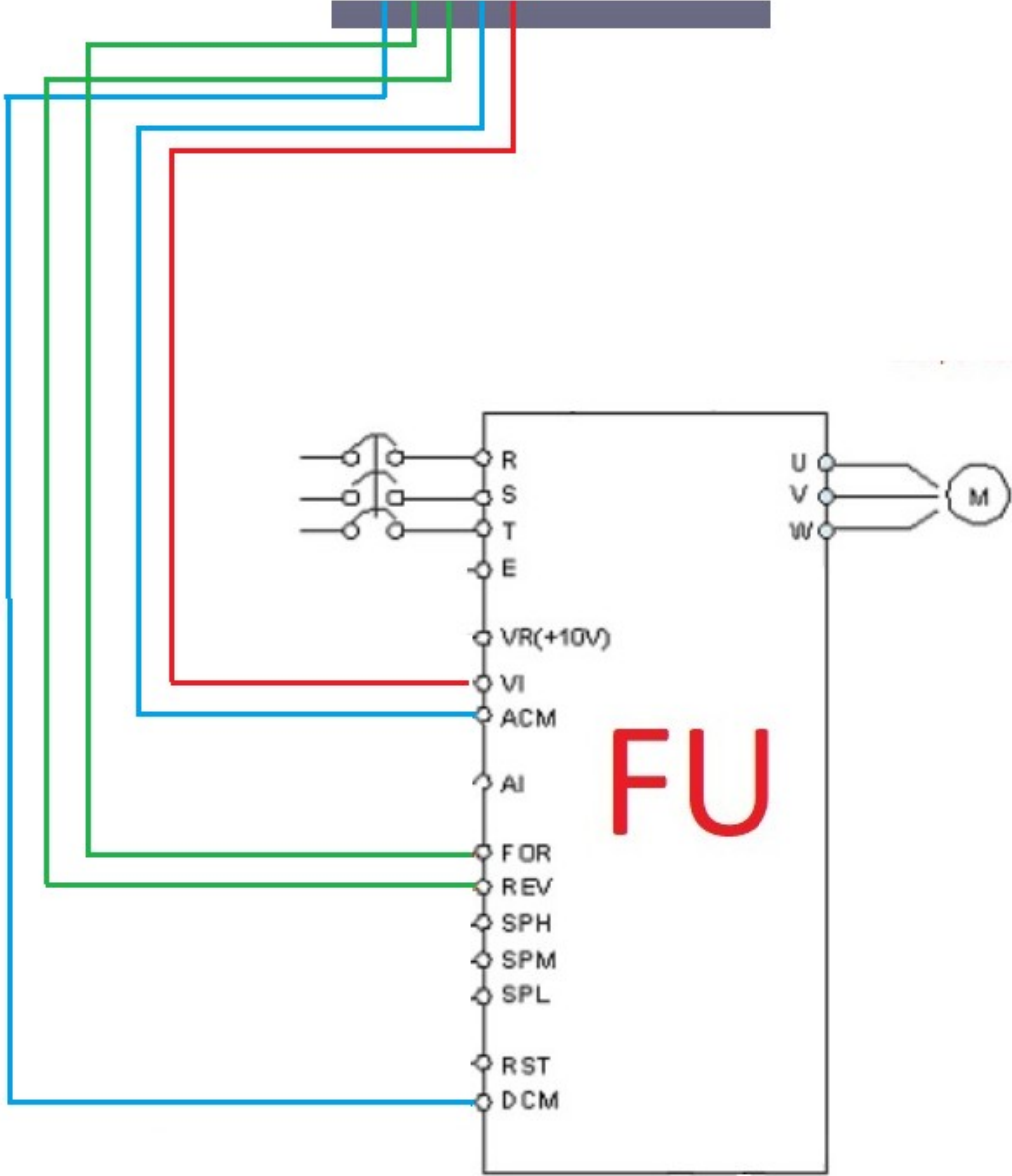
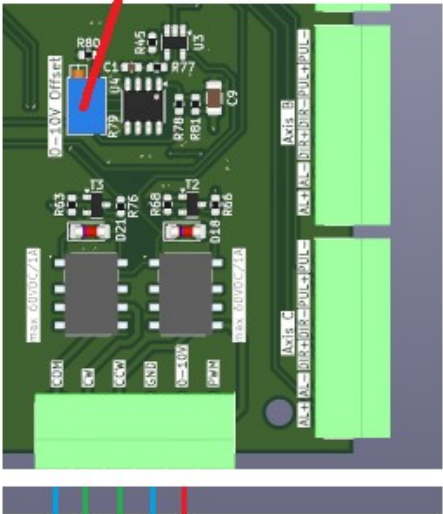
**Werkzeug Information**  
 Aktuelles: 0 WZW Aktiv (M06)  
 Durchmesser #: 0  
 Verrechnete Länge: 0  
 Kantentasten  
 Wiederhole Position Zurück auf Position

**Spindel**  
 0 SRO%  
 150% +/-  
 100% +/-  
 50% +/-  
 Spindel CW / Stop (M03) (M05)  
 Spindel CCW / Stop (M04) (M05)

G0 G17 G90 G91.1 G94 G21 G40 G49 G80 G98 G50 G67 G97 G54 G61 G69 G15 G40.1  
 History **ESS: Mach4 Enabled** Profile: **ess** Screen: **wx6german.set**

CW (clockwise) or CCW (counterclockwise) are switchable relay outputs.

0-10V Abgleich bei langen Kabel



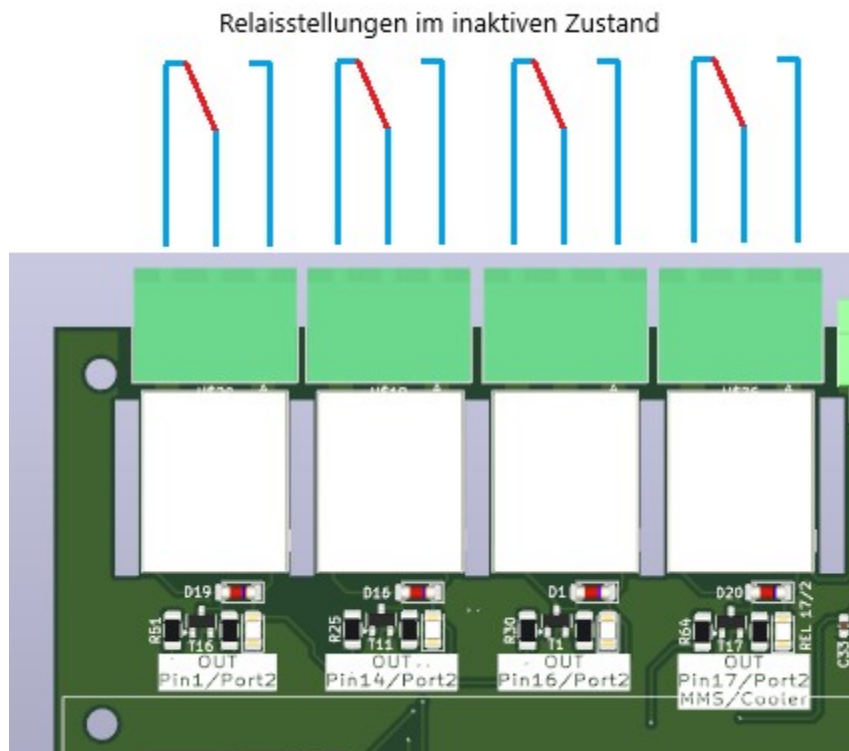
# Relay outputs

Three relay outputs up to 230V/10A are available:

PORT 2 → Pins 1, 14, 16, or 17 (for continuous or timer operation)

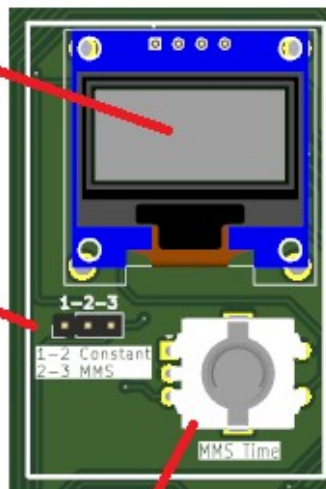
It can be connected to alternating current (AC) and direct current (DC)..

**Caution: Do not connect switched-mode power supplies, as these have a very high inrush current (up to 60A) and can damage the relay contacts..**



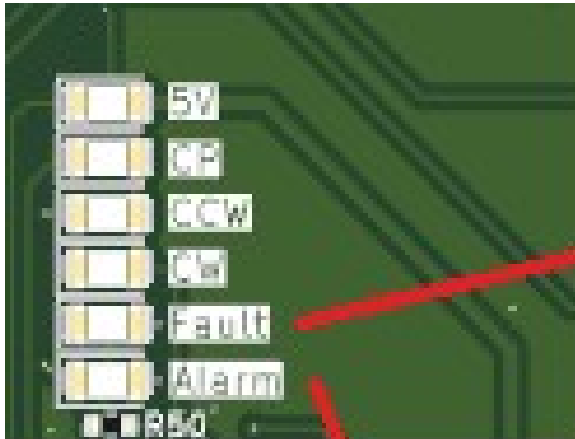
Anzeige:  
- 0-10S  
- Dauerbetrieb  
- Spindelspannung

zwischen  
Dauerbetrieb  
oder 1-10s  
Modus  
umschalten



Dreheinstellung von 1-10s  
beim drücken wird ein  
Reset für Default Werte

## Status display



bei  
Stromüberlastung  
des Boardes

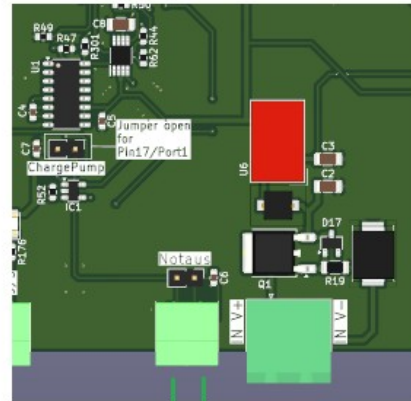
Alarm der Achsen wird auch  
am Display angezeigt

# external emergency stop

An external emergency stop switch with one normally open (NO) and one normally closed (NC) contact should be used.

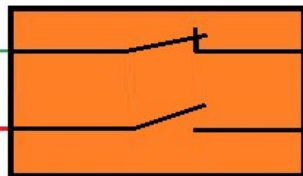
The external emergency stop switch is connected as a normally open contact to the E-Stop input, and the jumper JP5 behind it must be removed. This will only shut down the board.

To signal this in Mach4, the other connection of the emergency stop switch must be connected to an input on the board.



1x Öffner + 1x Schliesser

1x freien Eingang vom Board



GND von Board

Define the input for the input in the ESS plugin.

Ethernet SmoothStepper (ESS) Configuration v319, Mach4 build 4.2.0.6105 - Instance 0

Info General Motors Spindle Laser Laser... Analog Pins Config Input Signals Output Signals Homing Probing Backlash HC

- Set the pins Active High (Red Arrow Up) or Active Low (Green Arrow Down).
- Give the Pins you are using an Alias: {P#-#} DESCRIPTION (This is the {Port#-Pin#} for the pin and a description of it). This makes it MUCH EASIER to identify which pins do what in the Input and Output signal tabs.
- Assign Noise Filtering, in us, for each input pin, if needed (see the 'Info' tab for more details).
- A Feed Hold or Stop (Stop, EStop, Disabled or Limit) event can set the Output state to 'Force ON', 'Force OFF', or 'No Change'. 'No Change' means that the output is controlled by Mach4. With 'Force ON' and 'Force OFF' the ESS will force that desired state.
- Pins are always enabled, only Signals can be enabled or disabled. Connect pins as needed on the Input and Output signal tabs.

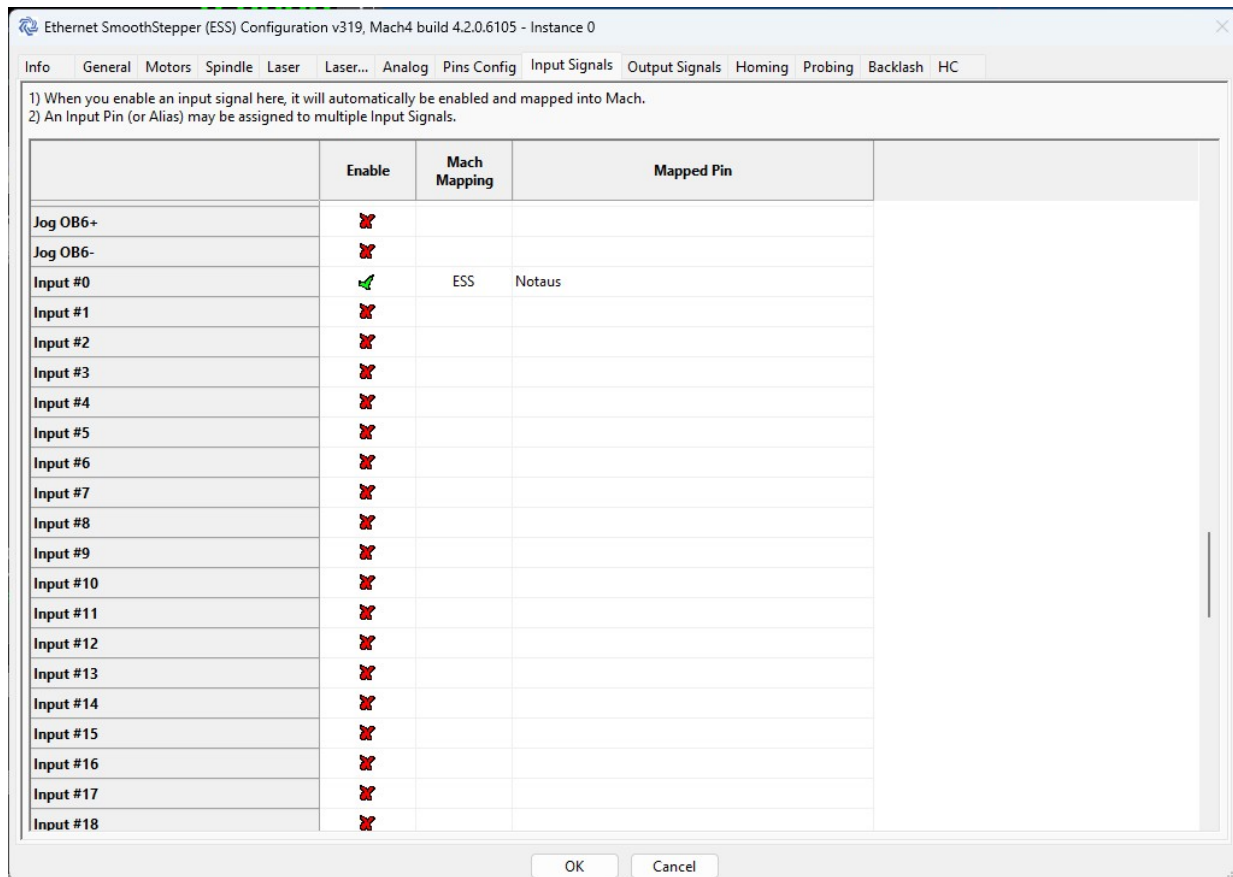
Port 2 Pins 2-9 Direction Port 3 Pins 2-9 Direction

Inputs  Outputs  Inputs  Outputs

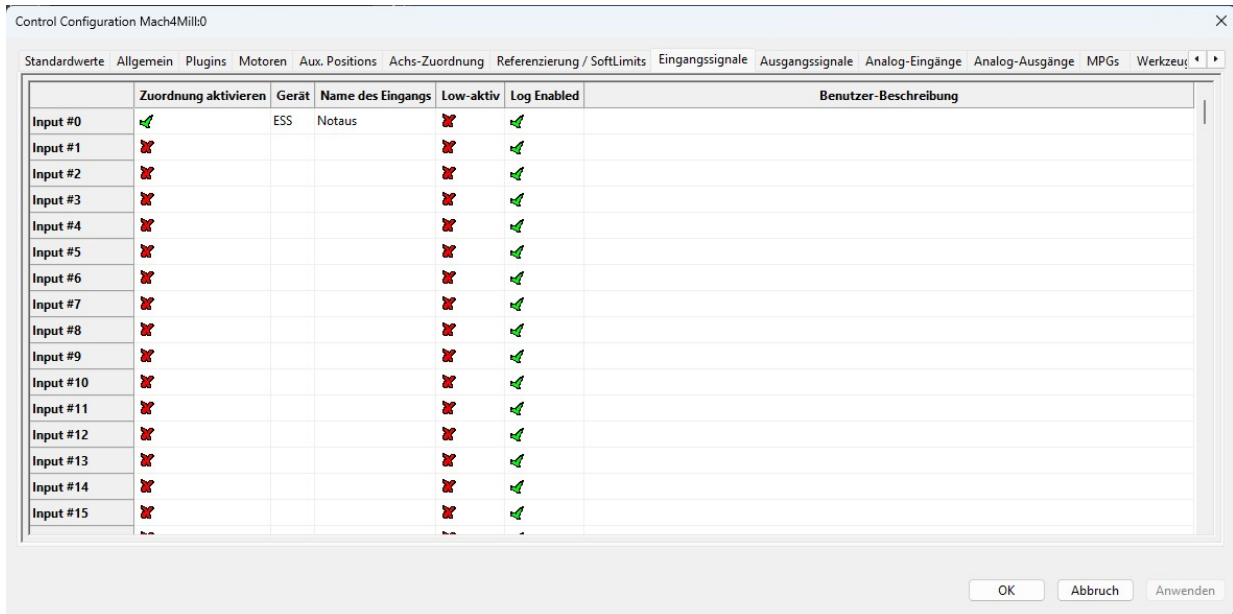
|             | DIR | Active High/Low | Alias or Name | Noise Filtering | Stop State | Feed Hold State |
|-------------|-----|-----------------|---------------|-----------------|------------|-----------------|
| Port1-Pin1  | Out | ↑               | spindelPWM    | -----           | No Change  | No Change       |
| Port1-Pin2  | Out | ↑               | x-step        | -----           | No Change  | No Change       |
| Port1-Pin3  | Out | ↑               | x-dir         | -----           | No Change  | No Change       |
| Port1-Pin4  | Out | ↑               | y-step        | -----           | No Change  | No Change       |
| Port1-Pin5  | Out | ↑               | y-dir         | -----           | No Change  | No Change       |
| Port1-Pin6  | Out | ↑               | z-step        | -----           | No Change  | No Change       |
| Port1-Pin7  | Out | ↑               | z-dir         | -----           | No Change  | No Change       |
| Port1-Pin8  | Out | ↑               | a-step        | -----           | No Change  | No Change       |
| Port1-Pin9  | Out | ↑               | a-dir         | -----           | No Change  | No Change       |
| Port1-Pin10 | In  | ↑               | Notaus        | 0.00            | -----      | -----           |
| Port1-Pin11 | In  | ↑               | {P1-11}       | 0.00            | -----      | -----           |
| Port1-Pin12 | In  | ↑               | {P1-12}       | 0.00            | -----      | -----           |
| Port1-Pin13 | In  | ↑               | {P1-13}       | 0.00            | -----      | -----           |
| Port1-Pin14 | Out | ↑               | CW-Rel        | -----           | No Change  | No Change       |
| Port1-Pin15 | In  | ↑               | {P1-15}       | 0.00            | -----      | -----           |
| Port1-Pin16 | Out | ↑               | CCW-Rel       | -----           | No Change  | No Change       |
| Port1-Pin17 | Out | ↑               | ChargePump    | -----           | No Change  | No Change       |

OK Cancel

## Define Input0 as emergency stop

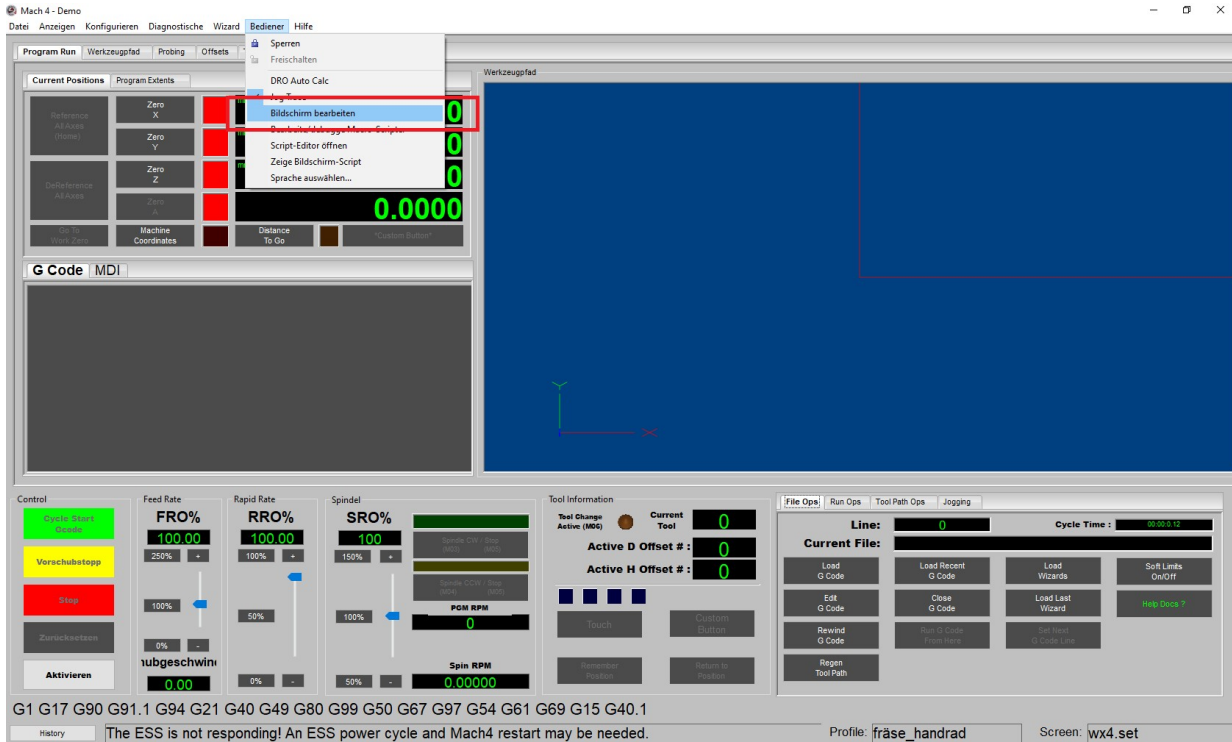


Define input 0 in the Config plugin as well.

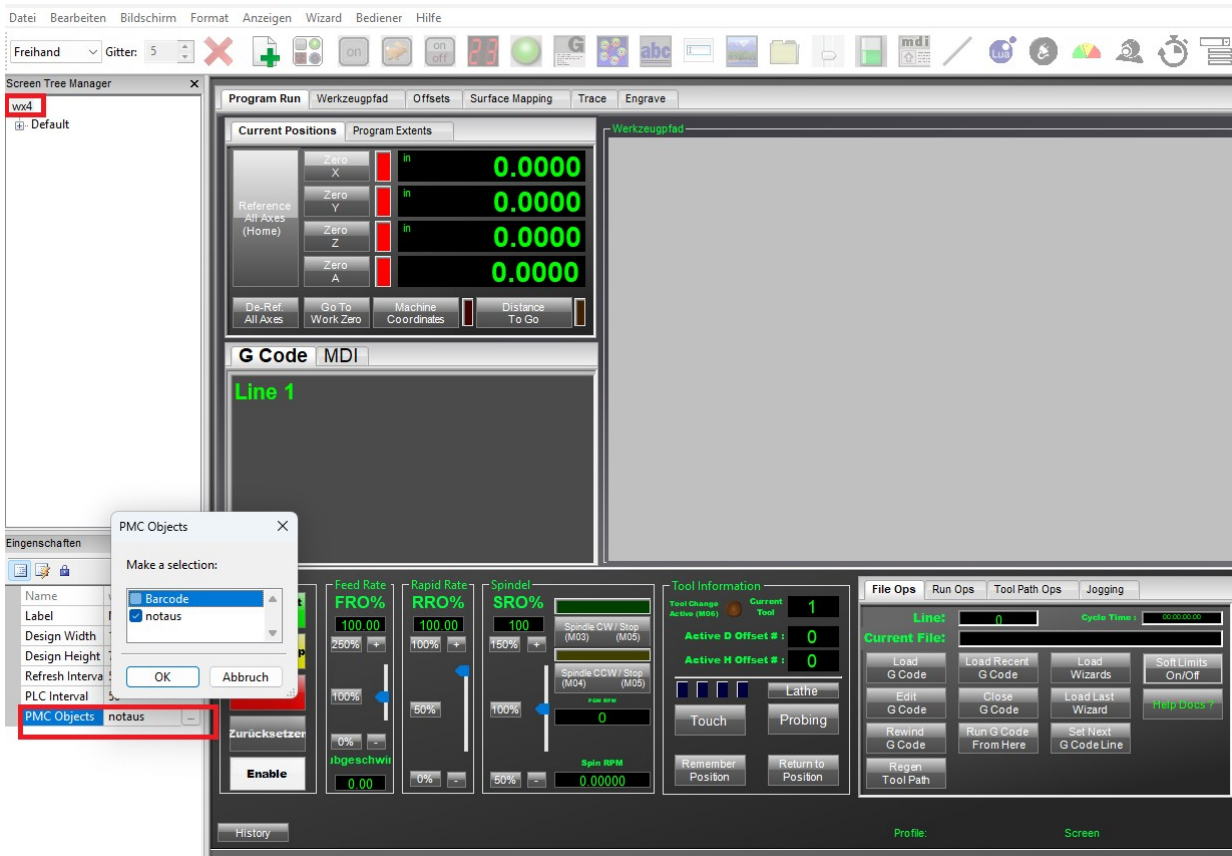


Copy the notaus.lua and notaus.pmc files into the Mach4Hobby folder\PMC.

In Mach4, go to Edit Screen.



## PMC aktivieren

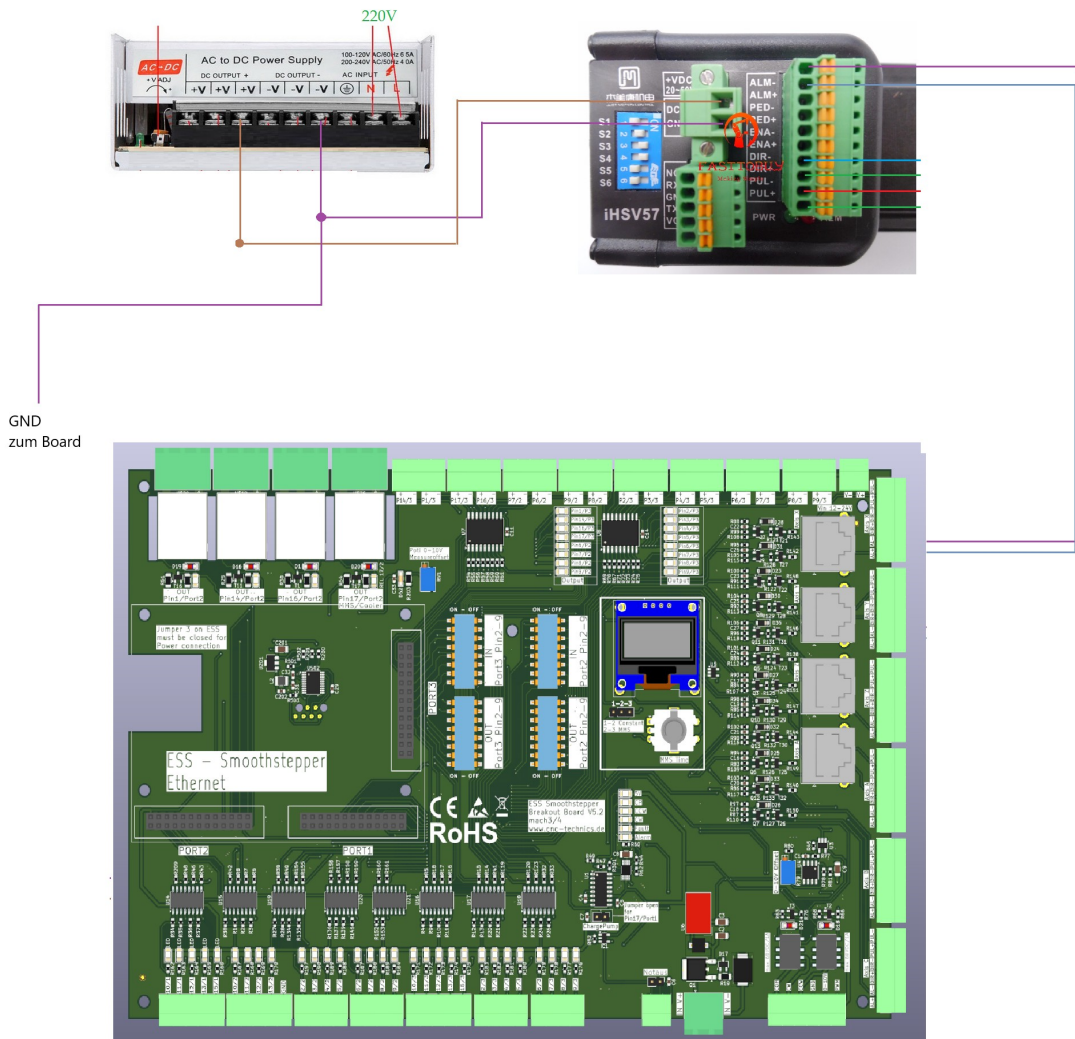


Finally, switch back to editing on screen to return to normal Mach4 mode.

# Alarm input from e.g. servo/stepper

Can also be triggered by bridging AL+ and AL-.

In Mach4, it can also be signaled via Port 2 Pin 15.



Control Configuration Mach4Mill:0

Standardwerte Allgemein Plugins Motoren Aux. Positions Achs-Zuordnung Referenzierung / SoftLimits Eingangssignale Ausgangssignale Analog-Eingänge A

|                | Zuordnung aktivieren | Gerät | Name des Eingangs | Low-aktiv | Benutzer-Beschreibung |
|----------------|----------------------|-------|-------------------|-----------|-----------------------|
| Motor 30 --    |                      |       |                   |           |                       |
| Motor 31 --    |                      |       |                   |           |                       |
| Probe          |                      |       |                   |           |                       |
| Index          |                      |       |                   |           |                       |
| Limit Override |                      |       |                   |           |                       |
| E-Stop         |                      | ESS   | {P1-15}           |           |                       |
| THC On         |                      |       |                   |           |                       |
| THC Up         |                      |       |                   |           |                       |
| THC Down       |                      |       |                   |           |                       |
| Timing         |                      |       |                   |           |                       |
| Jog X+         |                      |       |                   |           |                       |
| Jog X-         |                      |       |                   |           |                       |
| Jog Y+         |                      |       |                   |           |                       |
| Jog Y-         |                      |       |                   |           |                       |
| Jog Z+         |                      |       |                   |           |                       |

OK Abbruch Anwenden

w9 Ethernet SmoothStepper (ESS) Configuration - v260

Info General Motors Spindle Laser Pins Config **Input Signals** Output Signals Homing Probing Backlash HC

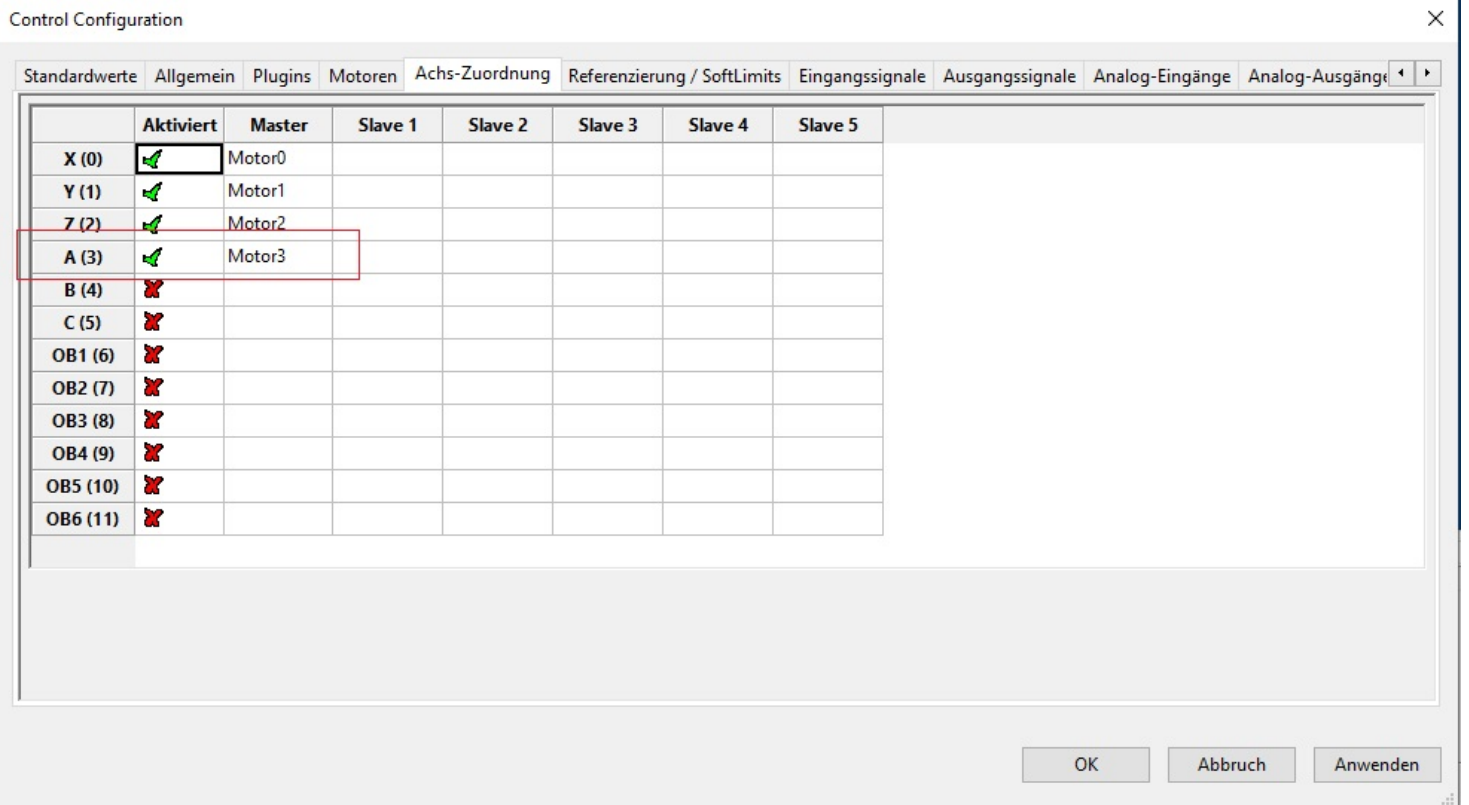
1) When you enable an input signal here, it will automatically be enabled and mapped into Mach.  
 2) An Input Pin (or Alias) may be assigned to multiple Input Signals.

|                  | Enable                              | Mach Mapping | Mapped Pin |
|------------------|-------------------------------------|--------------|------------|
| E-Stop           | <input checked="" type="checkbox"/> | ESS          | {P1-15}    |
| Motor 0 Home     | <input checked="" type="checkbox"/> |              |            |
| Motor 1 Home     | <input checked="" type="checkbox"/> |              |            |
| Motor 2 Home     | <input checked="" type="checkbox"/> |              |            |
| Motor 3 Home     | <input checked="" type="checkbox"/> |              |            |
| Motor 4 Home     | <input checked="" type="checkbox"/> |              |            |
| Motor 5 Home     | <input checked="" type="checkbox"/> |              |            |
| Motor 0 ++ Limit | <input checked="" type="checkbox"/> |              |            |
| Motor 1 ++ Limit | <input checked="" type="checkbox"/> |              |            |
| Motor 2 ++ Limit | <input checked="" type="checkbox"/> |              |            |
| Motor 3 ++ Limit | <input checked="" type="checkbox"/> |              |            |
| Motor 4 ++ Limit | <input checked="" type="checkbox"/> |              |            |
| Motor 5 ++ Limit | <input checked="" type="checkbox"/> |              |            |
| Motor 0 -- Limit | <input checked="" type="checkbox"/> |              |            |
| Motor 1 -- Limit | <input checked="" type="checkbox"/> |              |            |
| Motor 2 -- Limit | <input checked="" type="checkbox"/> |              |            |
| Motor 3 -- Limit | <input checked="" type="checkbox"/> |              |            |
| Motor 4 -- Limit | <input checked="" type="checkbox"/> |              |            |
| Motor 5 -- Limit | <input checked="" type="checkbox"/> |              |            |
| Motor 0 Index    | <input checked="" type="checkbox"/> | ESS-only     |            |
| Motor 1 Index    | <input checked="" type="checkbox"/> | ESS-only     |            |

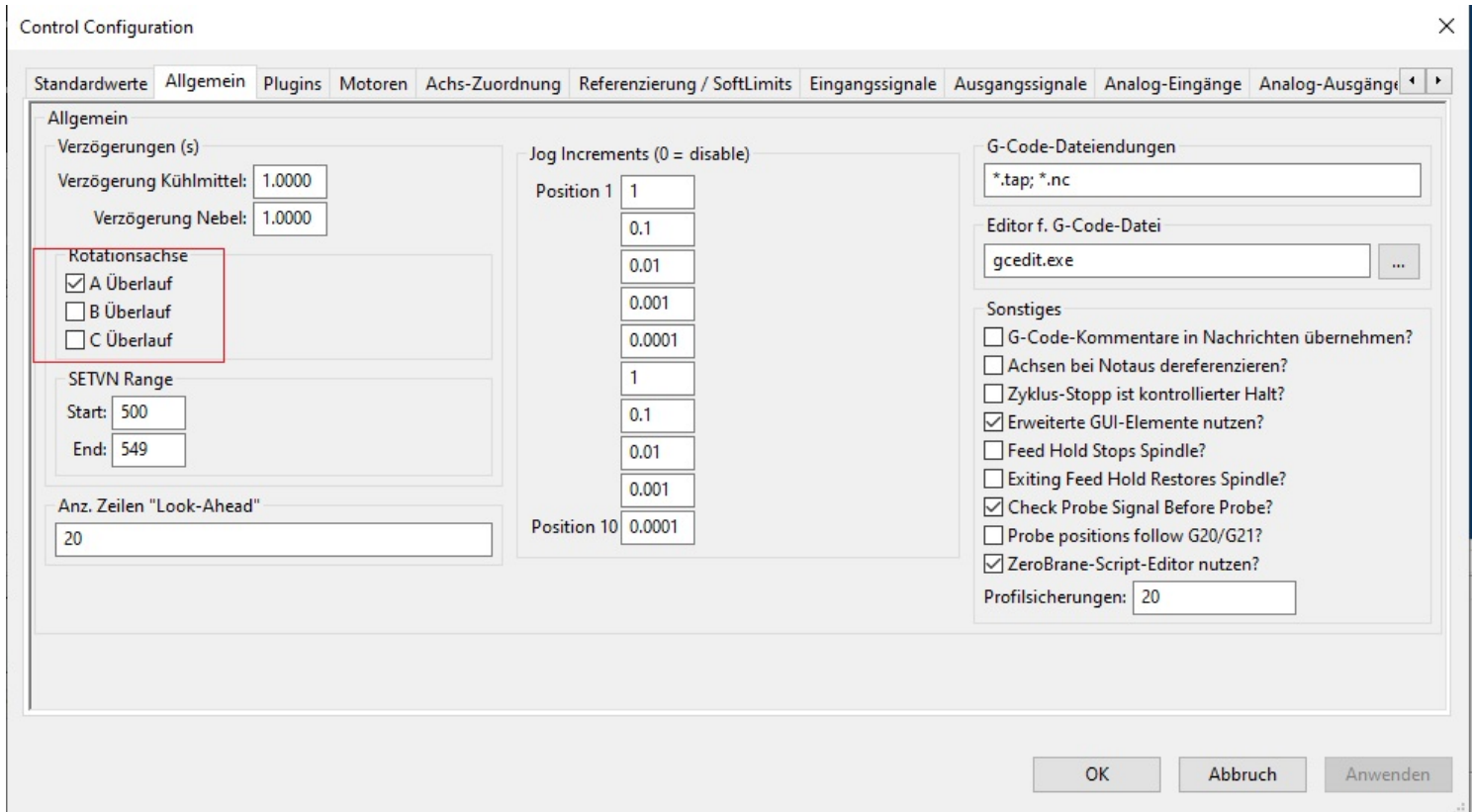
OK Cancel

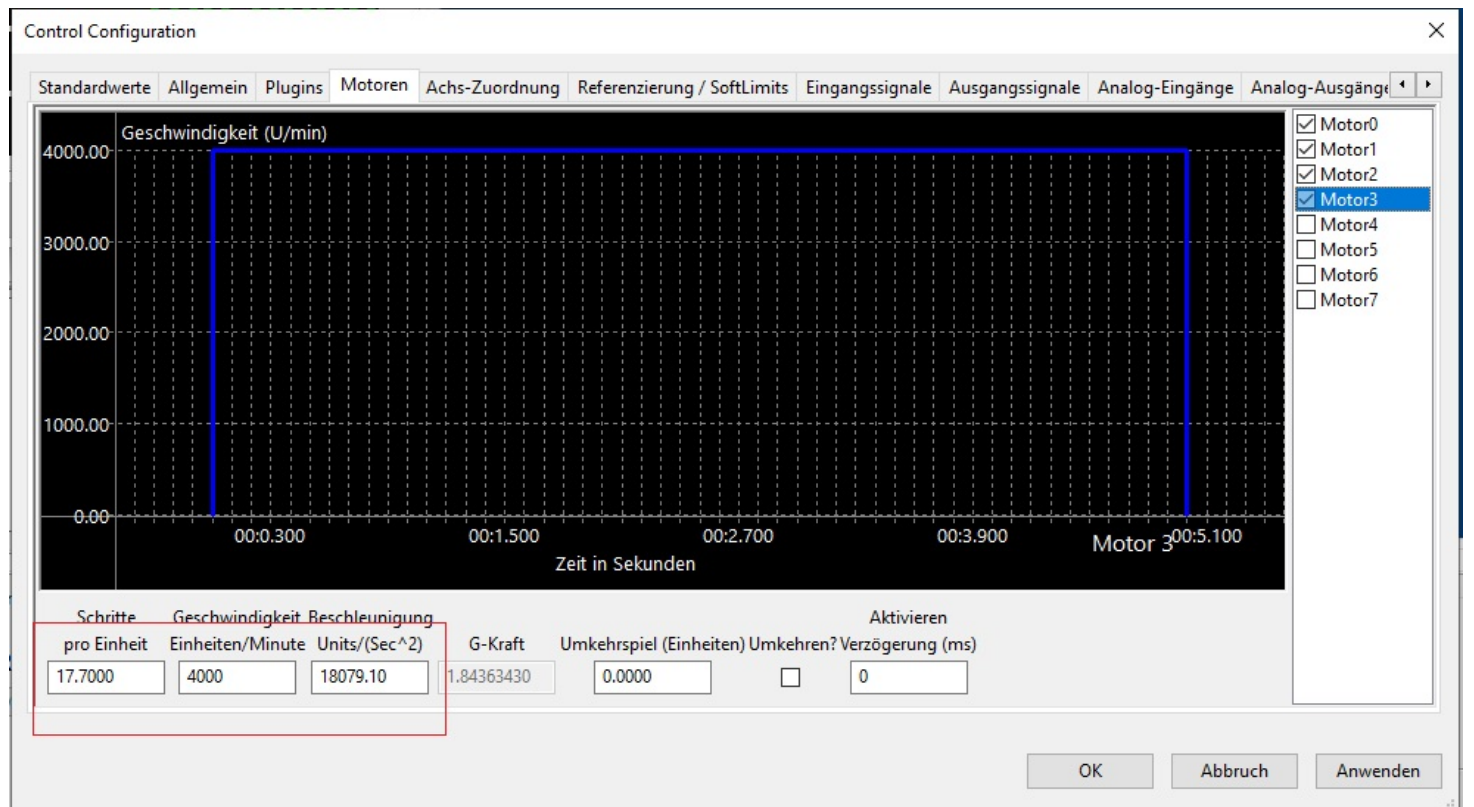
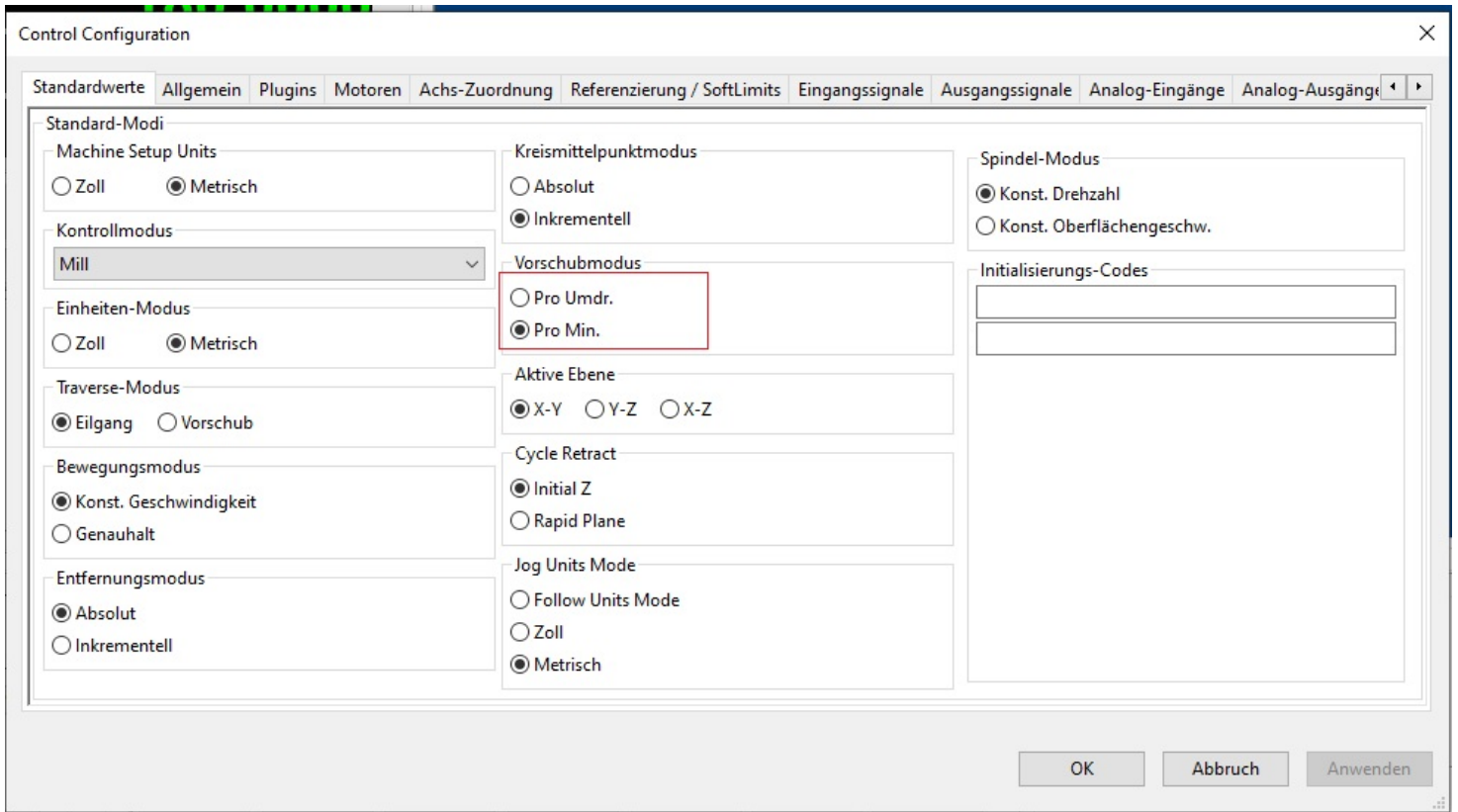
# Adjusting the rotary axis

First, a motor must be assigned as the axis of rotation.



The axis of rotation must be defined. Here it is motor A.





For example, if a motor has a resolution of 6400 per revolution, the setting must be  $6400/360 = 17.7$  in per unit.

Units per minute is the rotational speed.

The screenshot displays a CNC control interface with the following components:

- Top Menu:** Datei, Anzeigen, Konfigurieren, Diagnostische, Wizard, Bediener, Hilfe
- Navigation:** Programmablauf, Werkzeugwege, Maschinenkoordinaten, Tastermenu, Nullpunkte, Trace
- Aktuelle Position (Current Position):**

| Referenz Alle Achsen | Null | mm       | Value    |
|----------------------|------|----------|----------|
| X                    | mm   | 0.0000   | 0.0000   |
| Y                    | mm   | 0.0000   | 0.0000   |
| Z                    | mm   | 0.0000   | 0.0000   |
| A                    |      | 180.0000 | 180.0000 |
| B                    |      | 0.0000   | 0.0000   |
| C                    |      | 0.0000   | 0.0000   |
- G Code MDI:** A180
- Control Panel:** Cycle Start, Vorschubstopp, Stop, Pause, Trennen, FRO% (0.00), RRO% (100%), Jog Rate% (50.0)
- Buttons:** Z+, Y+, A+, B+, C+, X-, X+, Z-, Y-, A-, B-, C-, Incremental Jog Step, Button Jog Mode, Continuous, Keyboard Inputs Enable
- Werkzeug Information:** Aktuelles Tool: 0, WZW Aktiv (M06), Durchmesser #: 0, Verrechnete Länge: 0
- Spindel:** 0 SRO%, Spindel CW / Stop (M03 / M05), Spindel CCW / Stop (M04 / M05)
- Bottom Bar:** G0 G17 G90 G91.1 G94 G21 G40 G49 G80 G98 G50 G67 G97 G54 G64 G69 G15 G40.1, History: ESS: Mach4 Enabled, Profile: Mach4Mill\_6Axis, Screen: wx6german.set

The rotation axis can be tested using the MDI window.

For example, A180 for 180° and test with Cycle Start MDI.