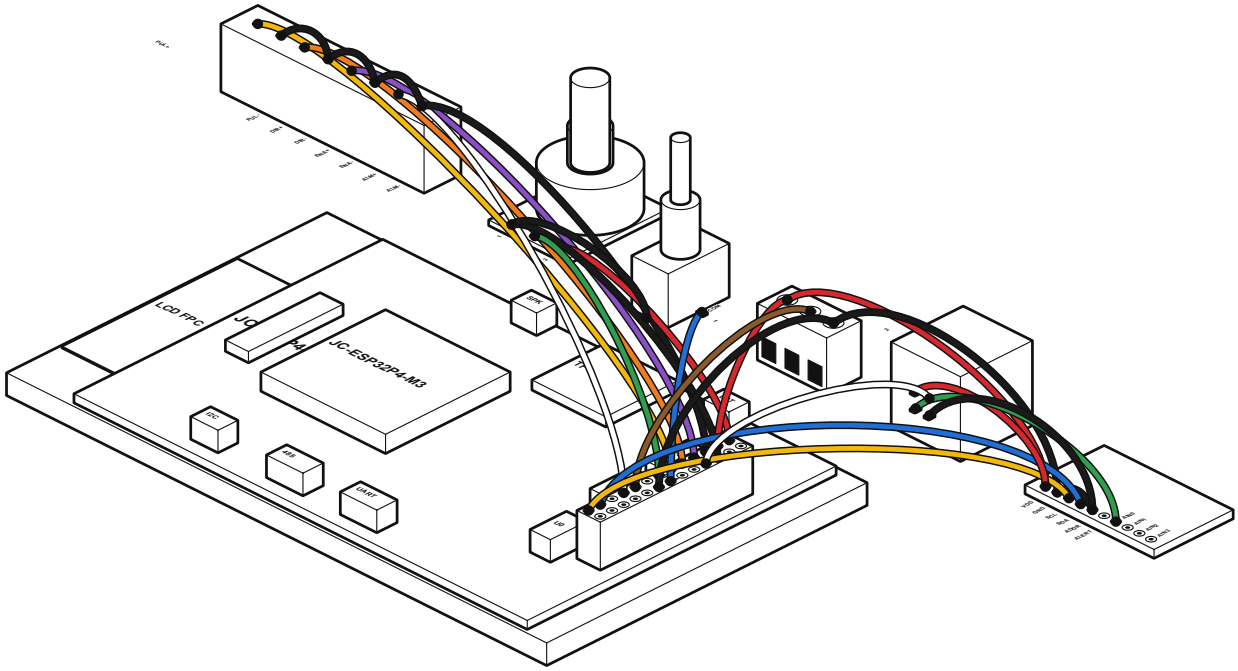
TIG ROTATOR CONTROLS



150 minutes

34 solder joints

16 screw clamps

●●● difficulty

Low-voltage control wiring for the ESP32-P4 TIG welding rotator

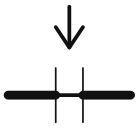
Layout not verified for DM542T signal terminal, ESP32-P4 touch board (JP1). Measure the real part before printing the case.



Soldering iron



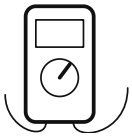
Solder



Wire stripper



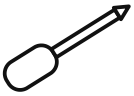
Side cutters



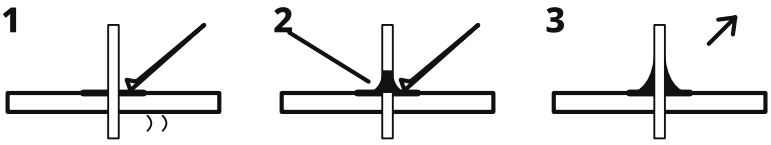
Multimeter



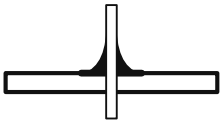
USB cable



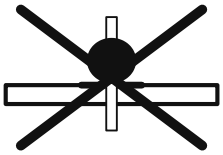
Small screwdriver



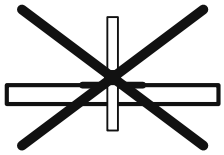
Heat the pad and the pin together for two seconds. Feed solder into the joint, not onto the iron. Take the solder away first, then the iron.



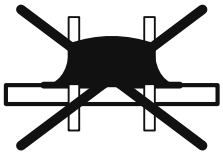
A shiny cone that wets both pad and pin



A ball sitting on the pin



Too little solder



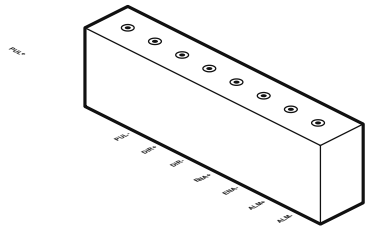
Solder joining two pins



Strip 3 mm, twist the strands, and tin the end before you solder it to a pad. Do not tin a wire that goes under a screw: a tinned end settles under the screw and works loose.



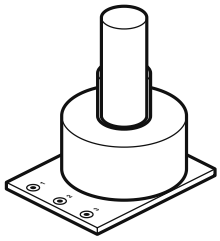
Unplug USB before you solder or change a wire. Work on a surface that does not burn, and wash your hands after handling solder.



1X DM542T stepper driver, signal terminal block (PUL/DIR/ENA/ALM)

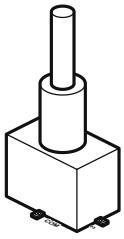
drv

Layout not verified. Measure yours before printing the case: Only the signal terminal is modelled, from no drawing.



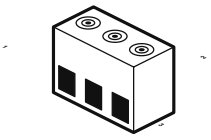
1X 16 mm panel potentiometer with solder lugs (Alpha RV16AF-10 type, 6 mm shaft) **10k linear**

pot



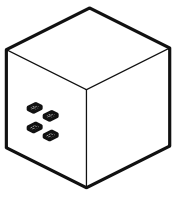
1X MTS-102 miniature toggle switch (SPDT, ON-ON, 6 mm bushing, solder lugs)

dirsw



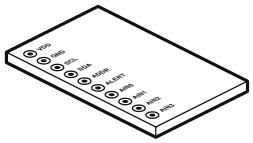
1X Screw terminal block, 3-way, 5 mm pitch (KF301-3P, sold as 5.0 or 5.08 mm)

estop



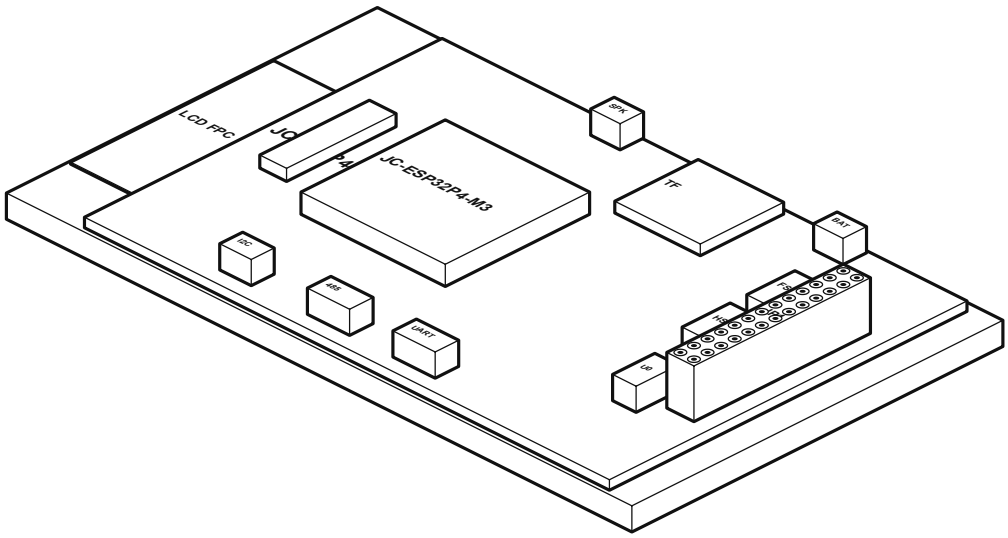
1X GX12 4-pin panel socket (aviation connector), solder cups

pedal



1x ADS1115 16-Bit ADC - 4 Channel with Programmable Gain Amplifier

ads



1x GUITION JC4880P443C ESP32-P4 4.3" display board (JC-ESP32P4-M3 core, JP1 2x13 header)

mcu

Layout not verified. Measure yours before printing the case: Outline is the maker's published figure, but no mechanical drawing exists for the parts on the back: JP1, USB-C and connector positions are scaled from a product photo, which is not a valid source for a case or bracket.

2x yellow wire, 120 mm

1x orange wire, 120 mm

1x purple wire, 120 mm

2x white wire, 120 mm

10x black wire, 120 mm

4x red wire, 120 mm

2x green wire, 120 mm

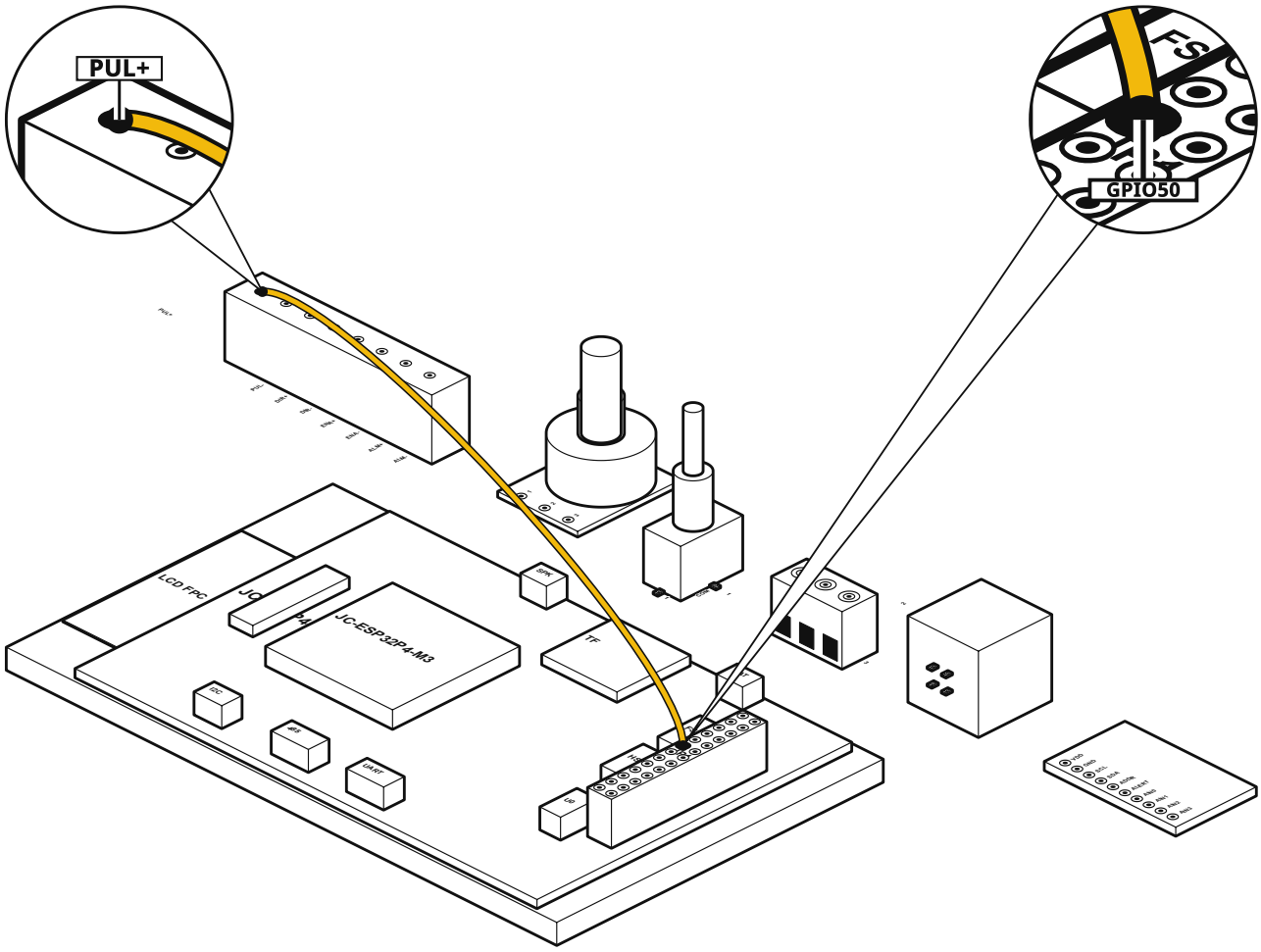
2x blue wire, 120 mm

1x brown wire, 120 mm

1

DM542T signal terminal **PUL+**

ESP32-P4 touch board (JP1) **GPIO50**



Solder and clamp a **yellow** wire → ESP32-P4 touch board (JP1) **GPIO50**

→ DM542T signal terminal **PUL+**

Step pulses to the driver

The end at the DM542T signal terminal PUL+ goes under a screw, not into solder: strip 5 mm, twist the strands tight or crimp on a ferrule, push the end fully in, tighten the screw and tug the wire to check it holds. Do not tin it.

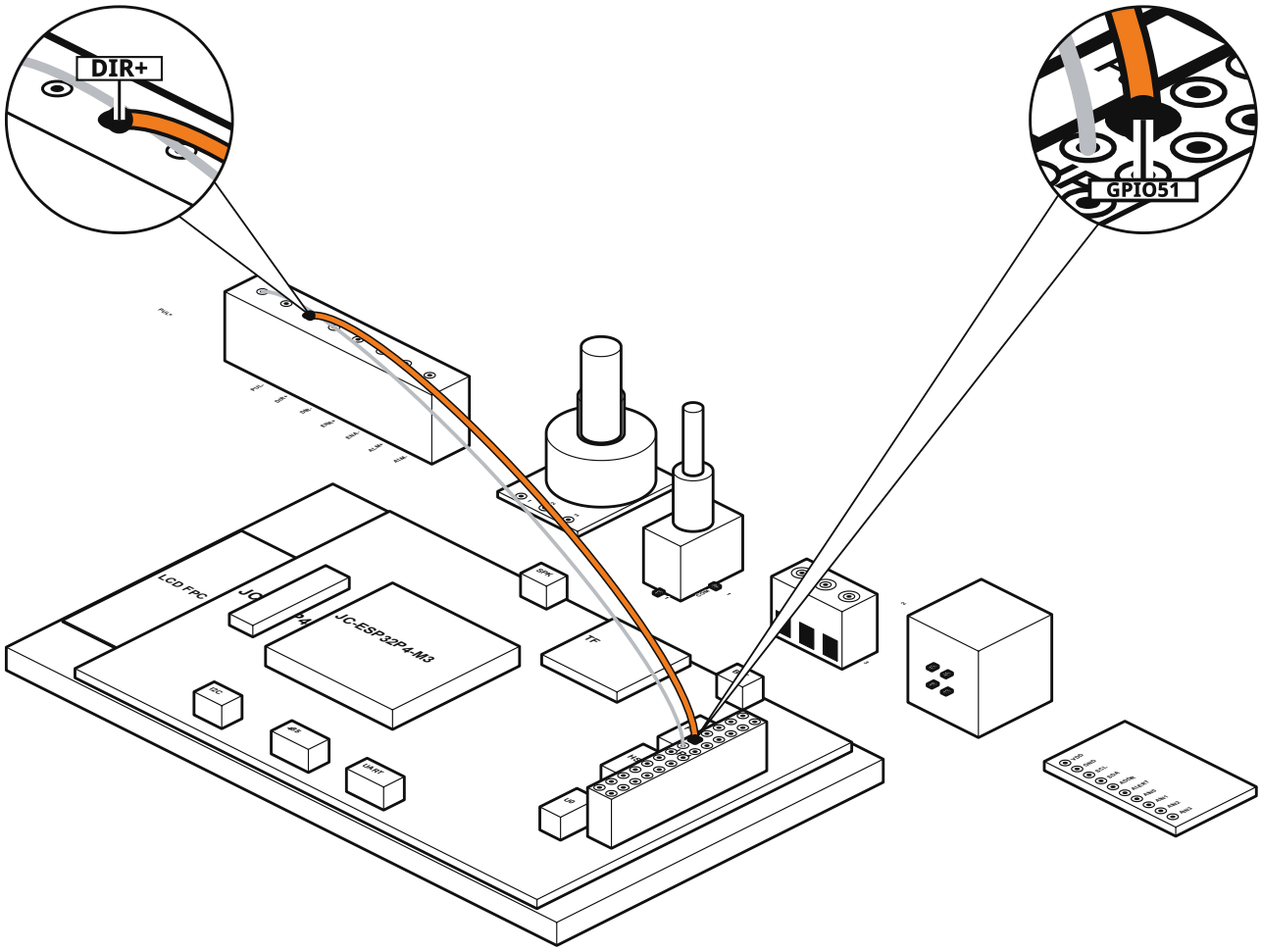
Layout of the ESP32-P4 touch board (JP1) not verified. Measure yours before printing the case.

Layout of the DM542T signal terminal not verified. Measure yours before printing the case.

2

DM542T signal terminal **DIR+**

ESP32-P4 touch board (JP1) **GPIO51**



Solder and clamp a **orange** wire → ESP32-P4 touch board (JP1) **GPIO51**

→ DM542T signal terminal **DIR+**

Rotation direction

The end at the DM542T signal terminal DIR+ goes under a screw, not into solder: strip 5 mm, twist the strands tight or crimp on a ferrule, push the end fully in, tighten the screw and tug the wire to check it holds. Do not tin it.

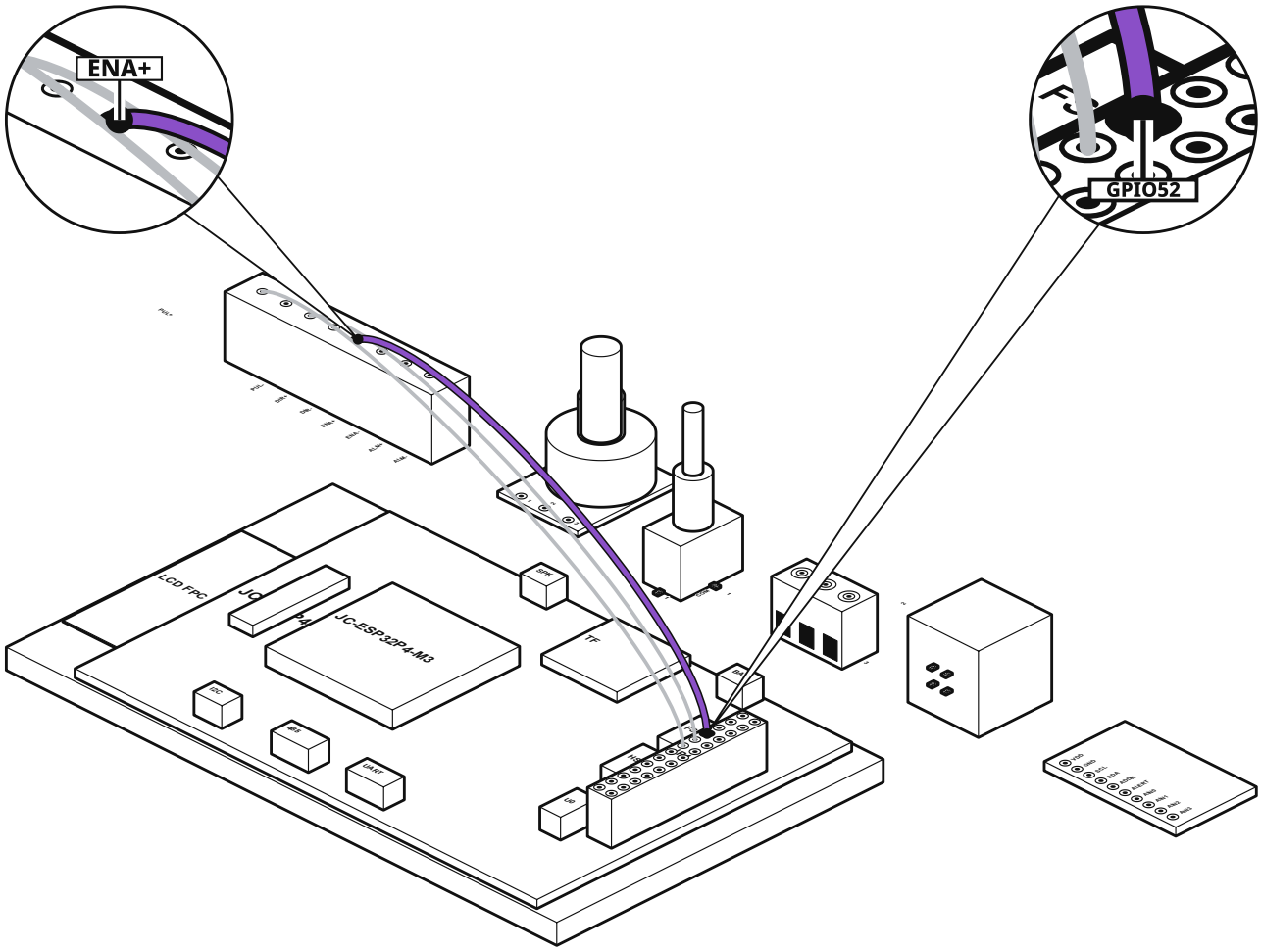
Layout of the ESP32-P4 touch board (JP1) not verified. Measure yours before printing the case.

Layout of the DM542T signal terminal not verified. Measure yours before printing the case.

3

DM542T signal terminal **ENA+**

ESP32-P4 touch board (JP1) **GPIO52**



Solder and clamp a **purple** wire → ESP32-P4 touch board (JP1) **GPIO52**

→ DM542T signal terminal **ENA+**

Enable; HIGH inhibits motion

The end at the DM542T signal terminal ENA+ goes under a screw, not into solder: strip 5 mm, twist the strands tight or crimp on a ferrule, push the end fully in, tighten the screw and tug the wire to check it holds. Do not tin it.

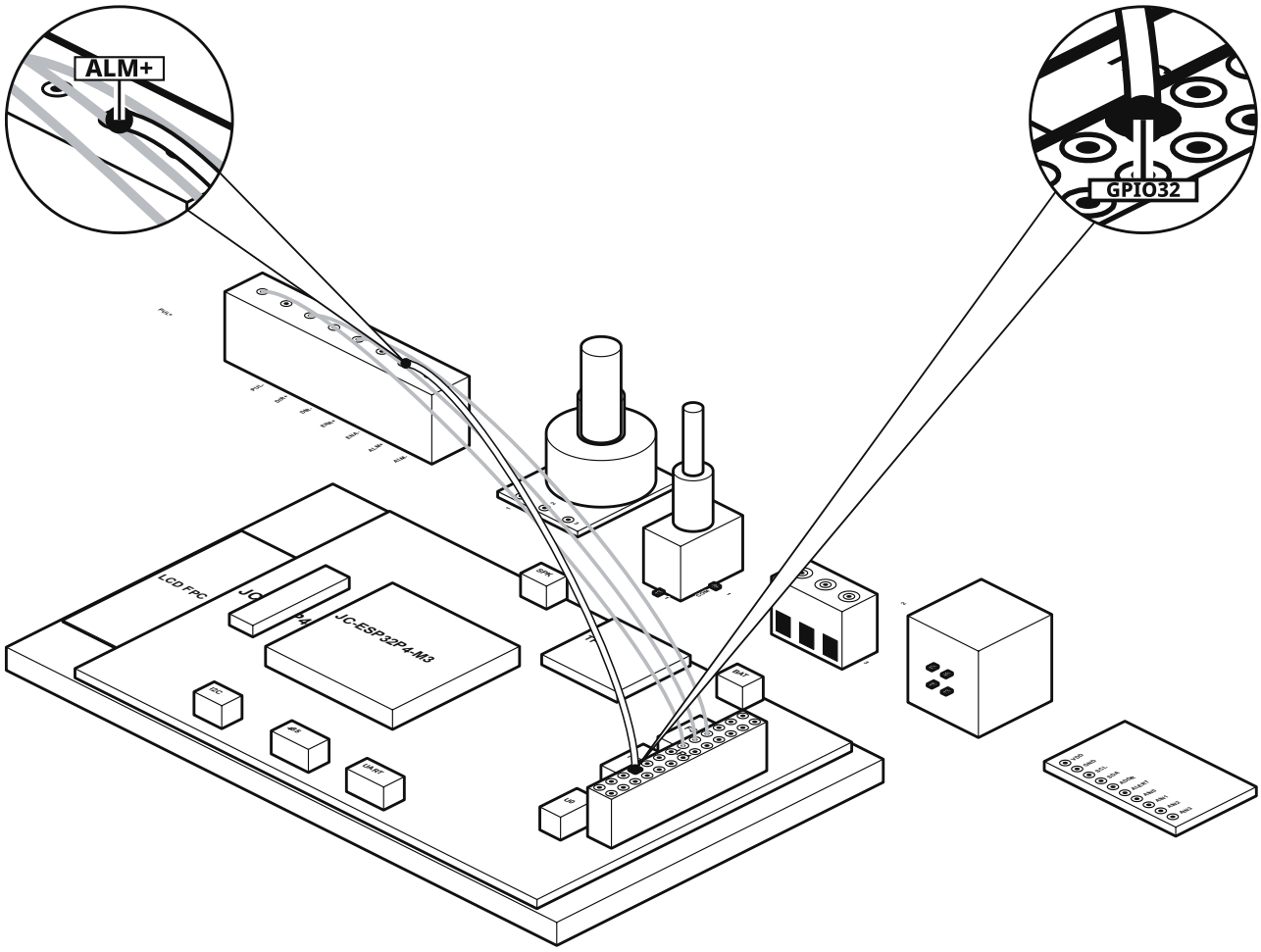
Layout of the ESP32-P4 touch board (JP1) not verified. Measure yours before printing the case.

Layout of the DM542T signal terminal not verified. Measure yours before printing the case.

4

DM542T signal terminal **ALM+**

ESP32-P4 touch board (JP1) **GPIO32**



Solder and clamp a **white** wire → ESP32-P4 touch board (JP1) **GPIO32** → DM542T signal terminal **ALM+**

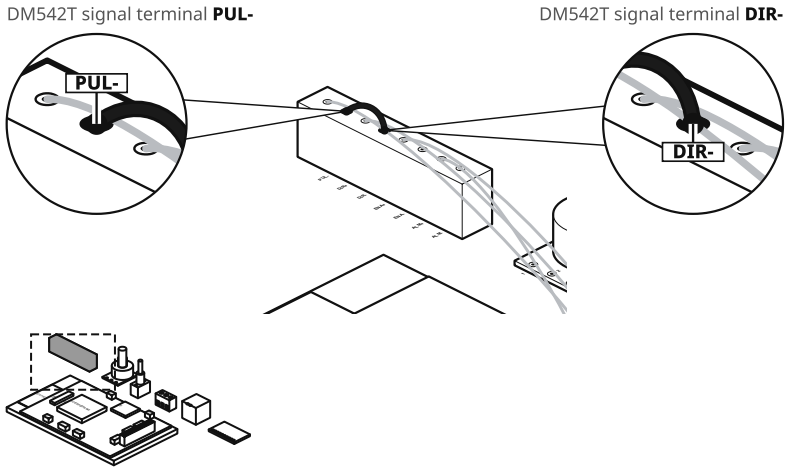
Driver alarm back to the controller

The end at the DM542T signal terminal ALM+ goes under a screw, not into solder: strip 5 mm, twist the strands tight or crimp on a ferrule, push the end fully in, tighten the screw and tug the wire to check it holds. Do not tin it.

Layout of the ESP32-P4 touch board (JP1) not verified. Measure yours before printing the case.

Layout of the DM542T signal terminal not verified. Measure yours before printing the case.

5



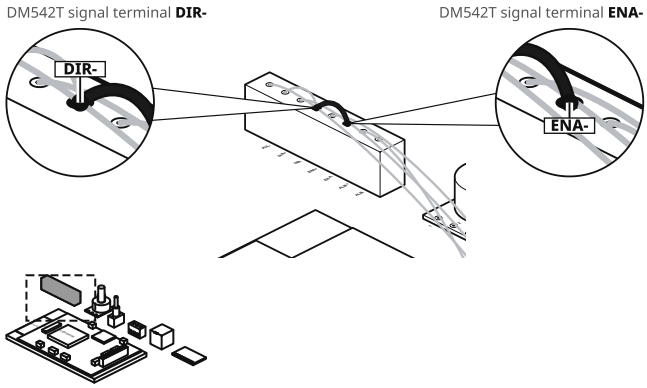
Clamp a **black** wire → DM542T signal terminal **PUL-** → DM542T signal terminal **DIR-**

Opto returns joined

Both ends go under a screw, not into solder: strip 5 mm, twist the strands tight or crimp on a ferrule, push the end fully in, tighten the screw and tug the wire to check it holds. Do not tin it.

Layout of the DM542T signal terminal not verified. Measure yours before printing the case.

6



Clamp a **black** wire → DM542T signal terminal **DIR-** → DM542T signal terminal **ENA-**

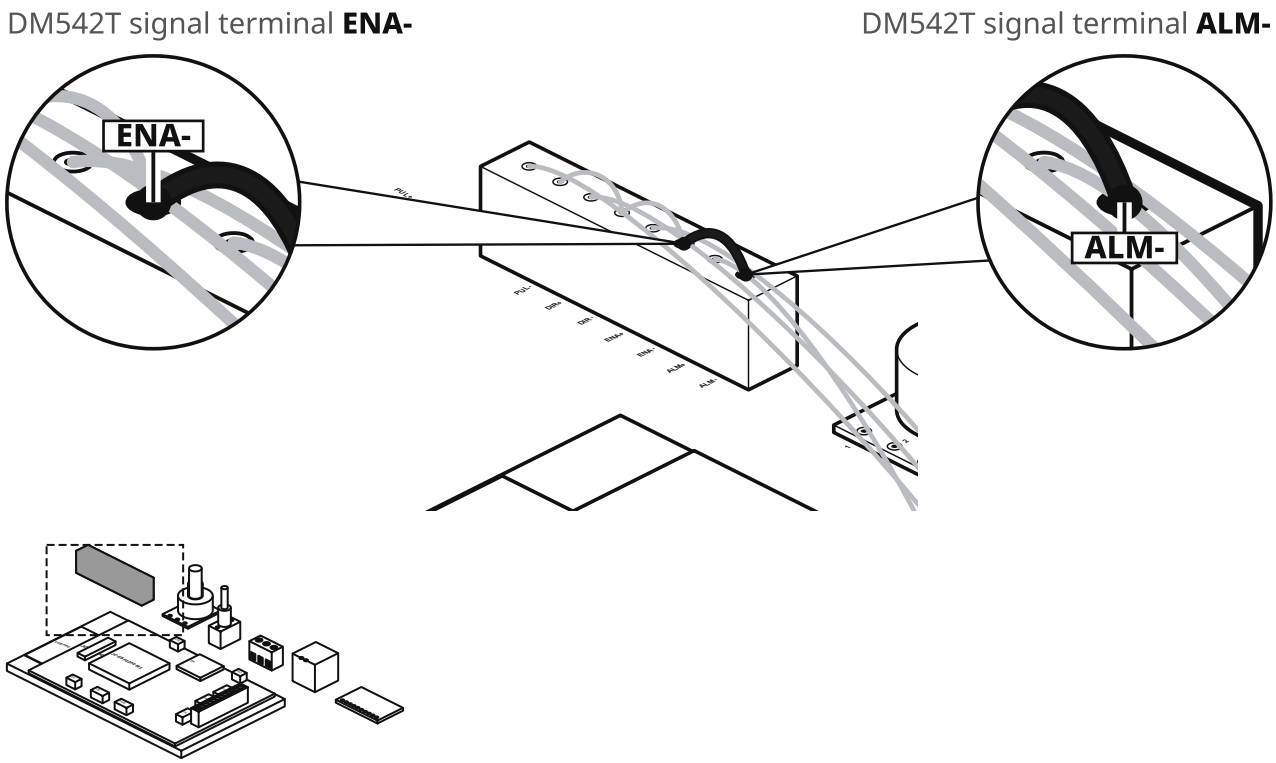
Opto returns joined

Both ends go under a screw, not into solder: strip 5 mm, twist the strands tight or crimp on a ferrule, push the end fully in, tighten the screw and tug the wire to check it holds. Do not tin it.

The DIR- clamp on the DM542T signal terminal already holds a wire. Put this one in the same clamp and tighten the screw on both; a twin ferrule holds two wires best.

Layout of the DM542T signal terminal not verified. Measure yours before printing the case.

7



Clamp a **black** wire DM542T signal terminal **ENA-** → DM542T signal terminal **ALM-**

Alarm return on the same ground

Both ends go under a screw, not into solder: strip 5 mm, twist the strands tight or crimp on a ferrule, push the end fully in, tighten the screw and tug the wire to check it holds. Do not tin it.

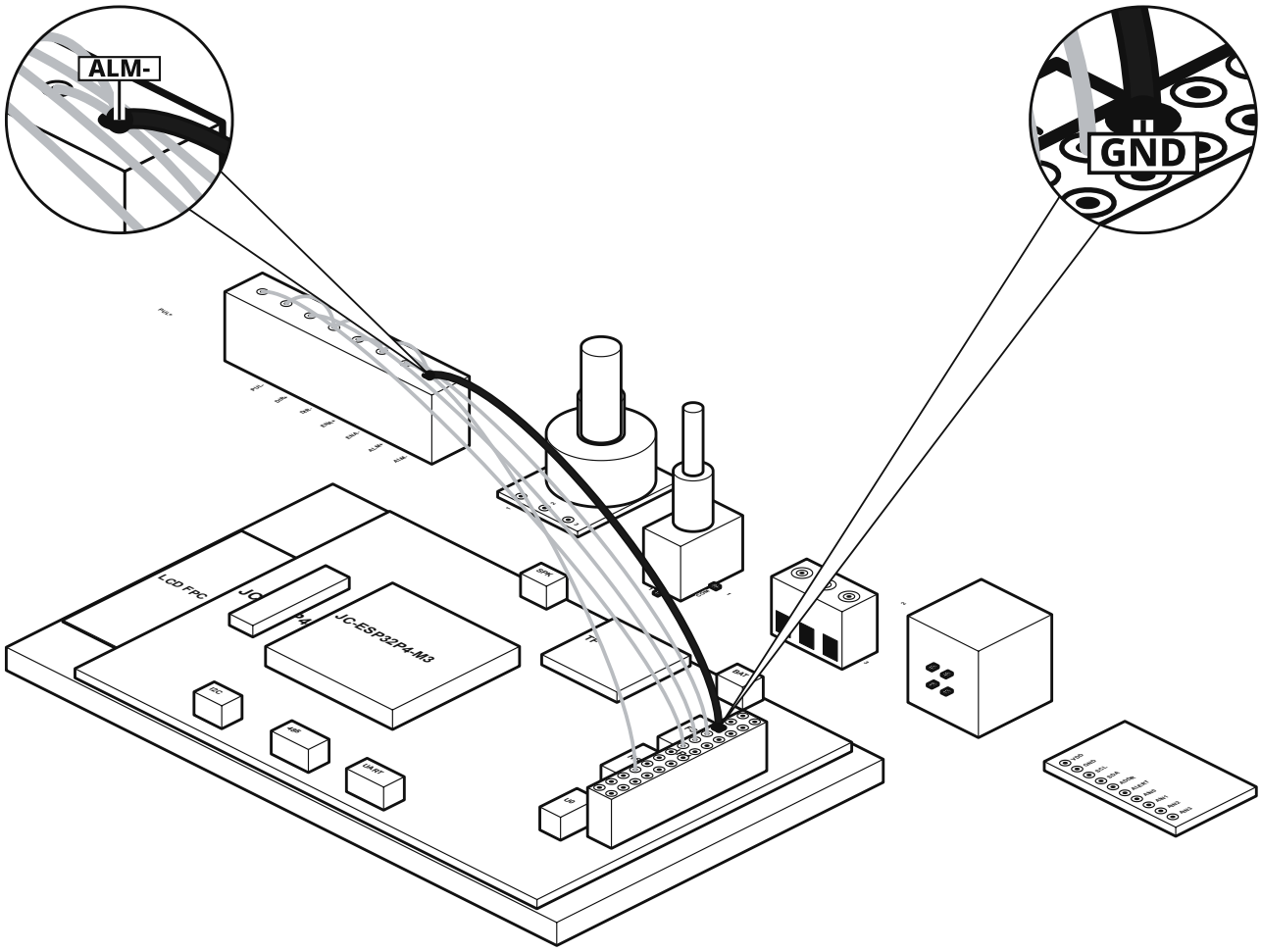
The ENA- clamp on the DM542T signal terminal already holds a wire. Put this one in the same clamp and tighten the screw on both; a twin ferrule holds two wires best.

Layout of the DM542T signal terminal not verified. Measure yours before printing the case.

8

DM542T signal terminal **ALM-**

ESP32-P4 touch board (JP1) **GND**



Solder and clamp a **black** wire DM542T signal terminal **ALM-** → ESP32-P4 touch board (JP1) **GND**

Common ground with the driver logic

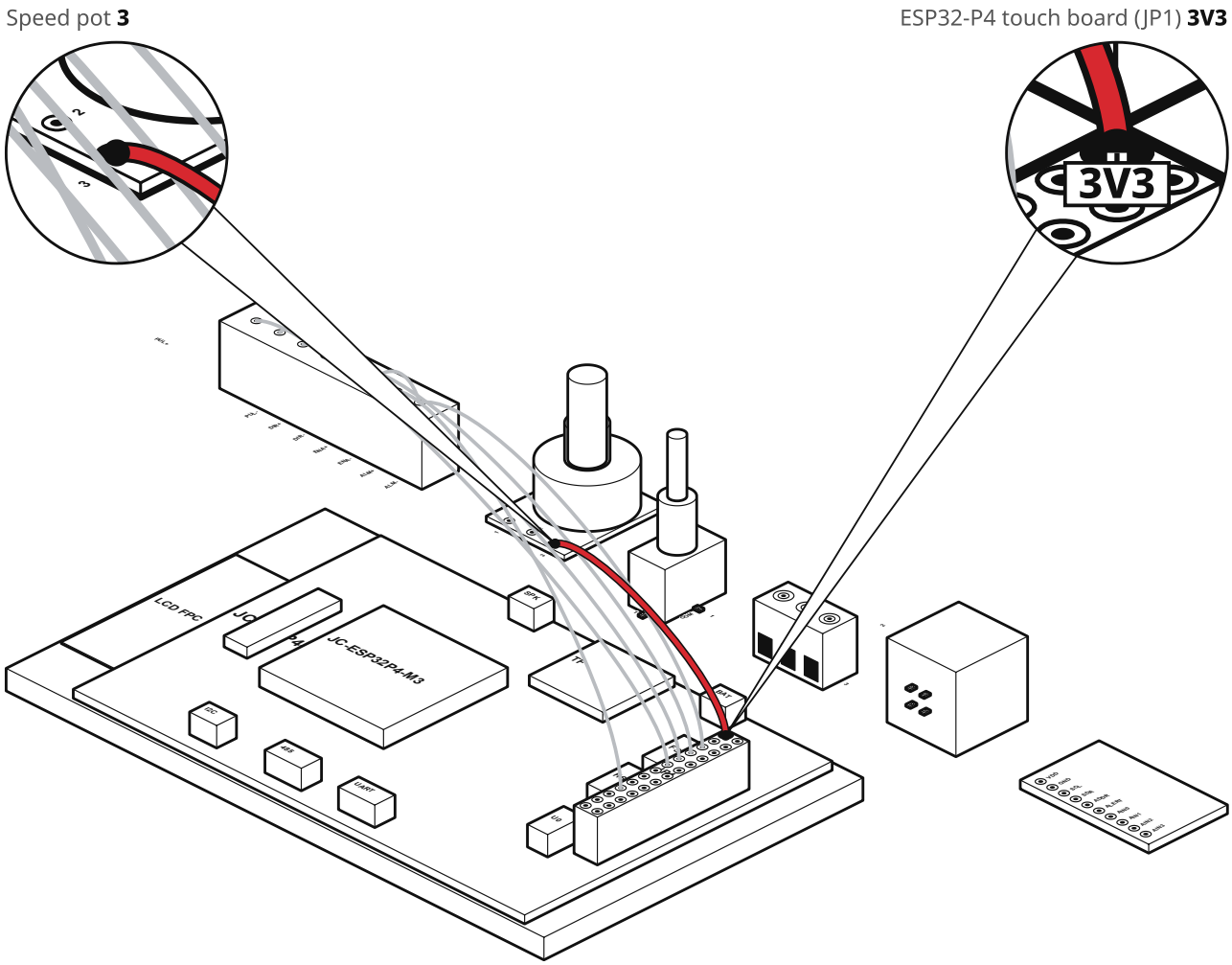
The end at the DM542T signal terminal ALM- goes under a screw, not into solder: strip 5 mm, twist the strands tight or crimp on a ferrule, push the end fully in, tighten the screw and tug the wire to check it holds. Do not tin it.

The ALM- clamp on the DM542T signal terminal already holds a wire. Put this one in the same clamp and tighten the screw on both; a twin ferrule holds two wires best.

Layout of the DM542T signal terminal not verified. Measure yours before printing the case.

Layout of the ESP32-P4 touch board (JP1) not verified. Measure yours before printing the case.

9



Solder a **red** wire | ESP32-P4 touch board (JP1) **3V3** → Speed pot **3**

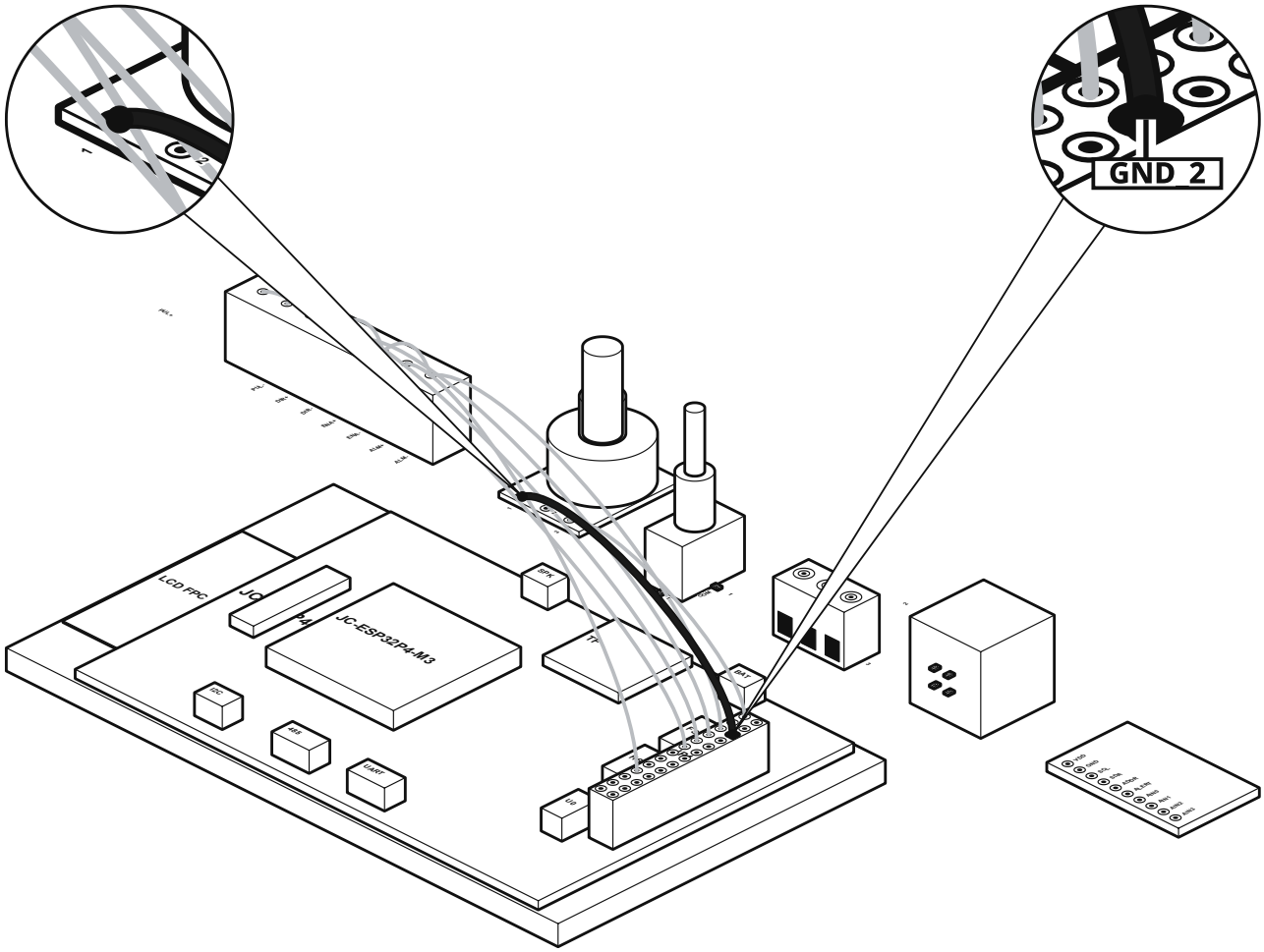
ADC reference to the pot

Layout of the ESP32-P4 touch board (JP1) not verified. Measure yours before printing the case.

10

Speed pot **1**

ESP32-P4 touch board (JP1) **GND_2**



Solder a **black** wire | Speed pot **1** → ESP32-P4 touch board (JP1) **GND_2**

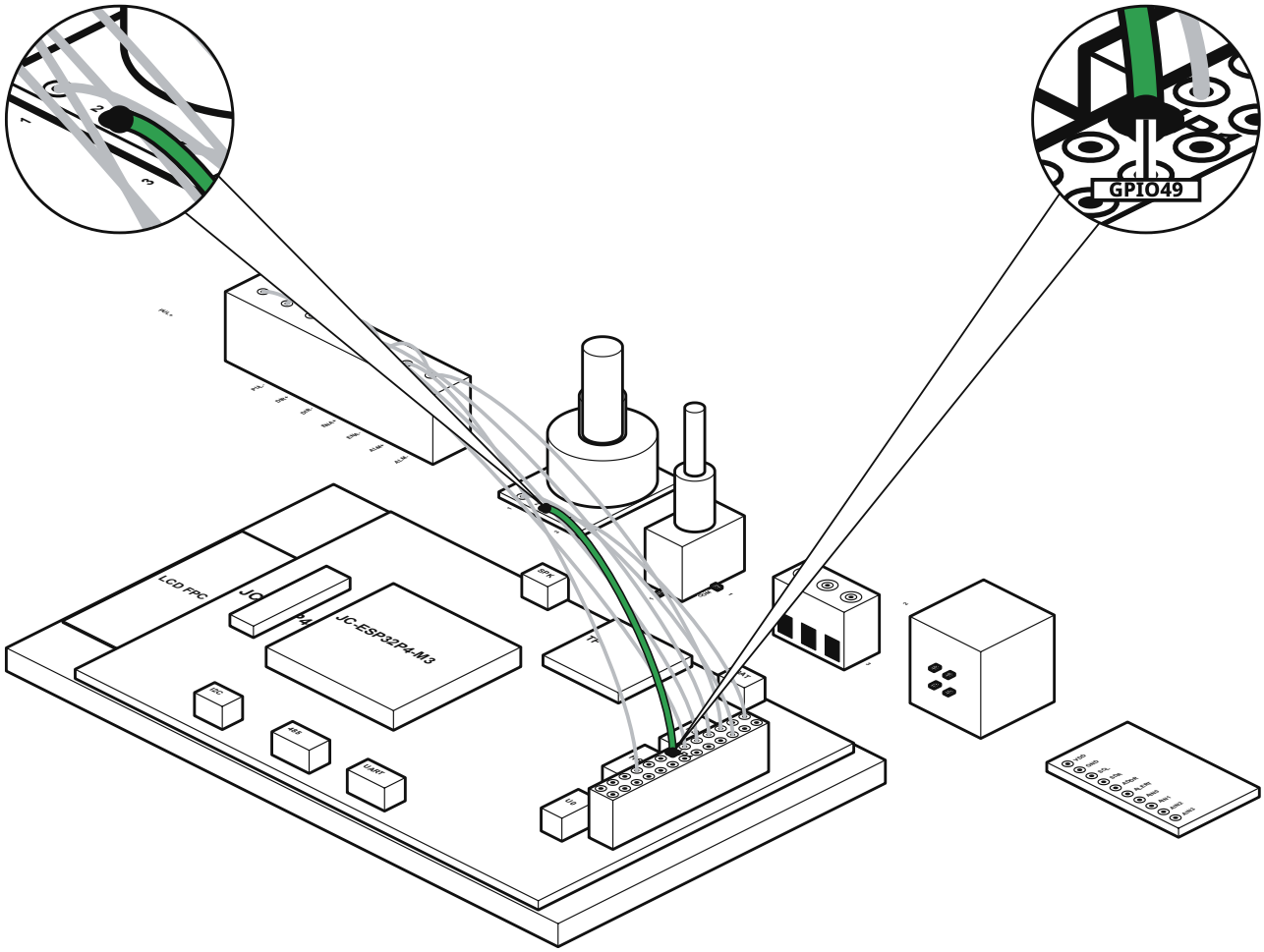
Pot low end to ground

Layout of the ESP32-P4 touch board (JP1) not verified. Measure yours before printing the case.

11

Speed pot **2**

ESP32-P4 touch board (JP1) **GPIO49**



Solder a **green** wire | ESP32-P4 touch board (JP1) **GPIO49** → Speed pot **2**

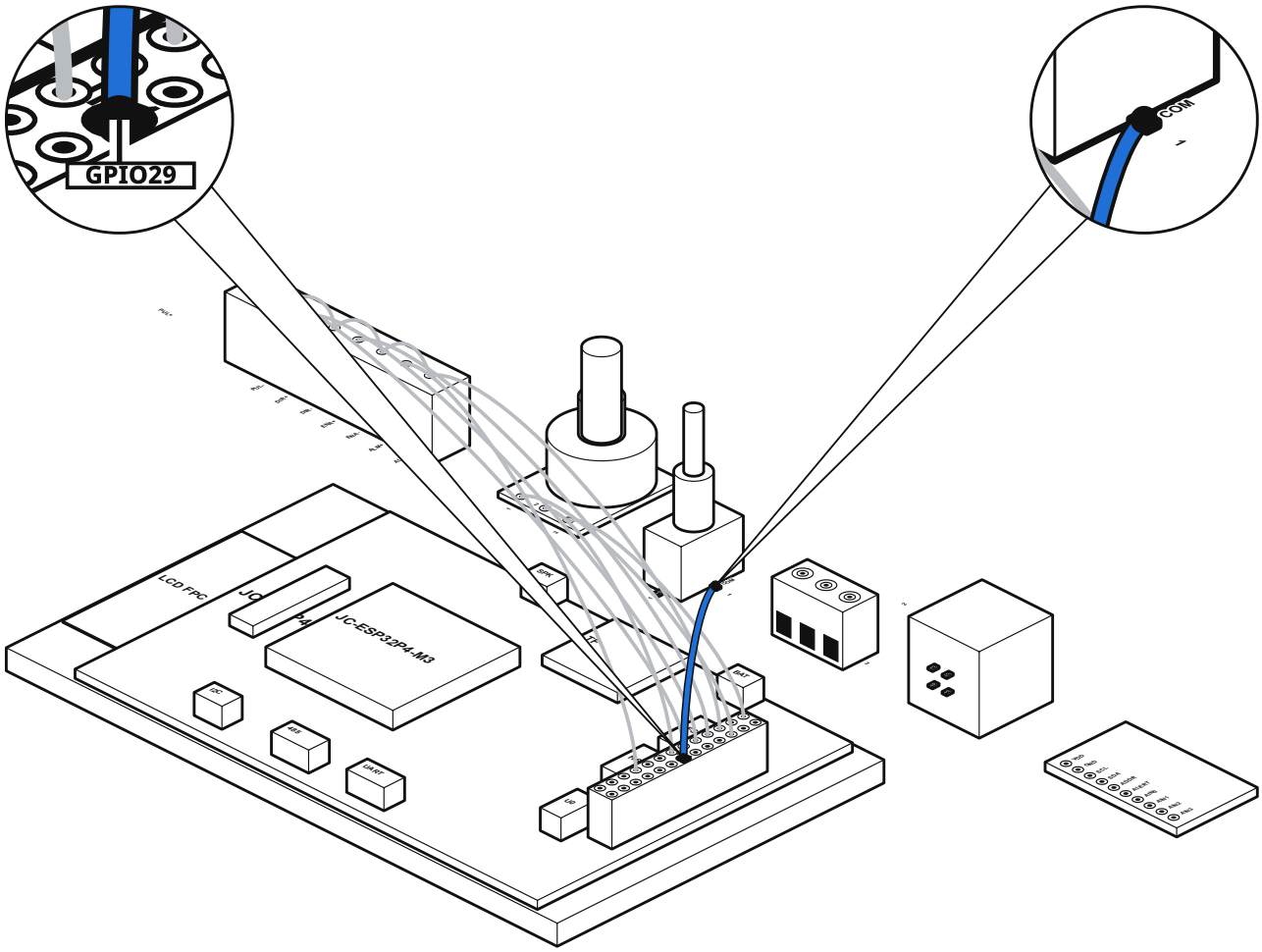
Wiper sets the speed

Layout of the ESP32-P4 touch board (JP1) not verified. Measure yours before printing the case.

12

ESP32-P4 touch board (JP1) **GPIO29**

Direction switch CW/CCW **COM**



Solder a **blue** wire ESP32-P4 touch board (JP1) **GPIO29** → Direction switch CW/CCW **COM**

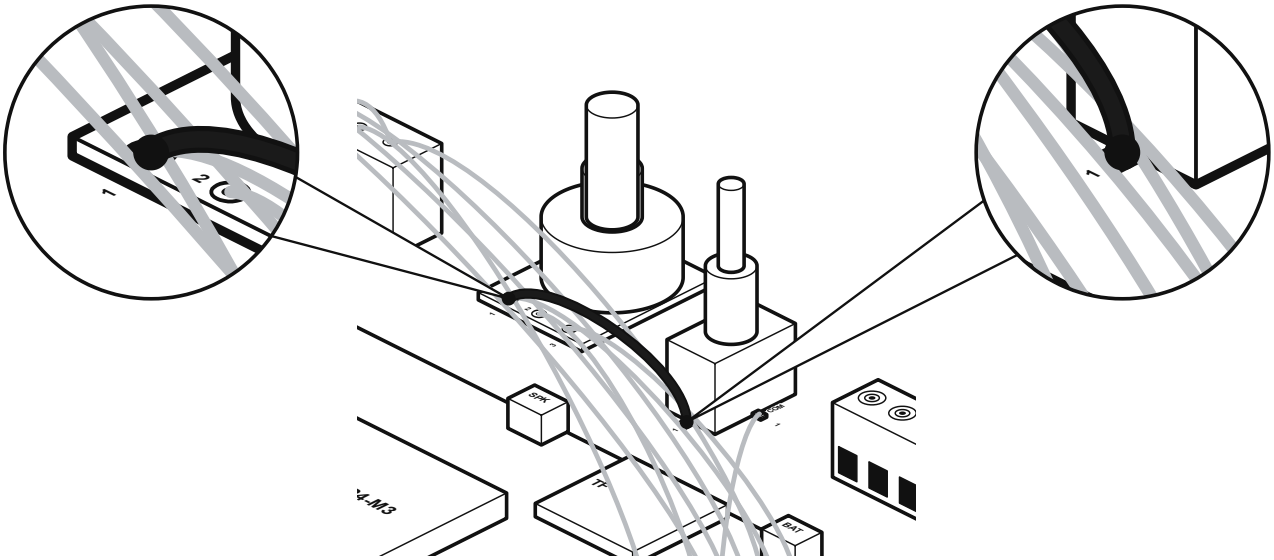
Direction switch input

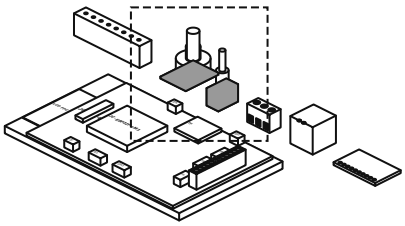
Layout of the ESP32-P4 touch board (JP1) not verified. Measure yours before printing the case.

13

Speed pot **1**

Direction switch CW/CCW **1**





Solder a **black** wire | Direction switch CW/CCW **1** → Speed pot **1**

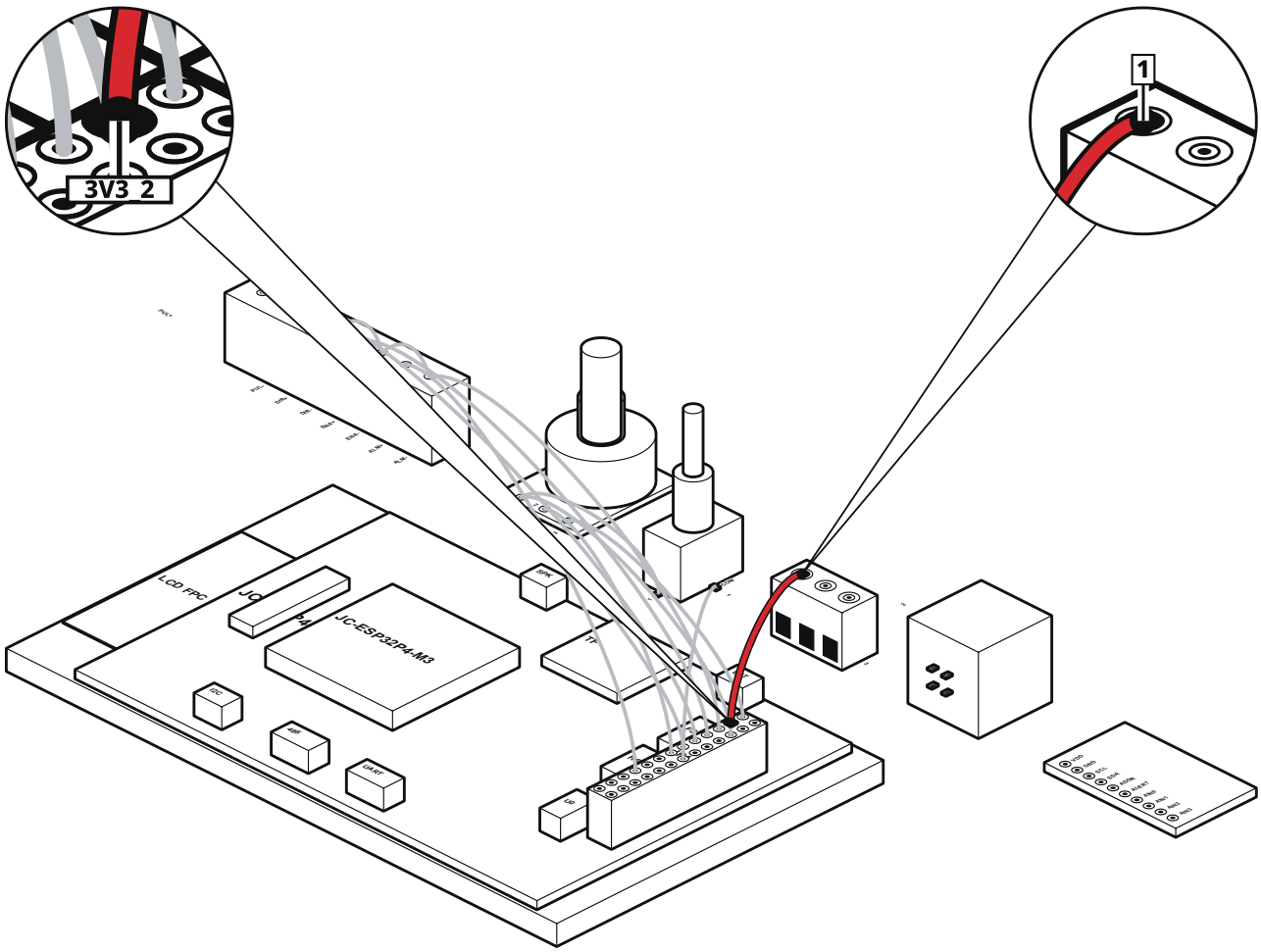
Switch pulls the input to ground

The 1 pad on the speed pot already holds a wire. Add this one beside it.

14

ESP32-P4 touch board (JP1) **3V3_2**

E-STOP interface input (3V3 / SIG / GND) **1**



Solder and clamp a **red** wire → ESP32-P4 touch board (JP1) **3V3_2**

→ E-STOP interface input (3V3 / SIG / GND) **1**

Power for the E-STOP interface

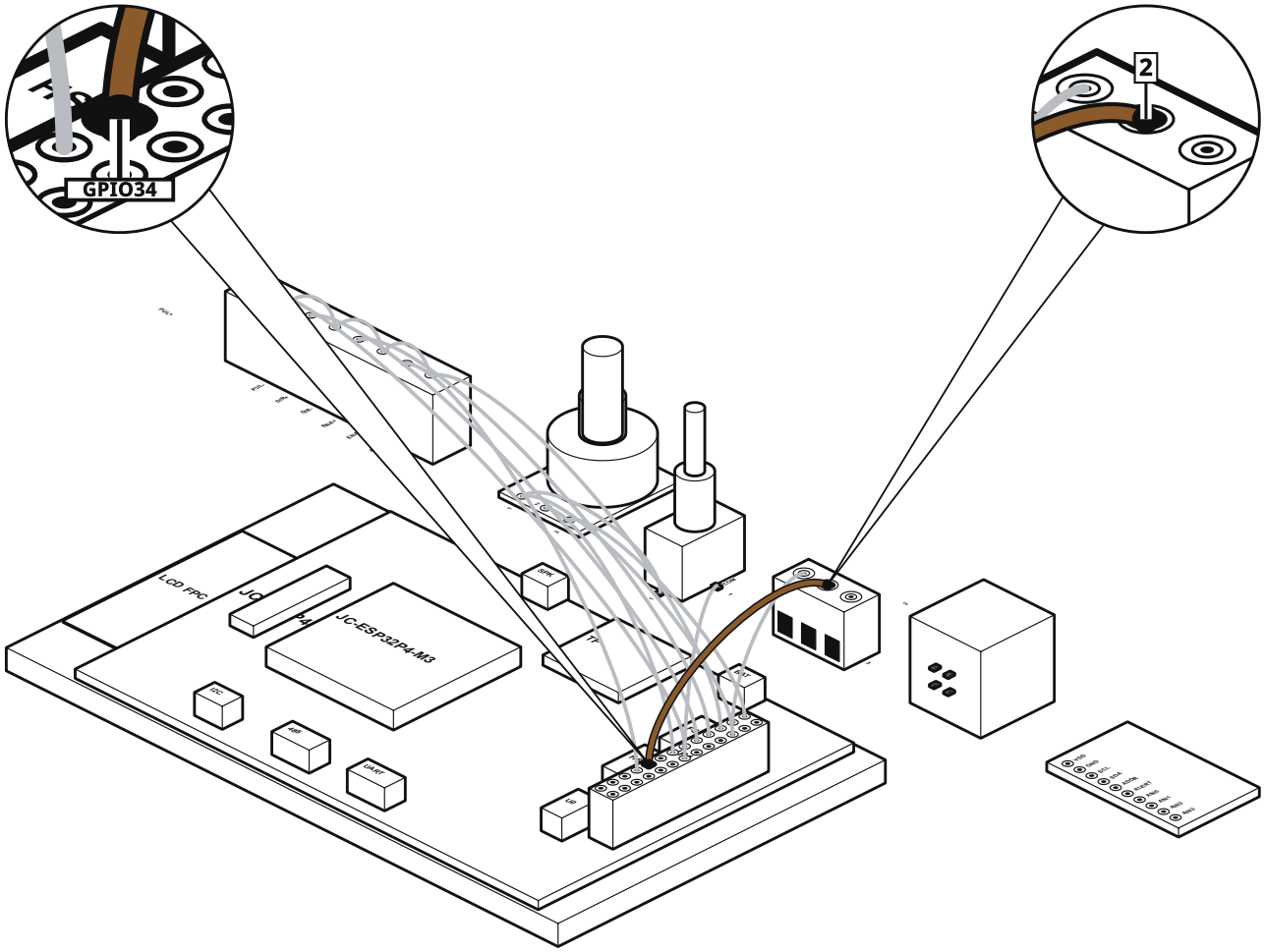
The end at the E-STOP interface input (3V3 / SIG / GND) 1 goes under a screw, not into solder: strip 5 mm, twist the strands tight or crimp on a ferrule, push the end fully in, tighten the screw and tug the wire to check it holds. Do not tin it.

Layout of the ESP32-P4 touch board (JP1) not verified. Measure yours before printing the case.

15

ESP32-P4 touch board (JP1) **GPIO34**

E-STOP interface input (3V3 / SIG / GND) **2**



Solder and clamp a **brown** wire → E-STOP interface input (3V3 / SIG / GND) **2** → ESP32-P4 touch board (JP1) **GPIO34**

E-STOP: HIGH healthy, LOW fault

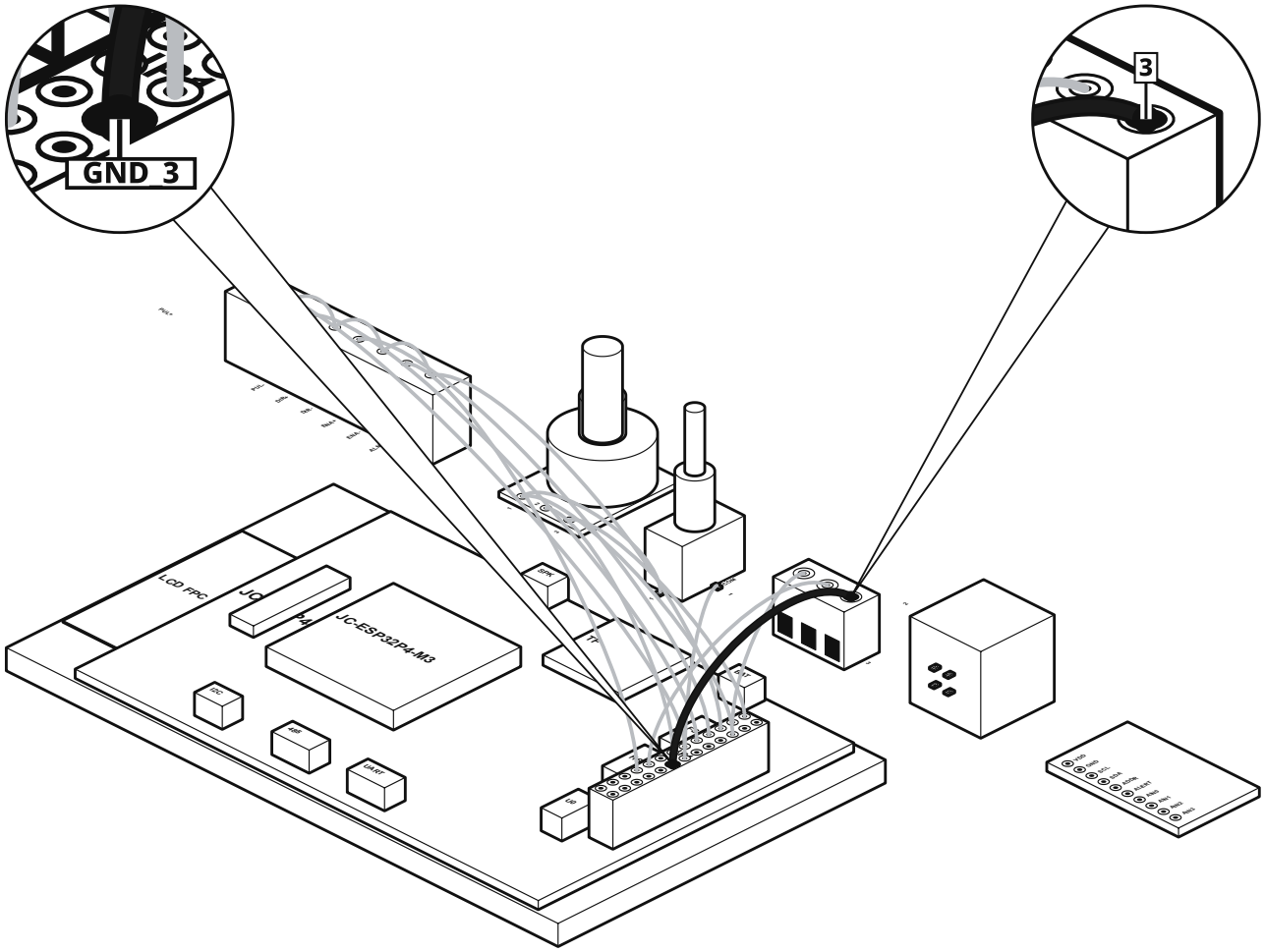
The end at the E-STOP interface input (3V3 / SIG / GND) 2 goes under a screw, not into solder: strip 5 mm, twist the strands tight or crimp on a ferrule, push the end fully in, tighten the screw and tug the wire to check it holds. Do not tin it.

Layout of the ESP32-P4 touch board (JP1) not verified. Measure yours before printing the case.

16

ESP32-P4 touch board (JP1) **GND_3**

E-STOP interface input (3V3 / SIG / GND) **3**



Solder and clamp a **black** wire → E-STOP interface input (3V3 / SIG / GND) **3** → ESP32-P4 touch board (JP1) **GND_3**

E-STOP interface ground

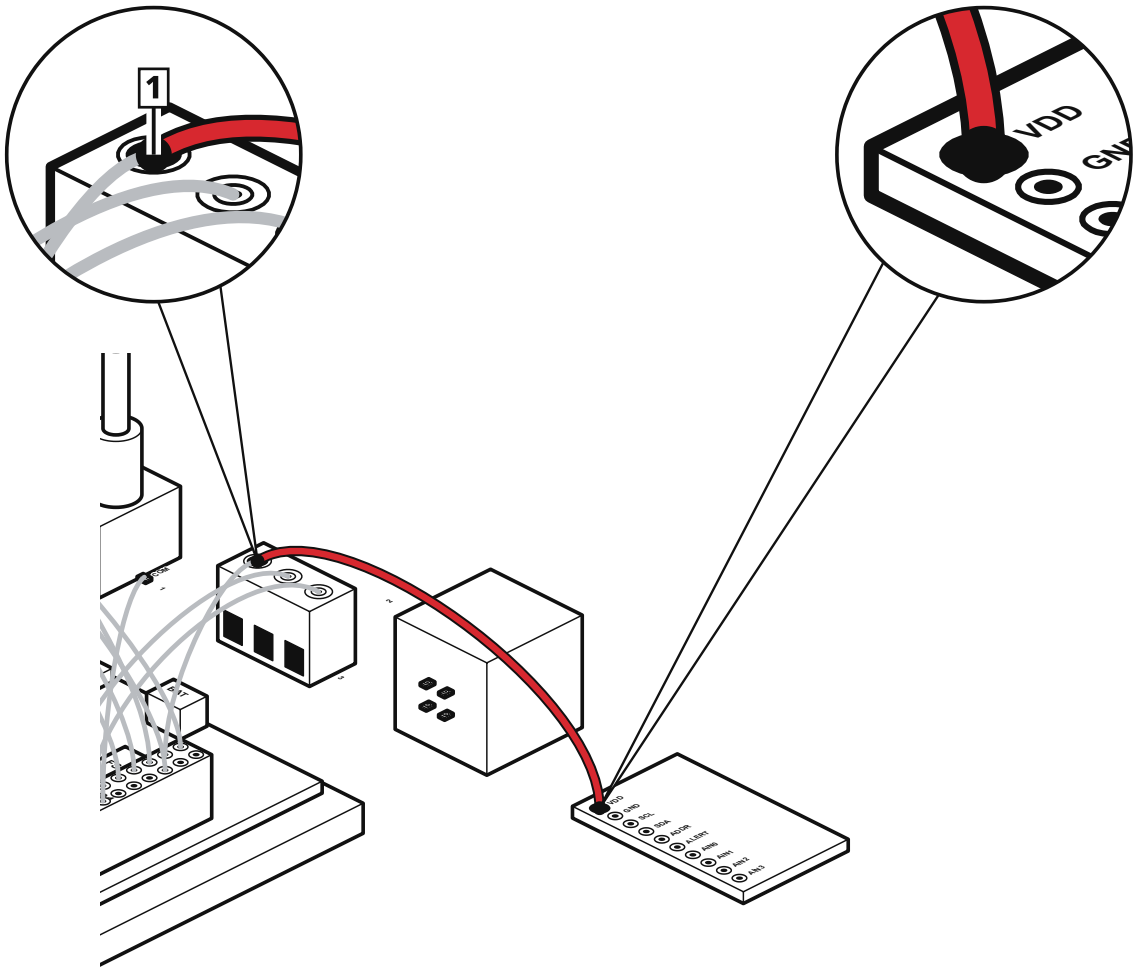
The end at the E-STOP interface input (3V3 / SIG / GND) 3 goes under a screw, not into solder: strip 5 mm, twist the strands tight or crimp on a ferrule, push the end fully in, tighten the screw and tug the wire to check it holds. Do not tin it.

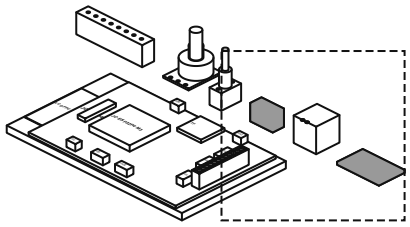
Layout of the ESP32-P4 touch board (JP1) not verified. Measure yours before printing the case.

17

E-STOP interface input (3V3 / SIG / GND) **1**

Pedal ADC (ADS1115) **VDD**





Solder and clamp a **red** wire

E-STOP interface input (3V3 / SIG / GND) **1** →

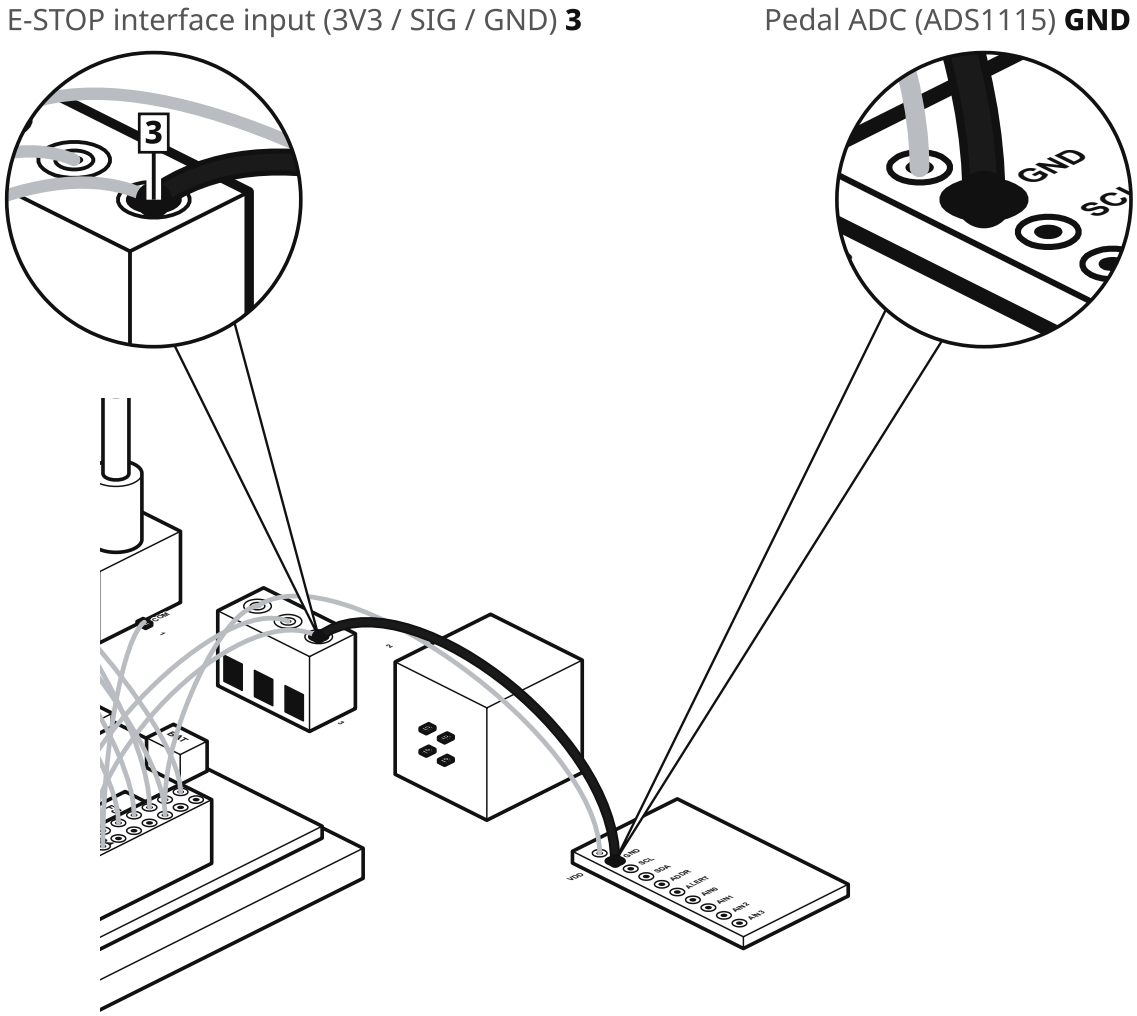
Pedal ADC (ADS1115) **VDD**

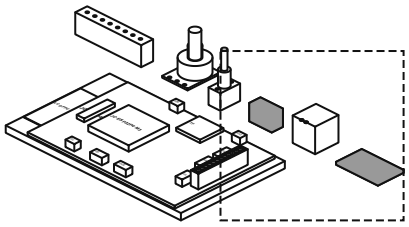
Power for the pedal ADC

The end at the E-STOP interface input (3V3 / SIG / GND) 1 goes under a screw, not into solder: strip 5 mm, twist the strands tight or crimp on a ferrule, push the end fully in, tighten the screw and tug the wire to check it holds. Do not tin it.

The 1 clamp on the E-STOP interface input (3V3 / SIG / GND) already holds a wire. Put this one in the same clamp and tighten the screw on both; a twin ferrule holds two wires best.

18





Solder and clamp a **black** wire

E-STOP interface input (3V3 / SIG / GND) **3** →

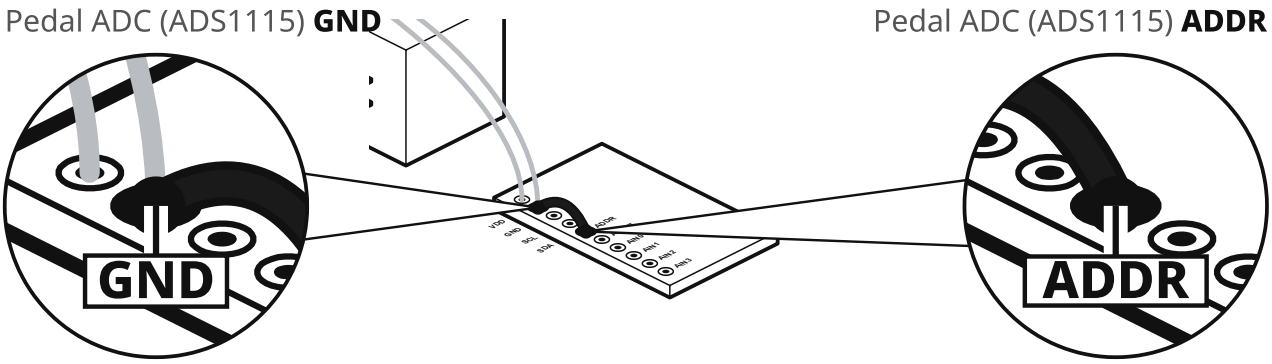
Pedal ADC (ADS1115) **GND**

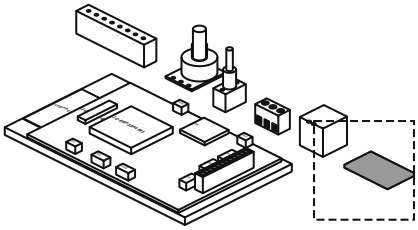
Ground for the pedal ADC

The end at the E-STOP interface input (3V3 / SIG / GND) 3 goes under a screw, not into solder: strip 5 mm, twist the strands tight or crimp on a ferrule, push the end fully in, tighten the screw and tug the wire to check it holds. Do not tin it.

The 3 clamp on the E-STOP interface input (3V3 / SIG / GND) already holds a wire. Put this one in the same clamp and tighten the screw on both; a twin ferrule holds two wires best.

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Solder a **black** wire | Pedal ADC (ADS1115) **GND** → Pedal ADC (ADS1115) **ADDR**

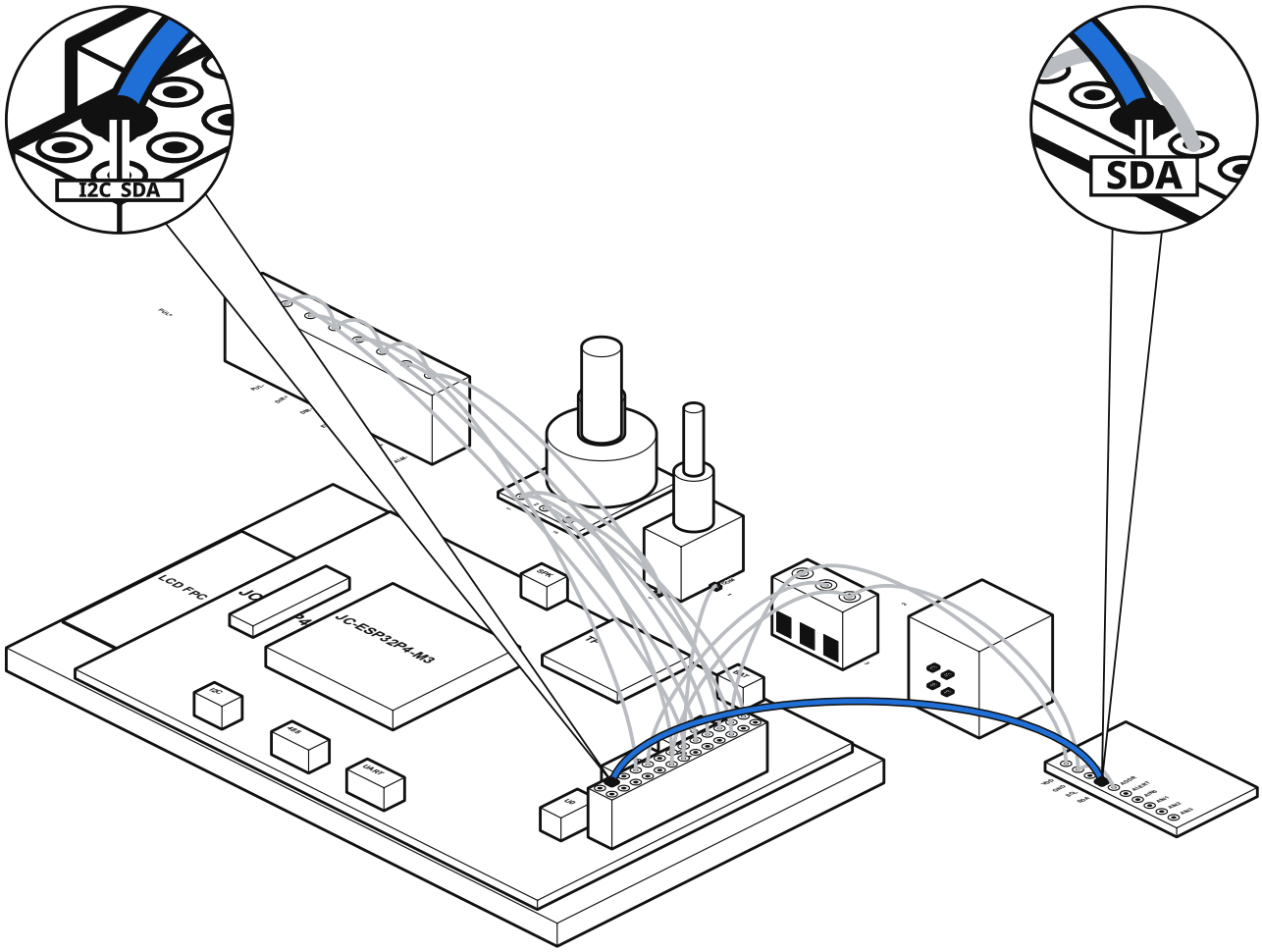
ADDR to ground selects 0x48

The GND pad on the pedal ADC (ADS1115) already holds a wire. Add this one beside it.

20

ESP32-P4 touch board (JP1) **I2C_SDA**

Pedal ADC (ADS1115) **SDA**



Solder a **blue** wire ESP32-P4 touch board (JP1) **I2C_SDA** → Pedal ADC (ADS1115) **SDA**

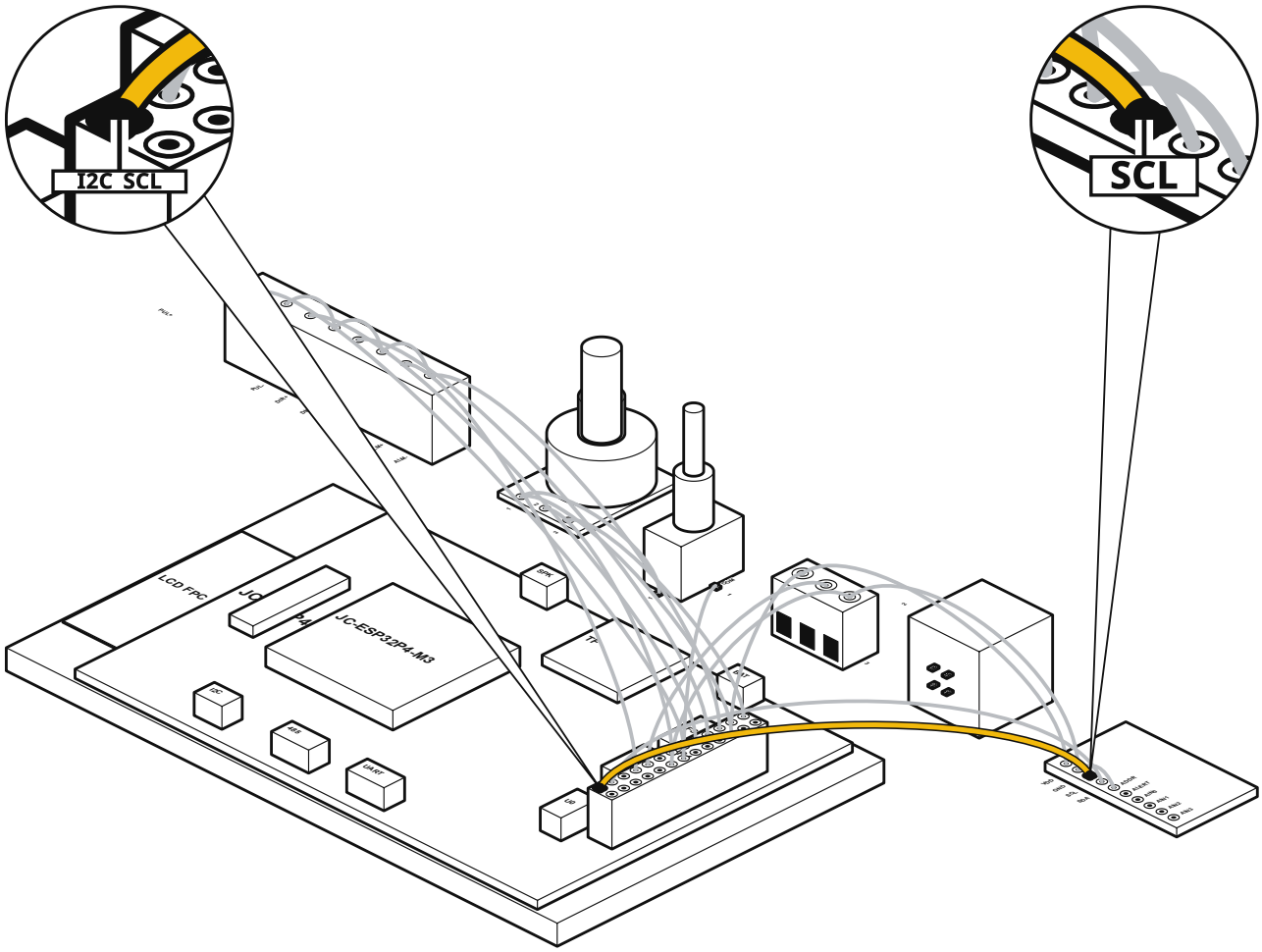
Shares the touch I2C data line

Layout of the ESP32-P4 touch board (JP1) not verified. Measure yours before printing the case.

21

ESP32-P4 touch board (JP1) **I2C_SCL**

Pedal ADC (ADS1115) **SCL**

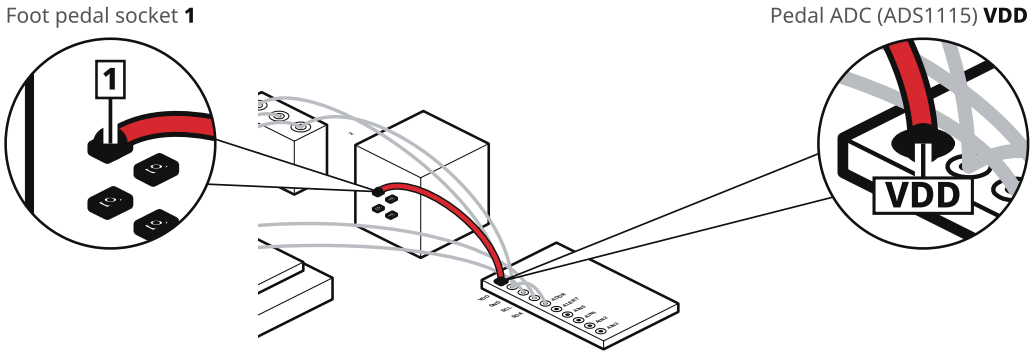


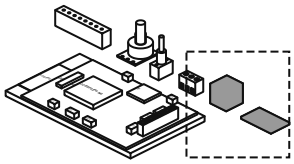
Solder a **yellow** wire ESP32-P4 touch board (JP1) **I2C_SCL** → Pedal ADC (ADS1115) **SCL**

Shares the touch I2C clock line

Layout of the ESP32-P4 touch board (JP1) not verified. Measure yours before printing the case.

22



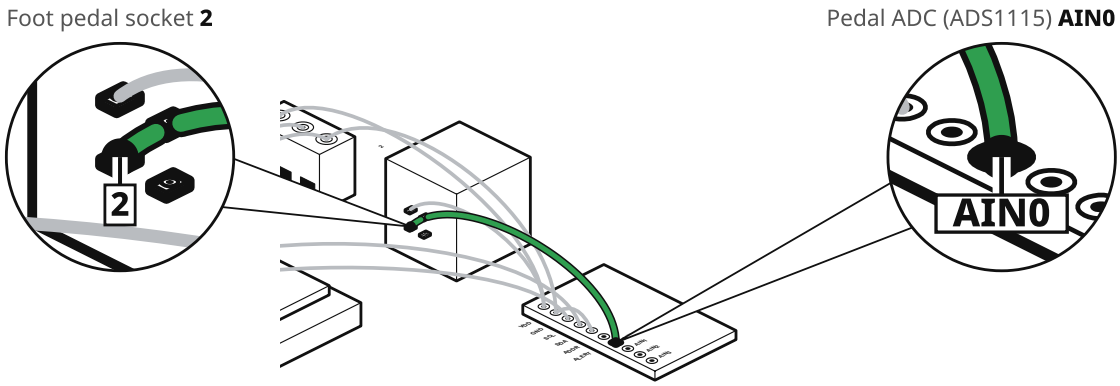


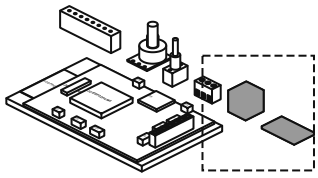
Solder a **red** wire | Pedal ADC (ADS1115) **VDD** → Foot pedal socket **1**

3.3 V to the pedal pot

The VDD pad on the pedal ADC (ADS1115) already holds a wire. Add this one beside it.

23





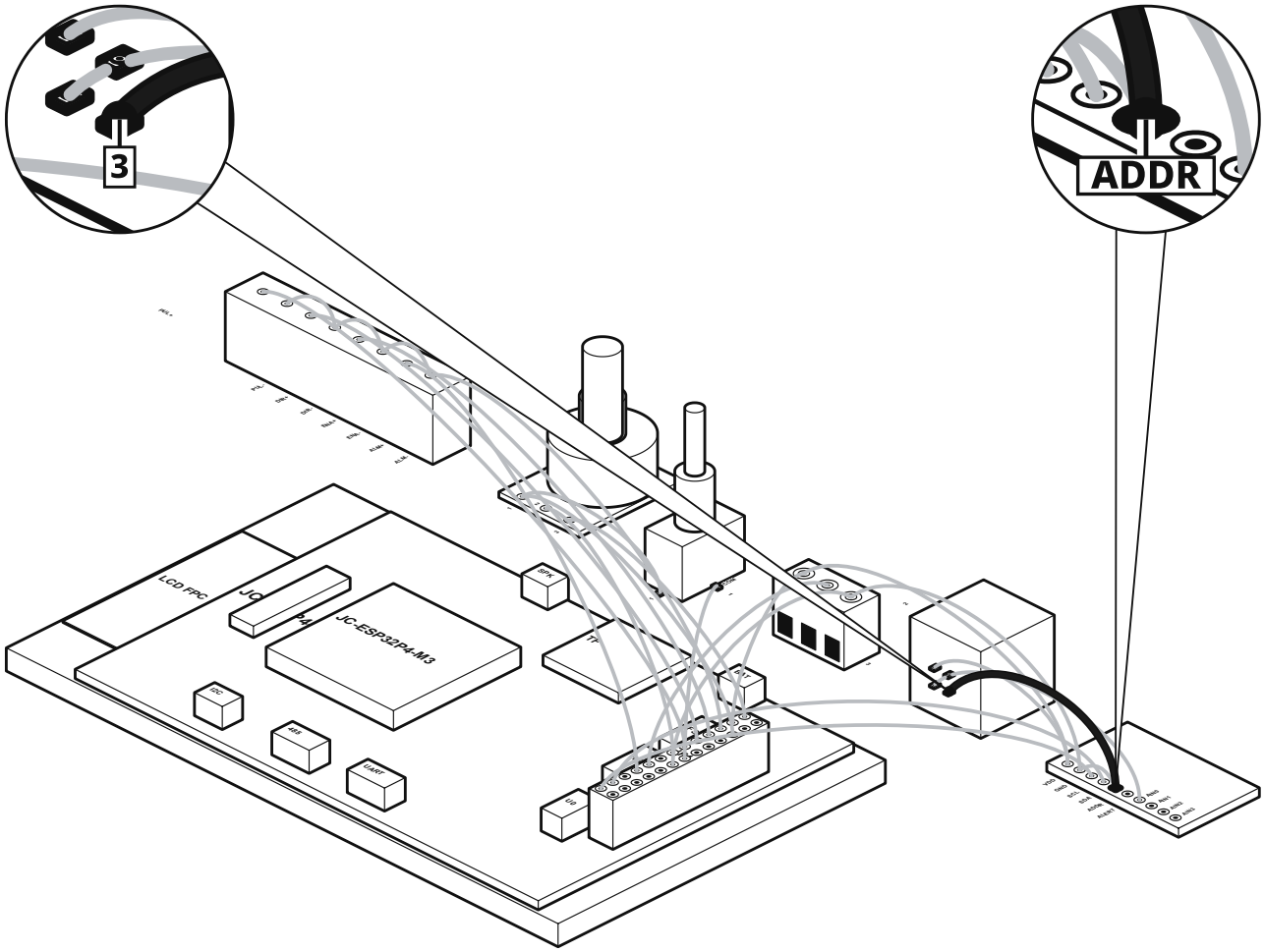
Solder a **green** wire | Foot pedal socket **2** → Pedal ADC (ADS1115) **AIN0**

Pedal pot wiper to the ADC

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Foot pedal socket **3**

Pedal ADC (ADS1115) **ADDR**



Solder a **black** wire | Foot pedal socket **3** → Pedal ADC (ADS1115) **ADDR**

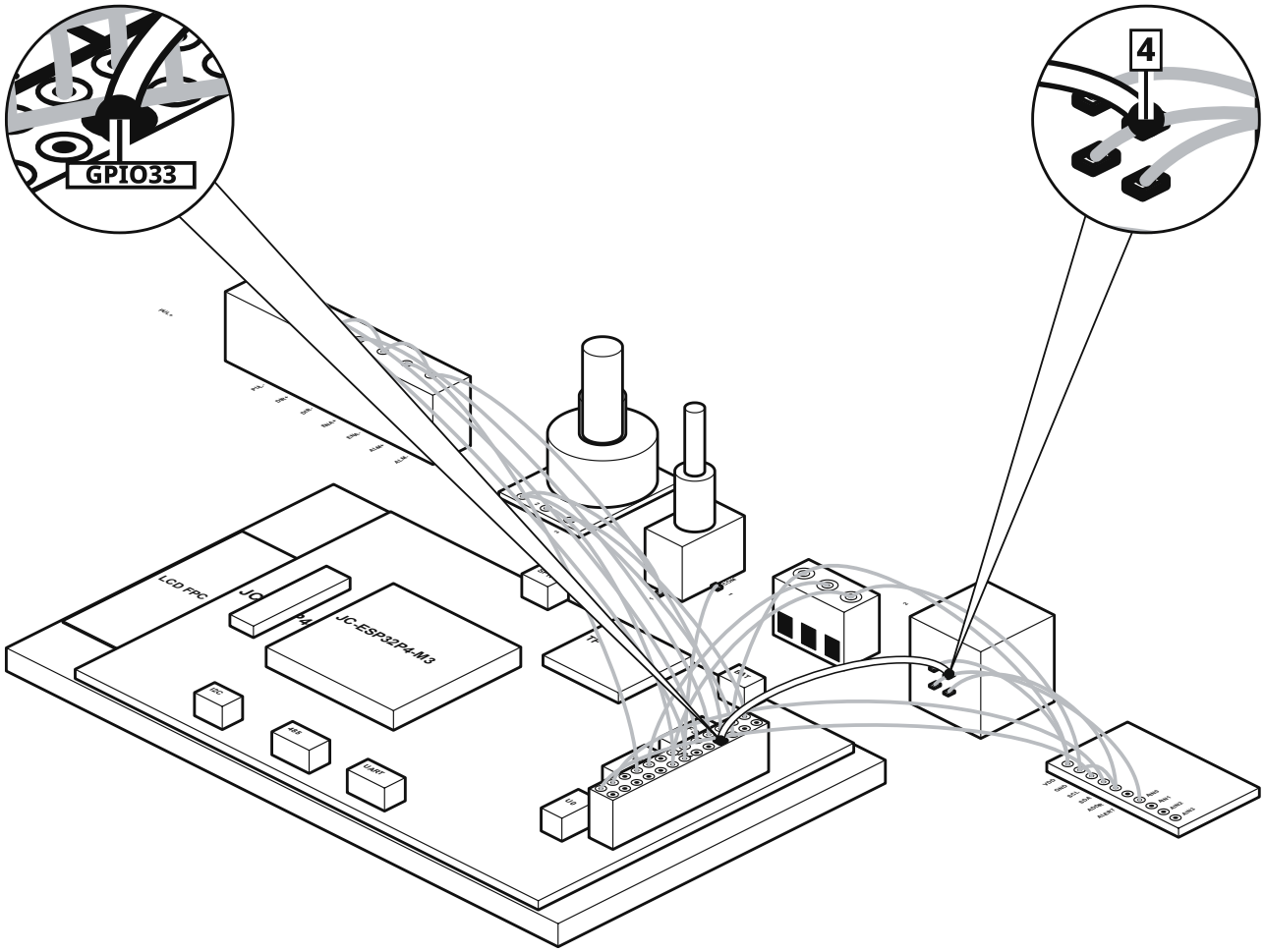
Pedal ground

The ADDR pad on the pedal ADC (ADS1115) already holds a wire. Add this one beside it.

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ESP32-P4 touch board (JP1) **GPIO33**

Foot pedal socket **4**



Solder a **white** wire | ESP32-P4 touch board (JP1) **GPIO33** → Foot pedal socket **4**

Pedal start switch, LOW pressed

Layout of the ESP32-P4 touch board (JP1) not verified. Measure yours before printing the case.

Before you switch it on

1. **Look.** Every joint is a shiny cone. No solder touches a neighbouring pad. No stray strands of wire. Tug every wire under a screw: none moves.

2. **These must not beep.** Set the multimeter to continuity and probe each pair. A beep means a short: find it before you plug in.

`3V3` ✕ `GND` `3V3_2` ✕ `GND`

3. **These must beep.** Probe the two ends of every connection.

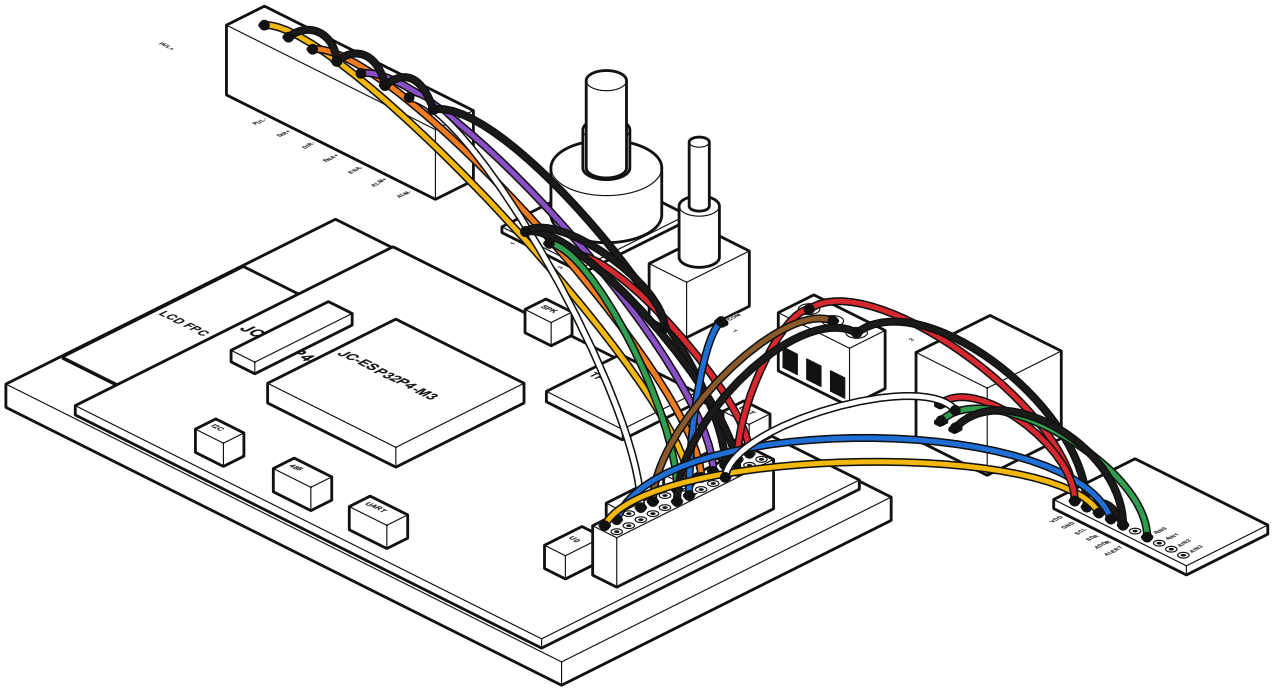
STEP	ESP32-P4 touch board (JP1) **GPIO50** · DM542T signal terminal **PUL+**
DIR	ESP32-P4 touch board (JP1) **GPIO51** · DM542T signal terminal **DIR+**
ENA	ESP32-P4 touch board (JP1) **GPIO52** · DM542T signal terminal **ENA+**
DRIVER_ALM	ESP32-P4 touch board (JP1) **GPIO32** · DM542T signal terminal **ALM+**
GND	DM542T signal terminal **PUL-** · DM542T signal terminal **DIR-** · DM542T signal terminal **ENA-** · DM542T signal terminal **ALM-** · ESP32-P4 touch board (JP1) **GND**
3V3	ESP32-P4 touch board (JP1) **3V3** · Speed pot **3**
GND	Speed pot **1** · ESP32-P4 touch board (JP1) **GND_2** · Direction switch CW/CCW **1**
POT	ESP32-P4 touch board (JP1) **GPIO49** · Speed pot **2**
DIR_SWITCH	ESP32-P4 touch board (JP1) **GPIO29** · Direction switch CW/CCW **COM**
3V3_2	ESP32-P4 touch board (JP1) **3V3_2** · E-STOP interface input (3V3 / SIG / GND) **1** · Pedal ADC (ADS1115) **VDD** · Foot pedal socket **1**
ESTOP	E-STOP interface input (3V3 / SIG / GND) **2** · ESP32-P4 touch board (JP1) **GPIO34**
GND	E-STOP interface input (3V3 / SIG / GND) **3** · ESP32-P4 touch board (JP1) **GND_3** · Pedal ADC (ADS1115) **GND** · Pedal ADC (ADS1115) **ADDR** · Foot pedal socket **3**
I2C_SDA	ESP32-P4 touch board (JP1) **I2C_SDA** · Pedal ADC (ADS1115) **SDA**
I2C_SCL	ESP32-P4 touch board (JP1) **I2C_SCL** · Pedal ADC (ADS1115) **SCL**
PEDAL_POT	Foot pedal socket **2** · Pedal ADC (ADS1115) **AIN0**
PEDAL_SW	ESP32-P4 touch board (JP1) **GPIO33** · Foot pedal socket **4**

4. **Plug in the USB cable.** Nothing gets warm, nothing smells. If something does, unplug USB at once and check the wires against the table above.

5. **Flash the bring-up test.** It reports every part it can find before you load the real firmware.

```
pio run -e bringup -t upload && pio device monitor
```

TIG Rotator Controls is built



The low-voltage controller subsystem of the DIY TIG welding positioner: the GUITION JC4880P443C ESP32-P4 touch board, its speed pot, direction switch, foot pedal (switch plus ADS1115 pot), conditioned E-STOP input and the DM542T signal terminal. Motor power, the stepper, gearbox and the grounded metal enclosure are outside this package.