3DPRECISION

ASSEMBLY and OPERATING MANUAL

Controller & Electronics for

- **Smart Rewinder**
- **Dryer**
- **LED Lighting**

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Version 1.20

LIABILITY

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Table of Content

1 Preface

1.1 Storage Instructions

Read this manual and all safety instructions carefully before assembling and using this product. Failure to do so may result in injury or product malfunction.

Keep all safety instructions and guidelines for future reference and pass them on to subsequent users of the product.

1.2 Access to Documentation and Information

1.2.1 Internet

For more information, visit our website: https://www.3dprecision.de

and our Discord community: https://discord.gg/hNZkaaDxHN

The latest version of the documentation is available on Printables.com. Detailed links can be provided below.

1.2.2 Documentation Feedback

Feedback is always welcome. Comments can be submitted via messenger or as comments on Printables.com.

We appreciate your feedback and value your input.

2 Safety, Instructions, and Notices

2.1 Personal Safety

- Drink sufficient water to stay alert and avoid dehydration.
- Ensure adequate ventilation (1–2 air changes per hour).
- Take regular breaks to allow your body to recover from ongoing tasks.

2.2 Workplace Safety

- Keep your workspace clean and free of clutter.
- Always wear appropriate personal protective equipment .
- Ensure that all tools are in proper working condition.
- Use ergonomic desks or workbenches to reduce strain on your wrists and arms .

3 Requirements, Assumptions, and Limitations

The system has been tested with several original Prusa CORE One and MMU3 systems using the latest available firmware . No technical modifications or special settings in PrusaSlicer are required for operation.

The MMU3 upgrade for the Nextruder described in the Prusa documentation should be installed.

For completeness: our CORE One test systems are equipped with Advanced Filtration and Buddy Cam. However, neither is required for operation.

The Dryer module was primarily developed for use in the CORE CUBE but can be adapted to other configurations if necessary.

The Dryer function is not intended as a replacement for a dedicated filament dryer .

Due to the large air volume and the potential use of different filament types at the same time, this would only be practical to a limited extent.

Its purpose is to maintain the drying state of the filament during the printing process for as long as possible while using moderate energy .

4 Introduction

4.1 Description of the System and Components

This microcontroller-based system was developed to control the Smart Rewinder – an active filament spool management system designed for DIY use.

The Smart Rewinder was specifically developed for Prusa printers equipped with MMU3, such as the CORE One, MK4, and MK3, but can likely also be used with other printer systems.

The system responds to filament movement in both directions and rotates the spools accordingly, ensuring that the filament is always guided without tension or resistance .

It provides an innovative alternative to conventional filament buffer systems, which are often impractical and complex to use, and clearly outperforms passive or purely mechanical rewinders in terms of functionality and reliability.

The system can be operated as a standalone unit but can also be integrated into filament storage systems such as the CORE CUBE due to its modular design . Up to five Smart Rewinders can be connected.

Starting with version 3.0 of the mainboard , a dryer function and LED lighting function are also integrated.

Operation during use is performed via a touch display , which simultaneously shows current and relevant information for all functions.

Advanced settings can be configured via a web interface .

In addition, integration options for Home Assistant and PrusaLink are available.

Currently, the system supports English, German, Italian, and French. Additional languages can be added upon request.

4.2 Boards

- The system requires three boards :
- Mainboard (1x)
- Display board (1x)
- Rewinder board (1x per rewinder)

The required Gerber files for manufacturing the boards are included in the download.

These can be uploaded to service providers such as PCBWay for production.

4.3 Electronics

Only through-hole components (no SMD) with a pitch of ≥2.54 mm are used on the boards.

This makes assembly easier, even for beginners and less experienced hobbyists.

4.4 Technical Data

Table 1 Technical Specifications

Parameter	Dimentions / Value
Dimensions	Rewinder board (H × W × D): approx. 4.4 cm × 6.1 cm × 2.0 cm Mainboard V1.0 (H × W × D): approx. 8.3 cm × 7.5 cm × 2.0 cm Mainboard V3.0 (H × W × D): approx. 9.5 cm × 7.5 cm × 2.0 cm Display board (H × W × D): approx. 3.0 cm × 6.5 cm × 2.0 cm
Power consumption	Depends on configuration and expansion level
Power supply	12V DC, 3A (rewinder only) 12V DC, 20A (dryer operation with or without rewinder)

5 Required Tools

Most materials can be ordered from common platforms such as Amazon, eBay, or AliExpress. Some components are not available as individual items due to their low unit cost. Others offer significant discounts when purchased in larger quantities. For many parts, links are provided, some of which are affiliate links. The required quantities are listed for each component .

Table 2 Tools.

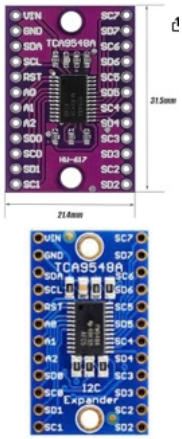
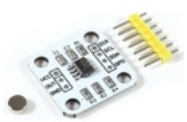
Tool	Illustration	Comment
Screwdriver		Depends on the screws used for the components
Soldering iron		
Pliers		
Side cutters		
Wire stripper		

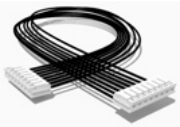
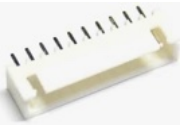
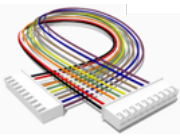
6 Bill of Materials

Most materials can be ordered from common platforms such as Amazon, eBay, or AliExpress. Some components are not available as individual items due to their low unit cost. Others offer significant discounts when purchased in larger quantities. For many parts, links are provided, some of which are affiliate links.

The required quantities are listed for each component .

Table 3 Bill of materials.

ID	Description	Illustration	Comment
ESP32T	Waveshare ESP32-S3 development board with 1.9" touch display, 170×320 resolution, 240 MHz LX7 dual-core, Wi-Fi and BLE		**Total quantity required: 1** Source: D/EU: https://amzn.to/49kqJBM Worldwide: https://www.waveshare.com/esp32-s3-lcd-1.9.htm?sku=30939 https://www.aliexpress.com/item/1005008853704674.html
TCA8	TCA9548A I2C 8-channel multiplexer breakout board, 1.8–5 V		**Total quantity required: 1 (Rewinder)** There are two versions of this board: the original Adafruit version and a lower-cost clone. The clone has a wider pinout. The mainboard supports both variants. Source: D/EU: https://amzn.to/3XAyHiY Worldwide: https://www.aliexpress.com/item/1005007308268521.html
DRV	DRV8825 stepper motor driver module, 1.5 A		**Total quantity required: 5 (Rewinder)** Source: D/EU: https://amzn.to/487ImTf Worldwide: https://www.aliexpress.com/item/1005006199405206.html
NEOP	Adafruit NeoPixel silicone LED strip, 180 LEDs/m, 1 m, Product-ID: 6016		**Total quantity required: 1 (LED)** **https://www.amazon.de/dp/B0DX483JMR** **https://www.adafruit.com/product/6016**
AS56	AS5600 magnetic encoder, 12-bit		**Total quantity required: 5 (Rewinder)** Source: D /EU: https://amzn.to/3LLnXM9 , https://amzn.to/486Kk6j Worldwide:

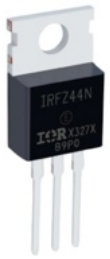
ID	Description	Illustration	Comment
			https://www.aliexpress.com/item/1005007960154822.html
HBS12	12 V heated bed power module based on high-power MOSFET (alternatively 12 V relay)		**Total quantity required: 1 (Dryer)** **https://www.amazon.de/dp/B07CR4QYJ8** **https://www.amazon.de/dp/B07DJYW5VD**
DHT20	DHT20 temperature and humidity sensor (I2C)		**Total quantity required: 1 (Dryer)** Source: D /EU: Amazon Worldwide: Amazon
MCP	MCP23017 16-bit I/O expander, I2C, DIP-28		**Total quantity required: 1 (Rewinder)** Source: D/EU: https://amzn.to/4i8ge71 , https://www.reichelt.de/de/de/shop/produkt/i_o-erweiterung_16bit_1_8_-_5v_seriell_i2c_dip-28-140074
JSE10	JST EH 10-pin header		Alternative for JSX10 2 x Display, 7 x Mainboard, 1 x per Rewinder. Source: https://www.taja-elektronik.de/JST-EH-Stiftleiste-10-polig-gerade-Printmontage
JCE1030	Cable with dual JST EH 10-pin socket connectors, approx. 30–40 cm, reverse wiring		Alternative for JSX1030 2 x for Display, 1 x per Rewinder, Source: https://www.taja-elektronik.de/Kabel-mit-zwei-JST-EH-Buchsen-30-cm-10-polig-AWG-26-UL1007
JSX10	JST XH 10-pin header		**Total quantity required: 14 (Rewinder), 14 (Rewinder & Dryer), 4 (Dryer)** 2 x Display, 7 x Mainboard, 1 x per Rewinder Source: https://www.taja-elektronik.de/JST-XH-Stiftleiste-10-polig-gerade-Printmontage
JCX1030	Cable with dual JST XH 10-pin socket connectors, approx. 30–40 cm, reverse wiring		**Total quantity required: 7 (Rewinder), 7 (Rewinder & Dryer), 2 (Dryer)** 2 x for Display, 1 x per Rewinder, Source: https://www.taja-elektronik.de/Kabel-mit-zwei-JST-XH-Buchsen-10-polig-30-cm-AWG-24-UL1007
JCX03	JST XH 3-pin header		**Total quantity required: 1 (NeoPixel LED Stripe)** Source: https://www.taja-elektronik.de/JST-XH-Stiftleiste-4-polig-gerade-Printmontage

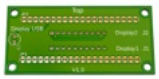
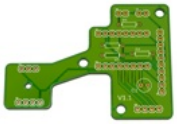
ID	Description	Illustration	Comment
JBX03	JST XH 3-pin socket housing		**Total quantity required: 1 (NeoPixel LED Stripe)** **https://www.reichelt.de/de/de/shop/produkt/jst_-_buchsengehaeuse_1x3-polig_-_xh-185086?search=JST%2520xh&** **siehe auch JCXCB**
JCX04	JST XH 4-pin header		**Total quantity required: 5 (Rewinder), 1 (Dryer)** Source: https://www.taja-elektronik.de/JST-XH-Stiftleiste-4-polig-gerade-Printmontage
JBX04	JST XH 4-pin socket housing		**Total quantity required: 1 (Dryer)** **https://www.reichelt.de/de/de/shop/produkt/jst_-_buchsengehaeuse_1x4-polig_-_xh-185087** **siehe auch JCXCB**
JCXCB	JST XH crimp contacts (set)		**Total quantity required: 4 (Dryer) 3 (LED)** Source: D/EU: **https://www.reichelt.de/de/de/shop/produkt/jst_-_crimpkontakt_buchse_-_xh-185091** **Maybe as a set:** **https://www.amazon.de/Preciva-Crimpzange-Stecker-Crimpbereich-SATA-Stromanschlüsse/dp/B0DX71SDBQ**
PINH	20-pin pin header, 2.54 mm pitch		**Total quantity required: 1 (Dryer, optional) 1 (LED, optional)** Source: D/EU: **https://www.reichelt.de/de/de/shop/produkt/stiftleisten_2_54_mm_1x20_gerade-119888**
HSTUBE	Heat shrink tubing, 3–4 mm diameter		**Total quantity required: 200 mm (Dryer) 60 mm (LED)** Source: D/EU: **https://www.amazon.de/Schrumpfschlauch-Wasserdicht-Isolierband-Elektrische-Reparaturen/dp/B0FKGVP318**
JCX0212	Cable with single JST XH 2-pin socket connector, approx. 12 cm		**Total quantity required: 5 (Rewinder)** Source: https://www.taja-elektronik.de/JST-XH-Buchse-mit-30-cm-Kabel-2-polig-AWG-24-UL1007
JCX02	JST XH 2-pin header		**Total quantity required: 5 (Rewinder)** Source: https://www.taja-elektronik.de/JST-XH-Stiftleiste-2-polig-gerade-Printmontage
PCS5	Cable sleeve, 5–7 mm diameter		**Total quantity required: 150 cm (Rewinder)** 1 x 27 cm per System and 1 x 27 cm per Rewinder, Source: D/EU: https://amzn.to/4479z76

ID	Description	Illustration	Comment
PL20	20-pin female header, straight, 2.54 mm pitch, height 8.5 mm		**Total quantity required: 2 (Rewinder)** Source: D/EU: https://amzn.to/3X0Nxzb https://www.reichelt.de/de/de/shop/produkt/20pol_buchsenleiste_gerade_rm_2_54_h_8_5mm-51827 Worldwide: https://www.aliexpress.com/item/1005003610333849.html Can also be made by cutting a longer pin header strip
PL12	12-pin female header, straight, 2.54 mm pitch, height 8.5 mm		**Total quantity required: 2 (Rewinder)** Source: D/EU: https://amzn.to/3X0Nxzb https://www.reichelt.de/de/de/shop/produkt/20pol_buchsenleiste_gerade_rm_2_54_h_8_5mm-51827 Worldwide: https://www.aliexpress.com/item/1005003610333849.html Can also be made by cutting a longer pin header strip
PL8	8-pin female header, straight, 2.54 mm pitch, height 8.5 mm		**Total quantity required: 10 (Rewinder)** Source: D/EU: https://amzn.to/3X0Nxzb https://www.reichelt.de/de/de/shop/produkt/20pol_buchsenleiste_gerade_rm_2_54_h_8_5mm-51827 Worldwide: https://www.aliexpress.com/item/1005003610333849.html Can also be made by cutting a longer pin header strip
PL4	4-pin female header, straight, 2.54 mm pitch, height 8.5 mm		**Total quantity required: 5 (Rewinder)** Source: D/EU: https://amzn.to/3X0Nxzb https://www.reichelt.de/de/de/shop/produkt/20pol_buchsenleiste_gerade_rm_2_54_h_8_5mm-51827 Worldwide: https://www.aliexpress.com/item/1005003610333849.html Can also be made by cutting a longer pin header strip
PL3	3-pin female header, straight, 2.54 mm pitch, height 8.5 mm		**Total quantity required: 5 (Rewinder)** Source: D/EU: https://amzn.to/3X0Nxzb

ID	Description	Illustration	Comment
			https://www.reichelt.de/de/de/shop/produkt/20pol_buchsenleiste_gerade_rm_2_54_h_8_5_mm-51827 Worldwide: https://www.aliexpress.com/item/1005003610333849.html Can also be made by cutting a longer pin header strip
NEMA	NEMA17 stepper motor, 42 × 23 mm (17HS4023), 1.5 A, 3.8 V, 2-phase, 1.8°		**Total quantity required: 5 (Rewinder)** Source: D/EU: https://amzn.to/4oLF4Mr , https://amzn.to/4ihup9W Worldwide: https://www.aliexpress.com/item/1005006027261699.html
FAN12	40 × 40 × 10 mm axial fan, 12 V DC, brushless		**Total quantity required: 4 (Dryer or Dryer & Rewinder)** Source: D/EU: Amazon Worldwide: Amazon
PHF12	Self-adhesive polyester heating film, 12 V/DC, IPX4, 320 × 137 mm		**Total quantity required: 4 (Dryer or Dryer & Rewinder)** **https://www.conrad.de/de/p/tru-components-polyester-heizfolie-selbstklebend-12-v-dc-12-v-ac-32-w-schutzart-ipx4-l-x-b-320-mm-x-137-mm-2489363.html**
SC5x2.1	DC connector socket, 5.5 × 2.1/2.5 mm, 12 V, 5 A		**Total quantity required: 1 (Rewinder with Mainboard PCB1.1)** Source: D/EU: https://www.reichelt.de/de/de/shop/produkt/einbaukupplung_loetoesen-227725 or https://www.reichelt.de/de/de/shop/produkt/einbaukupplung_loetstifte-227726
DC12.3	12 V power supply, 3 A, with angled connector, 1.5 m cable		**Total quantity required: 1 (Rewinder)** Source: D/EU: https://amzn.to/4ipJoid
DC12.20	12 V switching power supply, at least 20 A / 240 W, AC 100–230 V input		**Total quantity required: 1 (Dryer or Dryer & Rewinder)** Source: D/EU: https://www.amazon.de/dp/B0DJR41P5S

ID	Description	Illustration	Comment
C2.5x2	2 × 2.5 mm² cable, red/black		**Total quantity required: 400 cm** Source: D/EU: https://www.reichelt.de/de/de/shop/produkt/lautsprecherkabel_2x2_5_mm_25_m_rot_schwarz_cca-364128?nbc=1
C0.5x2	2 × 0.5 mm² cable, red/black		**Total quantity required: 200cm (Dryer)** Source: D/EU: https://www.reichelt.de/de/de/shop/produkt/lautsprecherkabel_rot_schwarz_cu_10_m-9813
WAGO3	3-wire WAGO connector		**Total quantity required: 6 (Dryer)** Source: D/EU: https://www.reichelt.de/de/de/shop/produkt/verbindungsklemme_3-leiteranschluss-149799
AKLH	2-pin header connector, 5.08 mm pitch, horizontal		**Total quantity required: 1** Source: D/EU: https://www.reichelt.de/de/de/shop/produkt/wannenstecker_fuer_akl_249_2-pol_rm5_08-36701?nbc=1
AKLV	2-pin header connector, 5.08 mm pitch, vertical		**Total quantity required: 3 (Dryer or Dryer & Rewinder)** Source: D/EU: https://www.reichelt.de/de/de/shop/produkt/wannenstecker_fuer_akl_249_2-pol_rm5_08-36693?nbc=1
AKLB	2-pin terminal block connector, 5.08 mm pitch		**Total quantity required: 1 , 4 (Dryer or Dryer & Rewinder),** Source: D/EU: https://www.reichelt.de/de/de/shop/produkt/anschlussklemmensystem_2-pol_rm5_08-36686?nbc=1
E100uF	Electrolytic capacitor, 100 µF, 16 V, 105°C, radial		**Total quantity required: 5 (Rewinder)** Source: D/EU: https://amzn.to/4oJ6bHX https://www.reichelt.de/de/de/shop/produkt/elko_radial_100_f_16_v_105_rm_2_5-359150
E10uF	Electrolytic capacitor, 10 µF, 16 V, 105°C, radial		**Total quantity required: 3 Optional, in case of weak power supply** Source: D/EU: https://amzn.to/4peljg9 https://www.reichelt.de/de/de/shop/produkt/elko_radial_10_f_16_v_105_rm_2-359162
C100nF	Multilayer ceramic capacitor, 100 nF, 50 V		**Total quantity required: 3** Source: D/EU: https://www.reichelt.de/de/de/shop/produkt/

ID	Description	Illustration	Comment
			vielschicht-kerko_100nf_50v_85_c-206918?search=C3z5u%2520100n&
R10K	Resistor, 10 kΩ, 0.25 W, 1%		**Total quantity required: 6 (Rewinder), 3 (Dryer)** Source: D/EU: https://www.amazon.de/dp/B0FCLK6GRL , https://www.reichelt.de/de/de/shop/produkt/widerstand_kohleschicht_10_kohm_0207_250_mw_5_-1338
R2K2	Resistor, 2.2 kΩ, 0.25 W, 1%		**Total quantity required: 10 (Rewinder)** Source: D/EU: https://www.amazon.de/dp/B0FCLLNSC7 , https://www.reichelt.de/de/de/shop/produkt/widerstand_kohleschicht_2_2_kohm_0207_250_mw_5_-1369
R100	Resistor, 100 Ω, 0.25 W, 1%		**Total quantity required: 3 (Dryer) 1 (LED)** Source: D/EU:
SD3A	Schottky diode, 40 V, 3 A		**Total quantity required: 1 (Rewinder), 2 (Dryer or Dryer & Rewinder), 1 (LED)** Source: D/EU: https://www.reichelt.de/de/de/shop/produkt/schottkydiode_40_v_3_a_do-201ad-41852?search=1n%25205822&
SD1A	Schottky diode, 40 V, 1 A		**Total quantity required: 1** Source: D/EU: https://www.reichelt.de/de/de/shop/produkt/schottkydiode_40_v_1_a_do-41-219449?search=1n%25205819rl%2520stm&
D1N400	Diode 1N4004, 1 A, 400 V		**Total quantity required: Optional 2/3 (Dryer)** Source: D/EU: https://www.reichelt.de/de/de/shop/produkt/schottkydiode_40_v_1_a_do-41-219449?search=1n%25205819rl%2520stm&
FET	MOSFET-Transistor IRFZ44N, 49A, 55V, N-Kanal		**Total quantity required: 3 (Dryer)** Source: D/EU: https://www.reichelt.de/de/de/shop/produkt/mosfet_n-ch_55v_49a_0_0175r_to-220ab-8820?PROVID=2788&gad_source=1&gad_campaignid=18337673922&gbraid=0AAAADwnxtbzVF4uzQGlaX5xBxQfVowvW&gclid=CjwKCAjw-J3OBhBuEiwAwqZ_h3GNqmBVfDNXSiu4l-O0ItmO-jRKMJutT6UDLBHH5gbWdfLe_-7H_BoC140QAvD_BwE
DCDC3	DC/DC converter, 4.75–28 V input, 3.3 V output, 0.5 A		**Total quantity required: 1** Source: D/EU: https://www.reichelt.de/de/de/shop/produkt/dc_dc-wandler_4_75_-_28_vin_3_3_vout_0_5_a_sip-3-242822

ID	Description	Illustration	Comment
DCDC5	DC/DC converter, 6.5–30 V input, 5 V output, 2 A		**Total quantity required: 1 (LED)** Source: D/EU: **https://www.reichelt.de/de/de/shop/produkt/dc_dc-wandler_6_5_-_30_vin_5_0_vout_2_a_sip-3-242830?nbc=1**
MSWR	Micro limit switch		**Total quantity required: 5 (Rewinder)** Source: D/EU: https://amzn.to/4oLRRyd, https://amzn.to/4piQ2J2 , https://amzn.to/3M9CJMF Worldwide: https://www.aliexpress.com/item/1005008652274058.html
PCB1.1	Mainboard V1.0 or V2.0 (preferably V3.0, PCB1.3)		**Total quantity required: 1** Source: https://pcbway.com/g/80Xmy9 ($5 discount for new customer)
PCB1.3	Mainboard V3.0		**Total quantity required: 1** Source: https://pcbway.com/g/80Xmy9 ($5 discount for new customer)
PCB2	ESP32/display board V1.0		**Total quantity required: 1** Source: https://pcbway.com/g/80Xmy9 ($5 discount for new customer)
PCB3	Rewinder board V1.1		**Total quantity required: 5 (Rewinder)** Source: https://pcbway.com/g/80Xmy9 ($5 discount for new customer)

7 Assembly

Before starting assembly, read this entire document carefully. The assembly process is moderately difficult but generally straightforward, as the system uses a limited number of different components.

7.1 Description and Naming of Parts and Materials

The material IDs defined in the Bill of Materials are used for identifying all parts.

7.2 Assembly and Soldering of the Boards

7.2.1 Mainboard PCB1.1 (V1.0 and V2.0)

The mainboard versions V1.0 and V2.0 are functionally identical and differ only in the solder connections for the DC connector SC5x2.1.

The mainboard can be manufactured using the Gerber file “Gerber_Mainboard.zip” and ordered from service providers such as PCBWay.

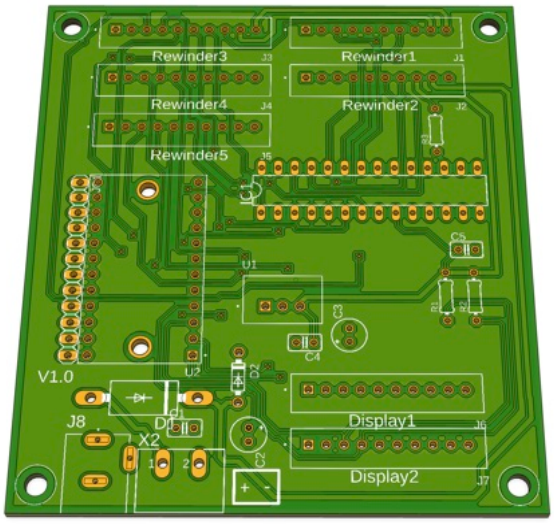


Figure 1 Mainboard PCB1.1 (V1.0 / V2.0).

Figure 2 Assembled Mainboard PCB1.1.

7.2.1.1 Materials and Components

Refer to the Bill of Materials for the required components .

Table 4 Materials & quantities for mainboard PCB1.1 (V1.0 / V2.0).

ID	Qty.	Purpose / Comment
PCB1.1	1	
JSX10	7	
JSE10	7	Alternative for JSX10
PL12	2	
SD3A	1	
SD1A	1	
R10K	1	
MCP	1	
C100nF	3	
DCDC3	1	
E10uF	2	Optional for C2 and C3 on the mainboard
SC5x2.1	1	

7.2.1.2 Assembly Steps

Place and solder all components onto the mainboard PCB1.1 as shown in the diagram.
Ensure **correct orientation of all JST connectors** ; the opening must face the direction of the arrow, typically toward the nearest board edge.
When installing the pin header PL12, select the **position that matches your TCA8** breakout board.
When installing the Schottky diodes SD3A and SD1A, pay attention to **polarity indicated by the printed ring.**

The **notch** on the MCP must face the left side.

The electrolytic capacitors E10uF are used for voltage stabilization and are optional when using the recommended DC/DC converter DCDC3.
If installed, **ensure correct polarity**: the negative terminal (white marking) must point in the direction of the arrow.

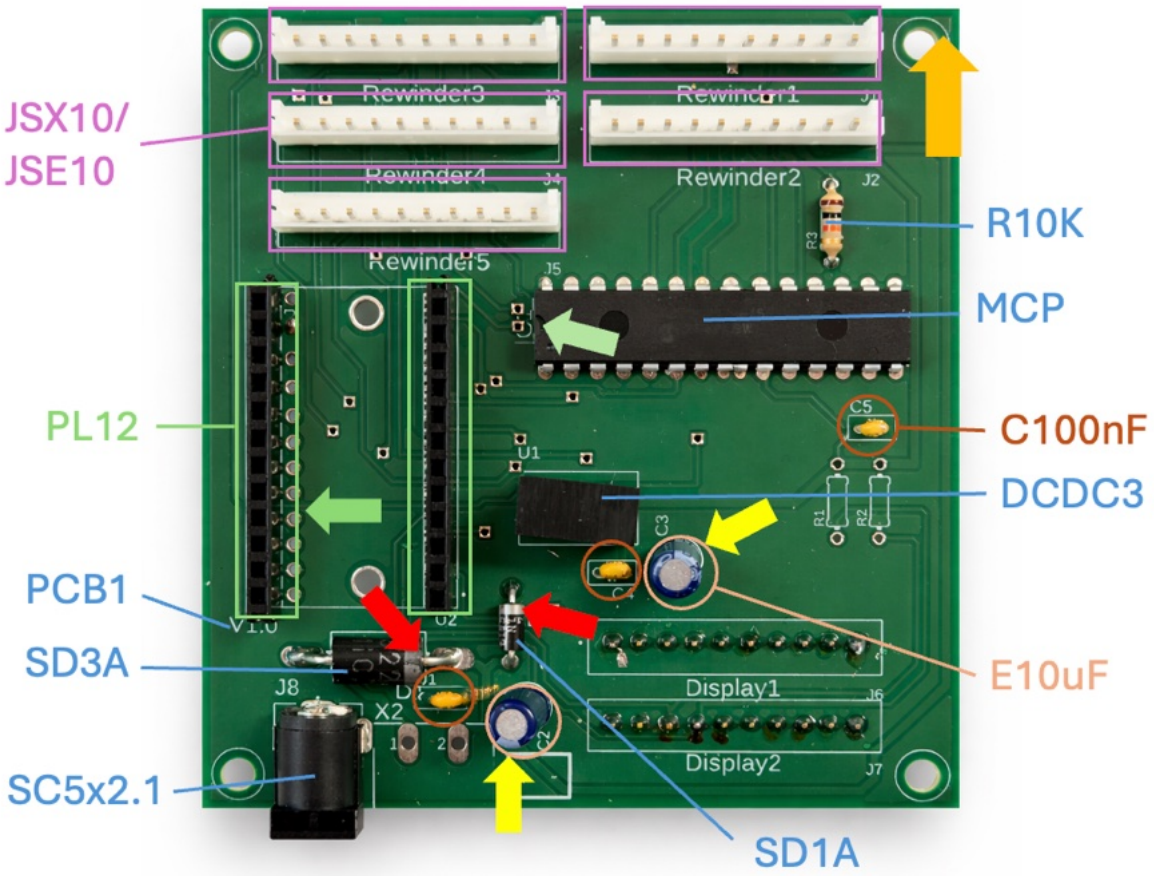


Figure 3 Mainboard PCB1.1 (V1.0 and V2.0) Step 1.

Now insert the TCA8 breakout board . Make sure that the pin labeled **VIN is located at the bottom right**.

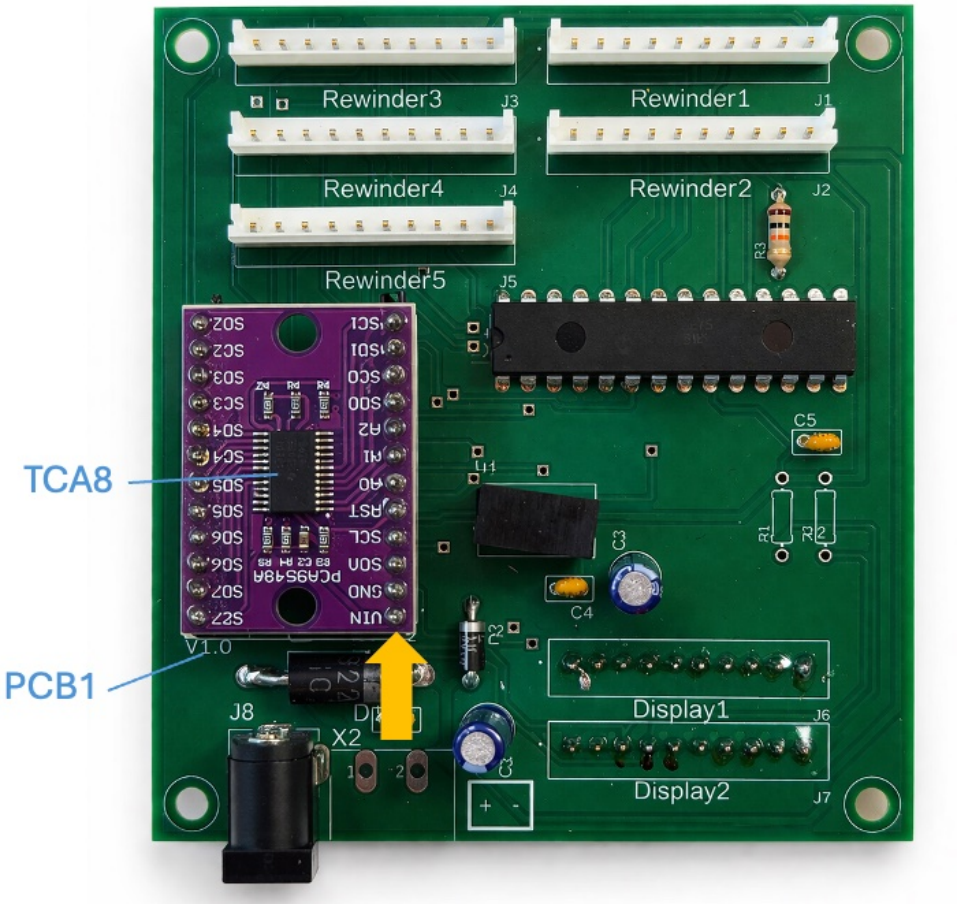


Figure 4 Mainboard PCB1.1 (V1.0 and V2.0) Step 2.

Warning: After inserting the TCA8 breakout board, check again that it has been inserted in the correct orientation and that none of the pins are offset.

On the back side, install the two JSX10/JSE10 connector headers for the display .
The connector openings must face toward the center of the board.

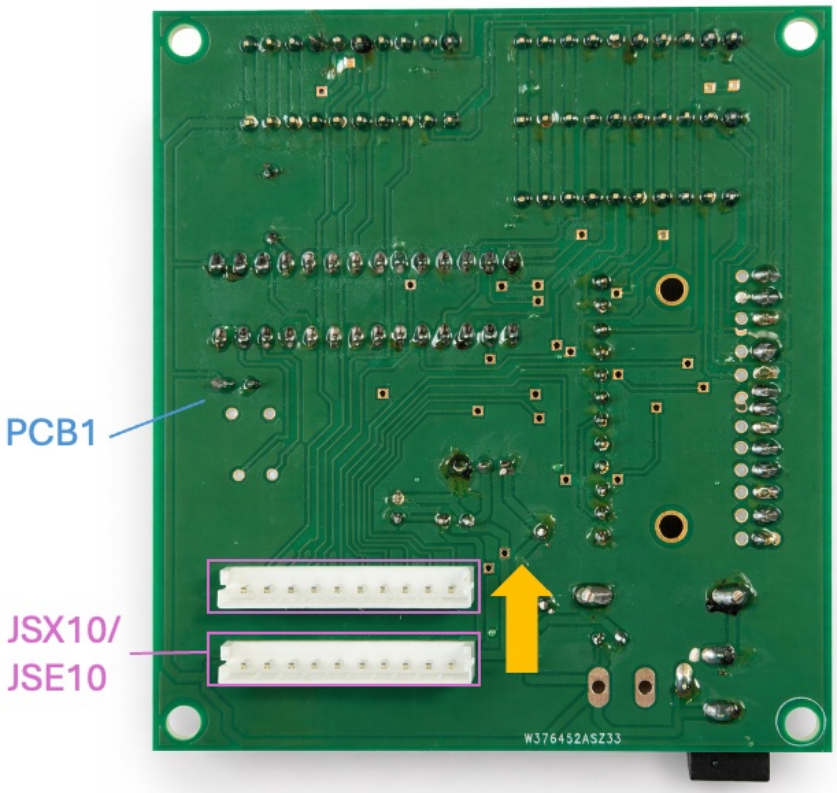


Figure 5 Mainboard PCB1.1 (V1.0 and V2.0) Step 3.

7.2.2 Mainboard V3.0

The mainboard V3.0 includes four functional areas: power supply for the microcontroller and display , control of the Smart Rewinder , control of the dryer , and control of the NeoPixel LED system .

Depending on the desired functionality, not all components need to be installed.

The mainboard can be manufactured using the Gerber file “Gerber_Mainboard_V3.0.zip” and ordered from service providers such as PCBWay.

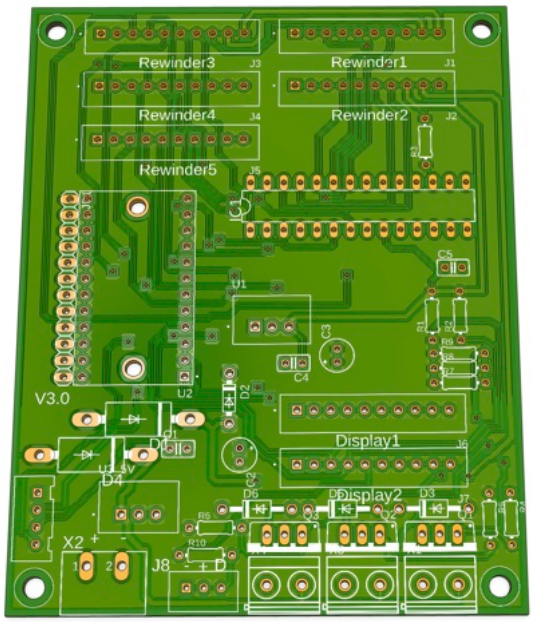


Figure 6 Mainboard PCB1.3 (V3.0).

Figure 7 Assembled Mainboard PCB1.3.

7.2.2.1 Materials and Components

Refer to the Bill of Materials for the required components .

The following components are required for the base assembly and must always be installed.

Table 5 Materials & quantities for mainboard base assembly PCB1.3 (V3.0).

ID	Qty.	Purpose / Comment
PCB1.3	1	
JSX10	2	For Display 1and 2 connectors
JSE10	2	Alternative for JSX10
SD3A	1	Position on the PCB labeled SD3A (a)
SD1A	1	
C100nF	3	
DCDC3	1	
E10uF	2	Optional for installation positions C2 and C3 on the PCB
AKLH	1	For power supply
AKLB	1	Connector for power supply

The following components are required for Smart Rewinder functionality .

Table 6 Materials & quantities for mainboard rewinder assembly PCB1.3 (V3.0).

ID	Qty.	Purpose / Comment
JSX10	5	For Rewinder 1-5 connectors
JSE10	5	Alternative for JSX10
PL12	2	
R10K	1	Position on the PCB labeled R10K (a)
MCP	1	
TCA8	1	

The following components are required for the dryer function .

Table 7 Materials & quantities for mainboard dryer assembly PCB1.3 (V3.0).

ID	Qty.	Purpose / Comment
JSX04	1	Connection for DHT20, see note below regarding pin headers
DHT20	1	
FET	3	
SD3A	1	Position on the PCB labeled SD3A (c)
R100	3	Position on the PCB labeled R100 (b)
R10K	3	Position on the PCB labeled R10K(b)
D1N400	3	Optional in case of relays and/or large fans
AKLV	3	
AKLB	3	
HBS12	1	
PHF12	4	
WAGO3	6	
C2.5x2	50cm	
C0.5x2	100cm	

The following components are required for LED lighting .

Table 8 Materials & quantities for mainboard lighting assembly PCB1.3 (V3.0).

ID	Qty.	Purpose / Comment
JSX03	1	Connection for NEOP, see note below regarding pin headers.
SD3A	1	Position on the PCB labeled SD3A (c)
R100	1	Position on the PCB labeled R100 (c)
DCDC5	1	
NEOP	1	

7.2.2.2 Assembly Steps

Place and solder the components onto the mainboard PCB1.3 according to the desired functionality as shown in the diagram.

Ensure **correct orientation of all JST connectors** ; the connector opening must always face the direction of the arrow.

When installing the pin header PL12, select the **position that matches your TCA8** breakout board.

When installing the Schottky diodes, ensure **correct polarity based on the printed ring markings**.

The **notch on the MCP** must face the left side.

The electrolytic capacitors E10uF are used for voltage stabilization and are optional when using the recommended DC/DC converter DCDC3.

If installed, ensure correct polarity: **the negative terminal** (white marking) must point in the direction of the arrow.

The MOSFETs must be installed with their back facing the connector side.

Solder them so that the pins extend approximately 1 mm on the underside, allowing them to be bent by 90° to fit into the enclosure.

The AKLV connector headers must be installed with correct orientation.

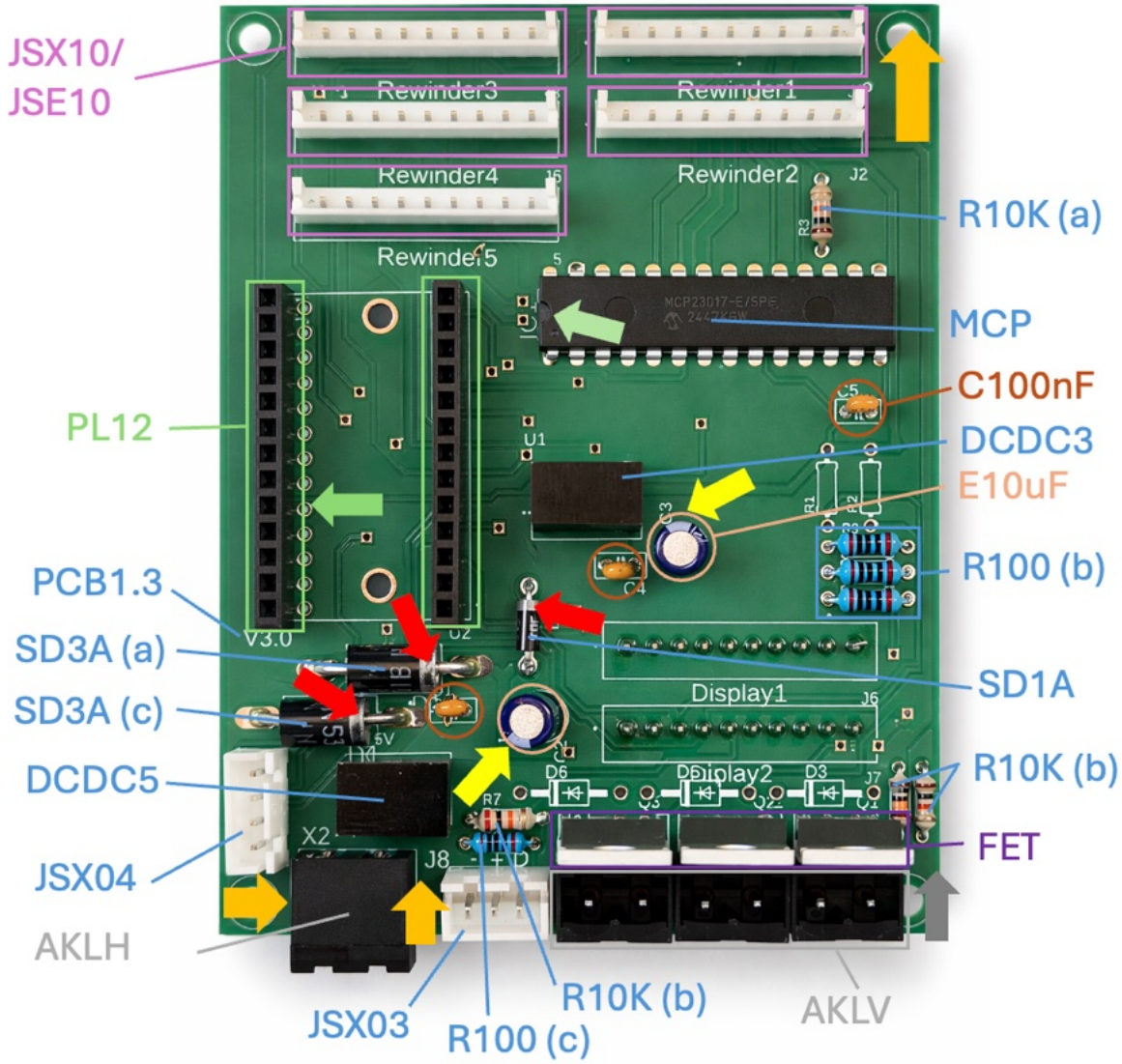


Figure 8 Mainboard PCB1.3 (V3.0) Step 1.

Instead of JSX03 and JSX04 connectors, standard pin headers may also be used. If this option is selected, it must also be considered when connecting the temperature and humidity sensor and the NeoPixel LED strip . Suitable cables are often included with the DHT20.

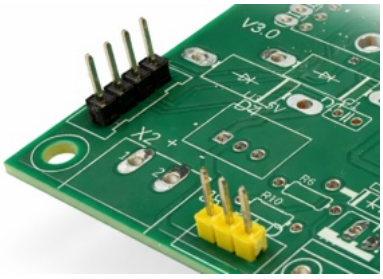


Figure 9 Mainboard PCB1.3 (V3.0) mit den alternativen Stiftleisten.

After completing the assembly, insert the TCA8 breakout board. Ensure that the pin labeled VIN is located at the bottom right.

If the recommended dryer components are used, the D1N400 diodes are not strictly required but can be installed without issues. They may be necessary when using relays or higher-power fans. Ensure correct polarity; the printed rings must face to the left.

The dryer connections operate at 12 V switching voltage and are assigned as follows:

1) Heating element
2) External fan (for ventilation)
3) Internal fan (for air circulation)

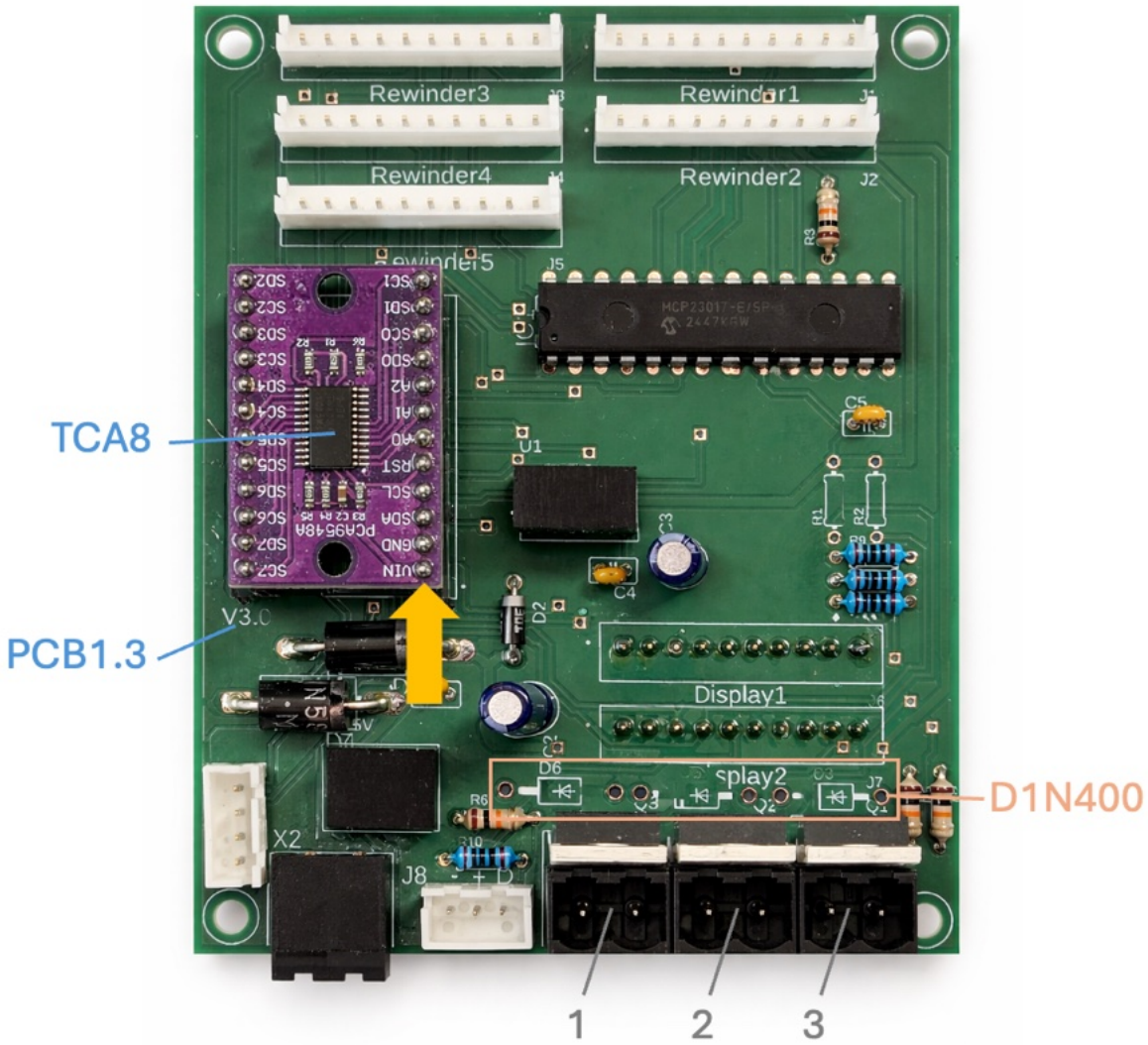


Figure 10 Mainboard PCB1.3 (V3.0) Step 2.

Warning: After inserting the TCA8 breakout board, check again that it has been inserted in the correct orientation and that none of the pins are offset.

On the back side, install the two JSX10/JSE10 connector headers for the display .
The connector openings must face toward the center of the board.

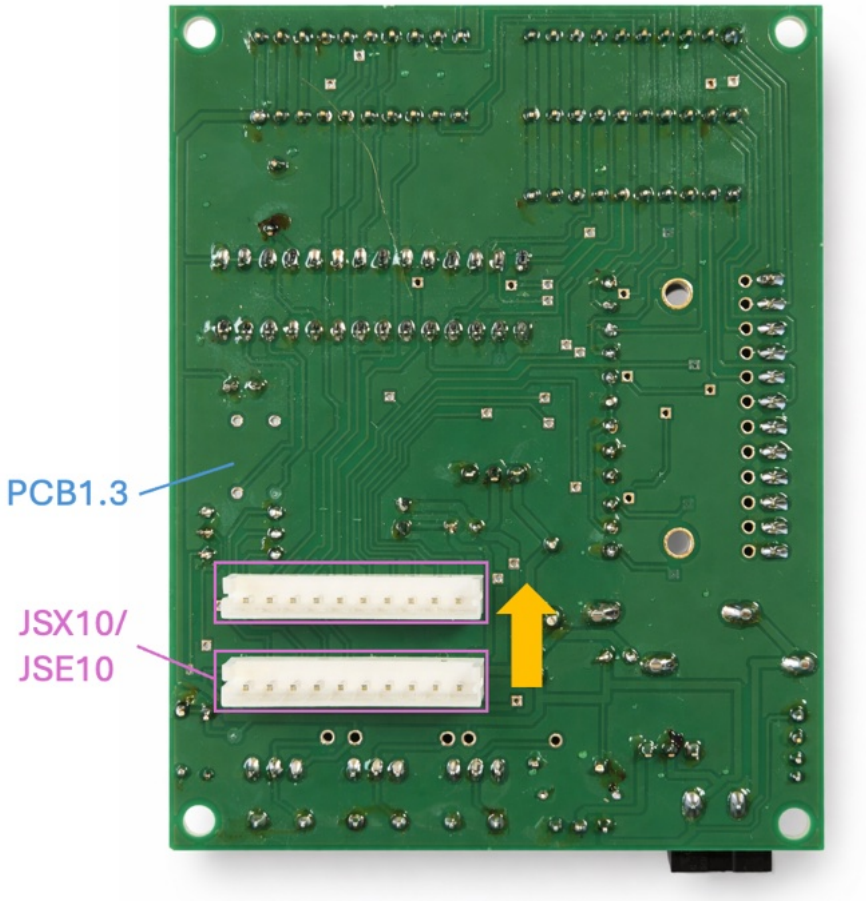


Figure 11 Mainboard PCB1.3 (V3.0) Step 3.

7.2.2.3 Connections

In addition to the five Smart Rewinder connections , mainboard PCB1.3 provides the following connections :

(A) I2C bus for the temperature and humidity sensor with 3.3 V
(B) 12 V DC power supply
(C) Adafruit NeoPixel connection with 5 V and digital signal
(D) Switching output for the heating element, 12 V
(E) Connection for two 12 V fans for external ventilation
(F) Connection for two 12 V fans for internal air circulation

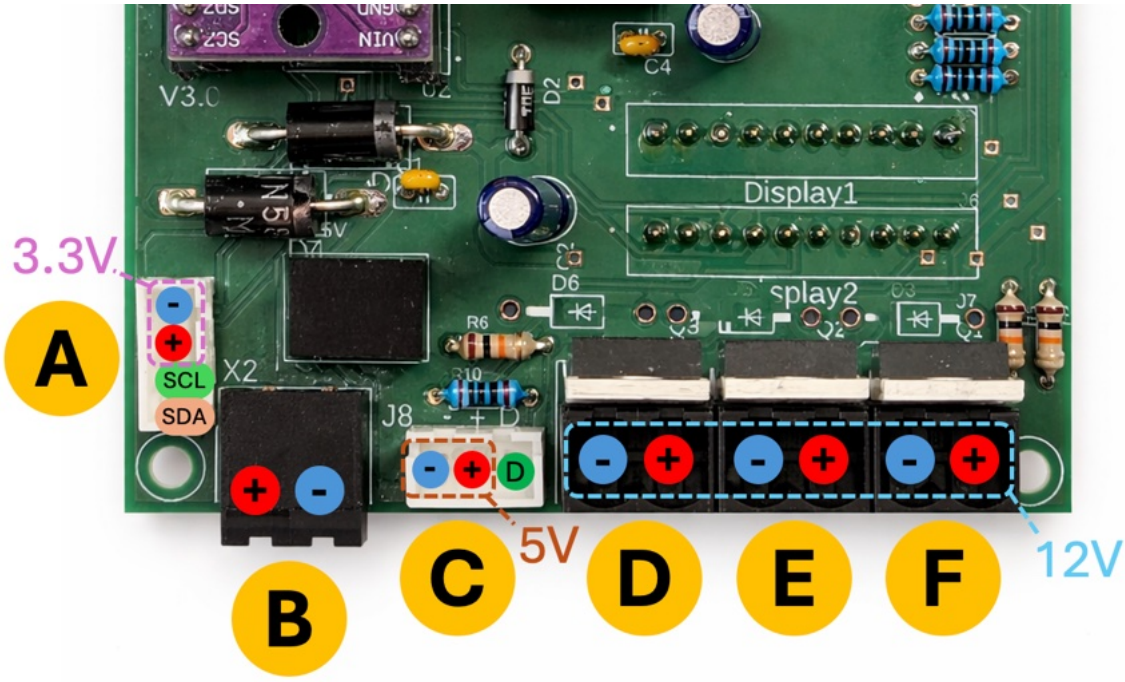


Figure 12 Connections of Mainboard PCB1.2 (V3.0).

Important: **Do not connect high-power components, such as heating elements, directly to the 12 V connections (D), (E), and (F). The PCB traces are not designed for such loads.**

7.2.3 Display Board

The display board can be manufactured using the Gerber file “Gerber_Display.zip” and ordered from service providers such as PCBWay.

Figure 13 Display board.

Figure 14 Assembled Display board.

7.2.3.1 Materials and Components

Refer to the Bill of Materials for the required components .

Table 9 Materials & quantities for display-board.

ID	Qty.	Purpose / Comment
PCB2	1	
JSX10	2	
JSE10	2	Alternative für JSX10
PL20	2	
E10uF	1	Optional for installation position C1, mounted horizontally

7.2.3.2 Assembly Steps

First, place the JSX10/JSE10 connector headers onto the underside of the display board PCB2 (the side without the “Top” marking) and solder them in place.

Ensure that the connector openings face forward when the board text is readable.

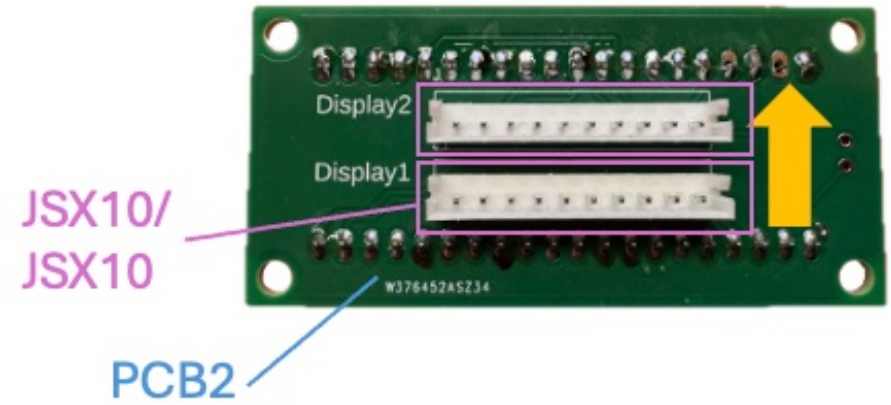


Figure 15 Display board Step 1.

Next, turn the board over and place the two PL20 pin headers for the display onto the top side marked “Top”

Figure 16 Display board Step 2.

Warning: When inserting the display, both during testing and final assembly, ensure that the USB port of the display is located on the side labeled "Display USB" on the board. Also verify that the pins are aligned correctly and not offset.

7.2.4 Rewinder Board

The rewinder board can be manufactured using the Gerber file "Gerber_Display.zip" and ordered from service providers such as PCBWay.

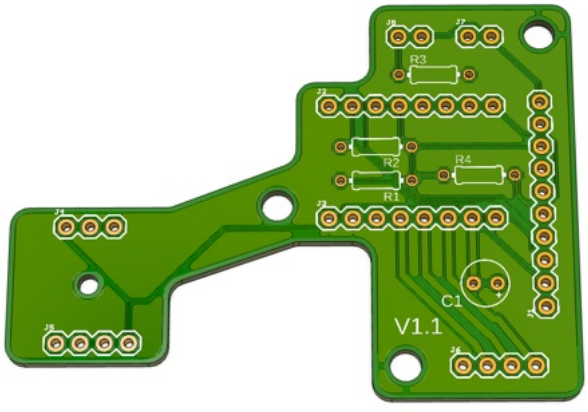


Figure 17 Rewinder board PCB3.

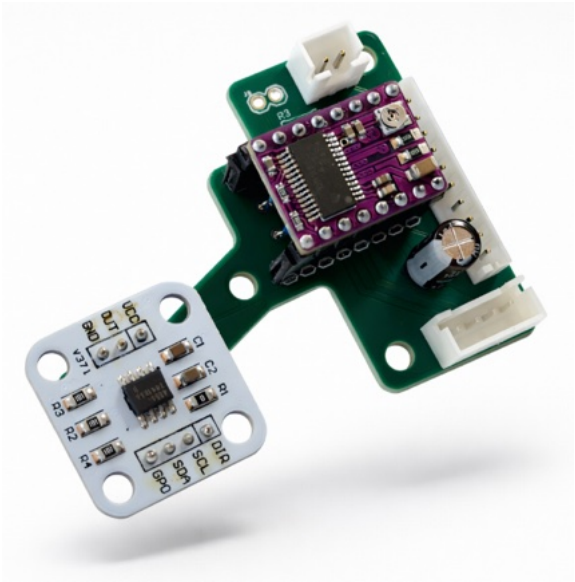


Figure 18 Assembled Rewinder board PCB3.

7.2.4.1 Materials and Components

Refer to the Bill of Materials for the required components .

Table 10 Materials & quantities for rewinder board.

ID	Qty.	Purpose / Comment
PCB3	1	
JSX10	1	
JSE10	1	Alternative für JSX10
PL8	2	
PL4	1	
PL3	1	
JSX02	1	
JSX04	1	
E100uF	1	
R2K2	2	
R10K	1	
DRV	1	

7.2.4.2 Assembly Steps

Position the rewinder board PCB3 as shown in the diagram. Insert all components and solder them in place. Ensure that the openings of the connector headers JSX10/JSE10, JSX02, and JSX04 face toward the inner side of the board. When installing the electrolytic capacitor E100uF, ensure correct polarity ; the negative terminal must be on the left side.

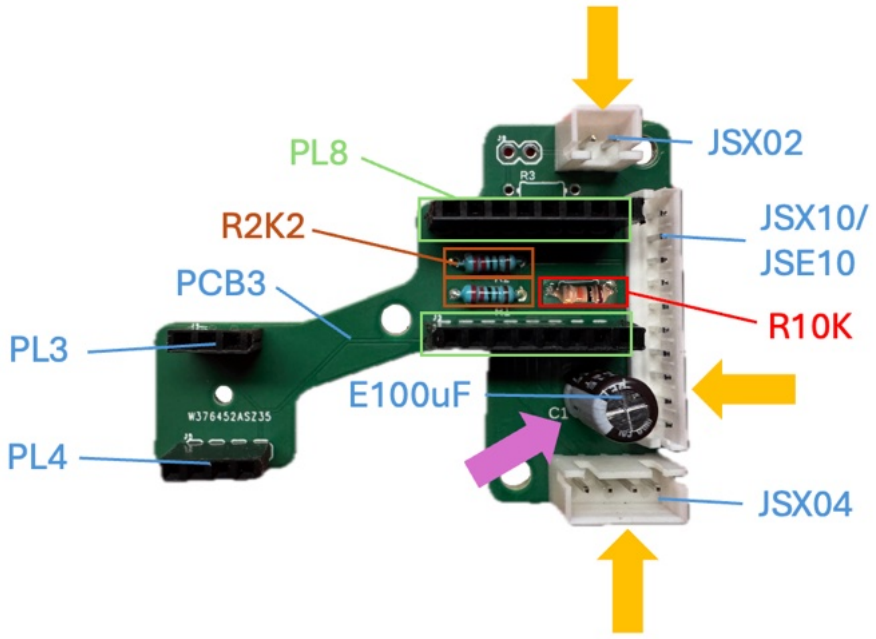


Figure 19 Rewinder board Step 1.

Insert the stepper motor driver module DRV so that the current adjustment potentiometer is located at the top right. Do not forget to attach the heatsink.

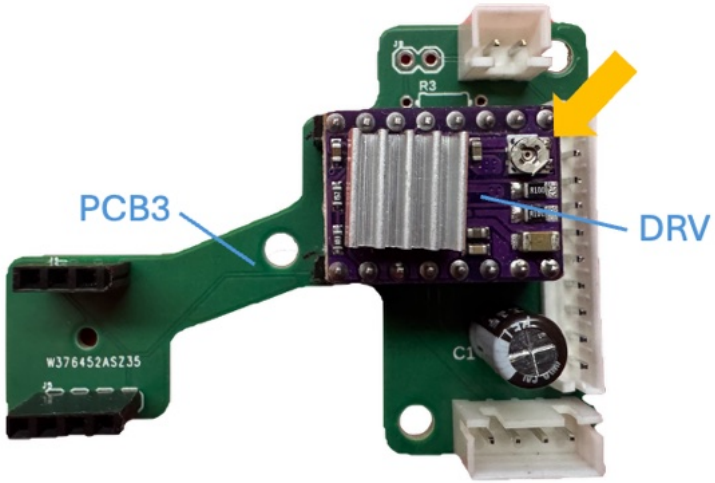


Figure 20 Rewinder board Step 2.

Warning: After inserting the stepper motor driver, verify that it is correctly oriented and that none of the pins are offset.

The magnetic encoder breakout board AS5600 must be equipped with 3-pin and 4-pin headers on the underside before installation.

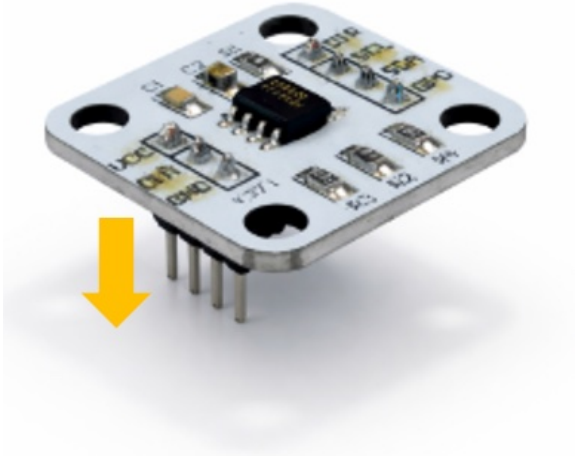


Figure 21 Magnetic Encoder AS56 with pin- header.

7.2.4.3 Current Limit Adjustment

Finally, the current limit must be set using the potentiometer . A dedicated measurement method can be used (for example: https://starthardware.org/stepper-motor-mit-dem-drv8825-steuern/).

Alternatively, you can start with the preset value determined during testing:

Turn the potentiometer clockwise until it reaches the stop, then turn it slightly back until approximately the shown position is reached.

The flat side of the potentiometer can be used as a visual reference.

Make fine adjustments if necessary, as the setting is very sensitive: Turning clockwise decreases the current. Turning counterclockwise increases the current.

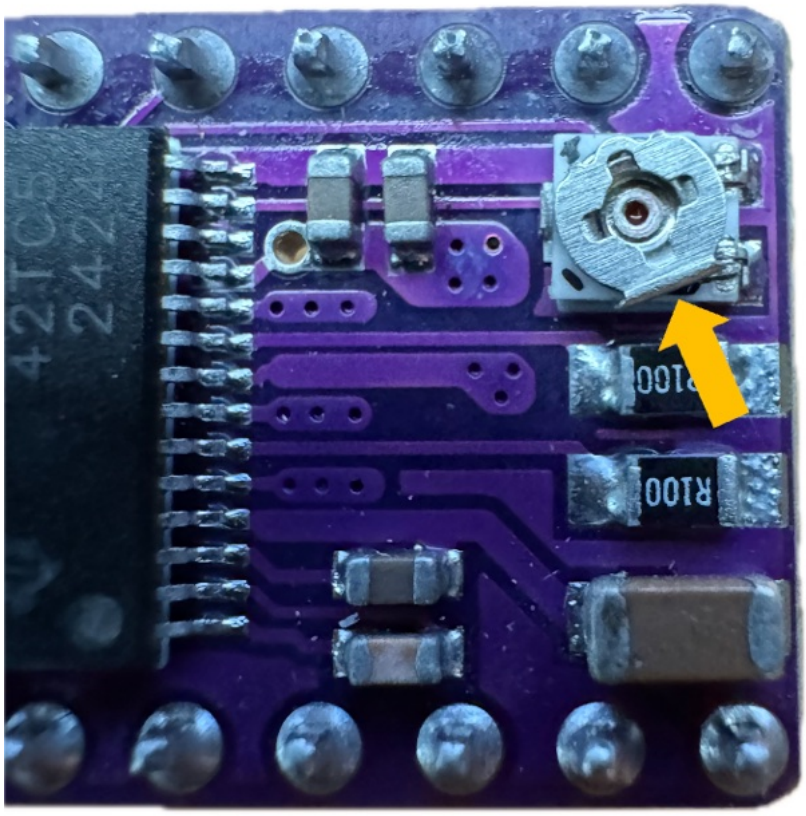


Figure 22 Rewinder board Step 3, adjustment of current limit.

7.3 Additional Components for Power Supply and Microcontroller/Display Connection

7.3.1 Display Cable

You can assemble the cables yourself using appropriate crimping tools ; suitable kits are available, for example, on Amazon. It is essential that the connectors are assembled in reverse orientation (pin 1 to pin 10, pin 2 to pin 9, etc.) so that the polarity matches the orientation of the connector headers on the boards. Alternatively, other connector systems may be used, provided they have a pitch of 2.54 mm and fit within the available space. Ensure a sufficient wire cross-section of at least AWG26 or 0.14 mm² . Reliable connections are important, as the communication bus is also routed through these cables. With high-quality connectors and cables, cable lengths of up to approximately 50 cm are generally unproblematic.

Direct soldering of cables to the PCB is not recommended.

7.3.1.1 Materials and Components

Table 11 Materials & quantities for display cable.

ID	Qty.	Purpose / Comment
JCX1030	2	
JCE1030	2	Alternative for JCX1030
PCS5	1	Approx. 27 cm long

7.3.1.2 Assembly Steps

Mark both ends of each cable (JCX1030/JCE1030) so they can be clearly identified later, for example, display 1 with one mark and display 2 with two marks.

Then insert both cables into the cable sleeve PCS5 .

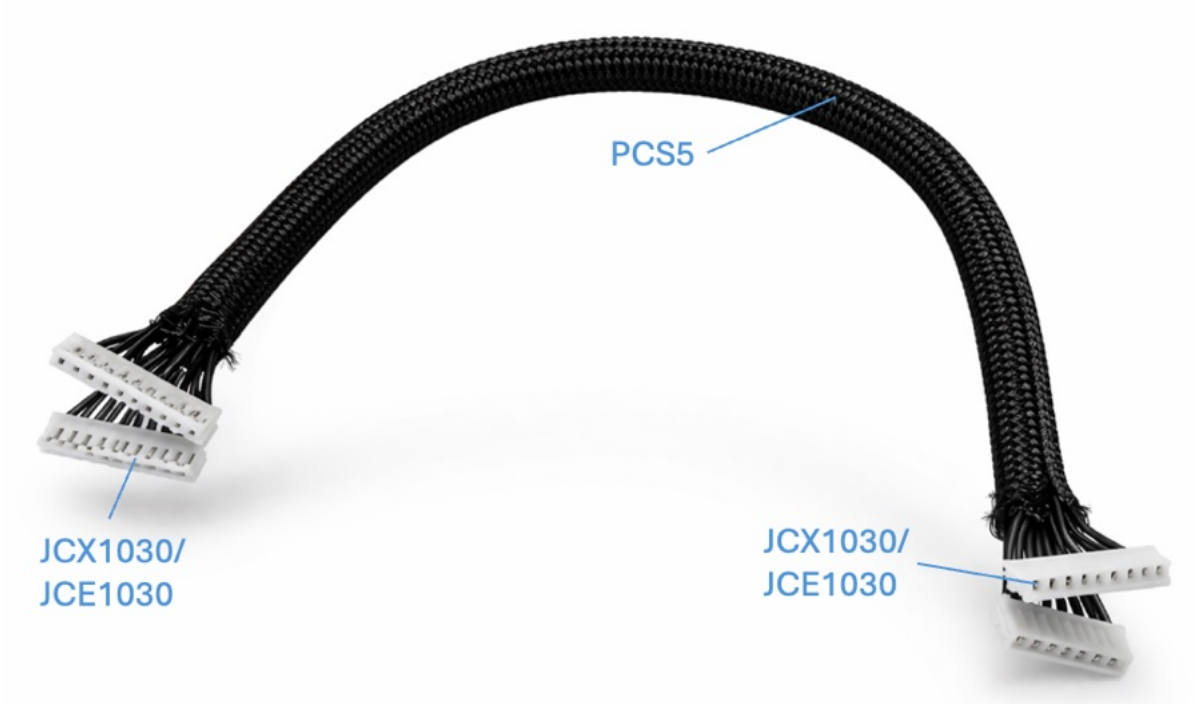


Figure 23 Display cable.

7.3.2 Power Supply

If you are using only the Smart Rewinder function with mainboard PCB1.1 (V1.0 or V2.0), you can skip this section, as the ready-made power supply DC12.3 is used in that case.

7.3.2.1 Materials and Components

Table 12 Materials & quantities for power supply.

ID	Qty.	Purpose / Comment
AKLB	1	
DC12.20	1	
C2.5x2	250 cm	Without Dryer: in one piece. With Dryer and HBS12 heated bed power module: in two pieces — 1 × 225 cm and 1 × 25 cm.

7.3.2.2 Assembly Steps

Connect the 250 cm cable C2.5x2 to the terminal connector AKLB . If you are using the heating module HBS12 , use the 25 cm cable segment. With the terminal connector oriented so that the screws face upward, connect the red wire (positive) to the left and the black wire (negative) to the right .

For connection details of the mainboard, refer to section 7.2.2.3.

If the heating module is not used, connect the other end of the cable (A) directly to the power supply DC12.20. If the heating module is used, connect it instead to the heating module HBS12 as described in section 7.5.2.

Figure 24 Mainboard power supply cable.

7.3.2.3 Important Notes

Always ensure correct polarity :

Red wire = positive (+)

Black wire = negative (−)

Incorrect polarity may damage components or the entire system.

7.4 Additional Components for Rewinder

For each Smart Rewinder required.

7.4.1 Smart Rewinder Cable

You can assemble the cables yourself using appropriate crimping tools ; suitable kits are available, for example, on Amazon.

It is essential that the connectors are assembled in reverse orientation (pin 1 to pin 10, pin 2 to pin 9, etc.) so that the polarity matches the orientation of the connector headers on the boards.

Alternatively, other connector systems may be used, provided they have a pitch of 2.54 mm and fit within the available space.

Ensure a sufficient wire cross-section of at least AWG26 or 0.14 mm² .

Reliable connections are important, as the communication bus is also routed through these cables.

With high-quality connectors and cables, cable lengths of up to approximately 50 cm are generally unproblematic.

Direct soldering of cables to the PCB is not recommended.

7.4.1.1 Materials and Components

Refer to the Bill of Materials for the required components .

Table 13 Materials & quantities for Smart Rewinder-cable.

ID	Qty.	Purpose / Comment
JCX1030	1	
JCE1030	1	Alternative für JCX1030
PCS5	1	Approx. 27 cm long

7.4.1.2 Assembly Steps

Insert the cable JCX1030/JCE1030 into the cable sleeve PCS5 .

Figure 25 Rewinder cable.

7.4.2 Filament Tension Micro Switch

7.4.2.1 Materials and Components

Refer to the Bill of Materials for the required components .

Table 14 Materials & quantities for filament tension micro-switch.

ID	Qty.	Purpose / Comment
MSWR	1	
JCX0210	1	

7.4.2.2 Assembly Steps

Cut the wires of the cable JCX0210 to approximately 12 cm and strip about 5 mm of insulation from the ends.

Solder the two wires to the lower two terminals of the micro switch MSWR .

The terminals should be labeled “C” (common) and “NO” (normally open).

Figure 26 Filament tension micro switch.

7.5 Additional Components for Dryer

7.5.1 Temperature and Humidity Sensor

Select the option that matches your mainboard configuration .

7.5.1.1 Materials and Components

Refer to the Bill of Materials for the required components .

Table 15 Materials & quantities für temperature and humidity sensor.

ID	Qty.	Purpose / Comment
DHT20	1	Dupont cables for Option B should be included pre-assembled
JBX04	1	For Option A, to convert the included cable to JST
JCXCB	4	For Option A, to convert the included cable to JST

7.5.1.2 Assembly Steps

For option B, simply connect the cable to the pins of the temperature and humidity sensor . Note that the pin assignment may differ from the mainboard.

Ensure that pins with identical labels on the sensor and the mainboard are connected correctly.

For option A, cut off the Dupont connectors on one side of the cable. Replace them with JST crimp contacts and insert them into the JSX04 socket in the correct order.

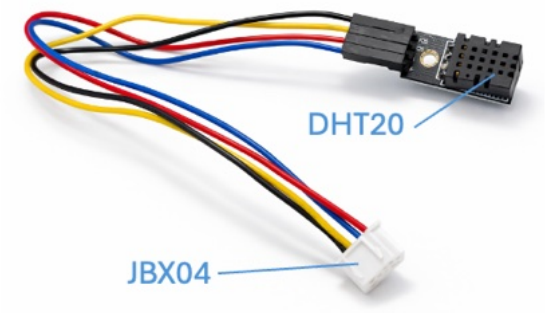


Figure 27 DHT20 with JBX04 cable (Option A).

Figure 28 DHT20 with Dupont cable (Option B).

7.5.2 Heating Module

Due to the high currents involved, a commercially manufactured high-power switching module is used.

These modules are inexpensive, widely used, and feature professionally manufactured solder joints.

This is an important safety measure, as the system may operate for extended periods without supervision.

7.5.2.1 Materials and Components

Refer to the Bill of Materials for the required components .

Table 16 Materials & quantities for heating module.

ID	Qty.	Purpose / Comment
AKLB	1	
HBS12	1	
PHF12	4	
WAGO3	6	
HSTUBE	40 mm	Optional heat shrink tube 2 x approx. 20 mm, if an extension of the control wire is required.
C2.5x2	60 cm	3 × approx. 20 cm (excluding the wire segments for the power supply)
C0.5x2	10 cm	Possibly for extending the control line

7.5.2.2 Assembly Steps

When using the dryer, the power supply for the mainboard is routed through the heating module HBS12 .

Connect the cable C2.5x2 (C) from the power supply DC12.20 and the approximately 25 cm cable (D) for the mainboard power supply to the corresponding terminals on the HBS12.

At the output terminals (often labeled “BED”), connect the 25 cm long combined cable (B) leading to the heating elements PHF12 .

The control cable (A) supplied with the HBS12 will later be connected to the mainboard.

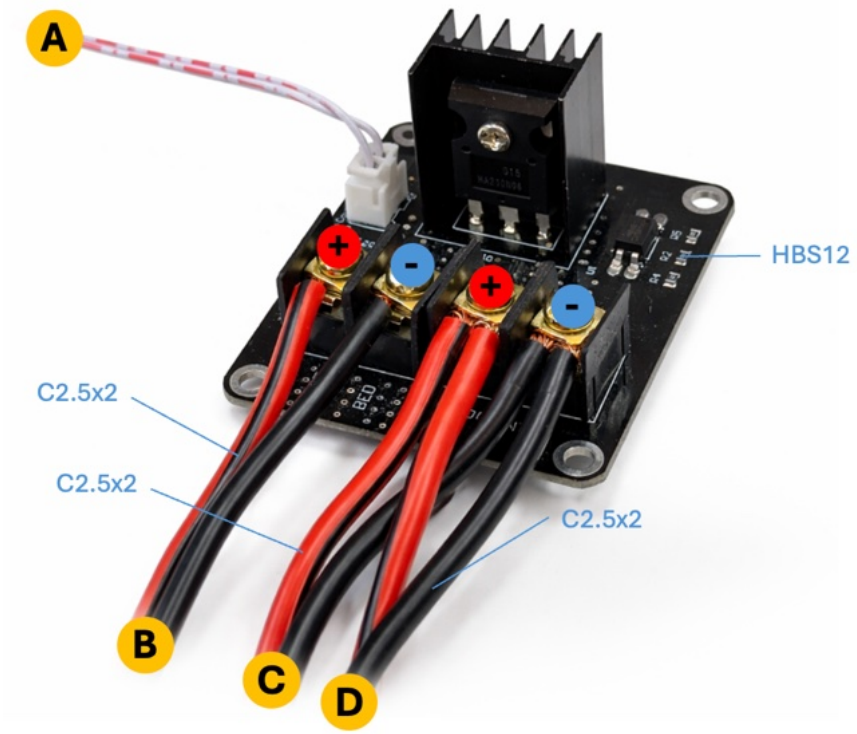


Figure 29 Connectors on 12V high-power switching module.

Warning: Always ensure correct polarity .

Red wire = positive (+)

Black wire = negative (–)

Prepare two pairs of heating films:

Use two WAGO connectors and insert one wire of a 20 cm cable C2.5x2 into each center terminal.

Then connect one wire from each of the two heating films to the WAGO connectors.

Repeat this process for the second pair.

Next, connect two WAGO connectors to the central supply cable leading to the heating module.

Insert the two heating film pairs into the remaining terminals.

Polarity is not critical here, but consistent color usage (red/black) is recommended for clarity.

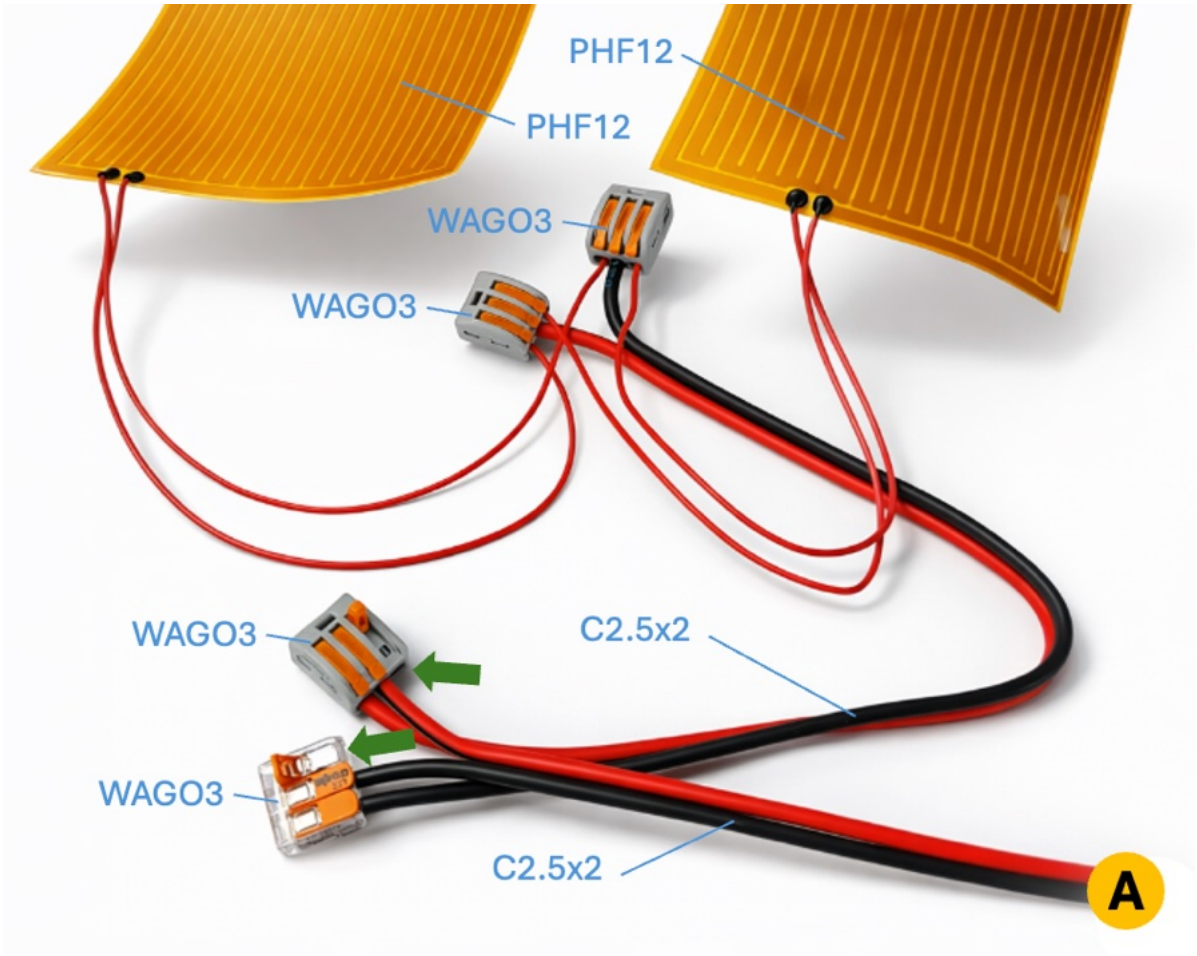


Figure 30 Heating foils PHF12 with cables.

If necessary, extend the control cable by a few centimeters.

Attach the terminal connector AKLB to the open end.

Polarity may not be predefined depending on the module version; verify this and connect accordingly.

Refer to section 7.2.2.3 for mainboard connection details.

Figure 31 Control cable for 12V high-power switching module.

7.5.3 Fan module

A fan module consists of two fans . Two fan modules are required: one for internal air circulation and one for external ventilation. For the internal variant, optional also two fans can be connected instead of one.

7.5.3.1 Materials and Components

Refer to the Bill of Materials for the required components .

Table 17 Materials & quantities for fan module.

ID	Qty.	Purpose / Comment
AKLB	2	
HSTUBE	160 mm	Heat shrink tube 8 x approx. 20 mm
FAN12	4/6	For the internal fans you could also use two on each side.
C0.5x2	140 cm	4 x ca. 35 cm

7.5.3.2 Assembly Steps

Cut off the original connectors from the fans. Extend each wire using approximately 35 cm of cable C0.5x2.

Connect the wires of two fans to one terminal connector AKLB. With the connector oriented so that the screws face upward:

Connect the black wires (negative) to the left.

Connect the red wires (positive) to the right .

Refer to the mainboard connection details in section 7.2.2.3 on page 30.

Figure 32 Fan module with 2 x FAN12 and extended wires and connector AKLB.

7.6 Additional Components for Lighting

7.6.1 LED Strip

The connection cables of the Adafruit NeoPixel LED strip are very short and must be extended for this application.

7.6.1.1 Materials and Components

Refer to the Bill of Materials for the required components .

Table 18 Materials & quantities for lighting.

ID	Qty.	Purpose / Comment
JBX03	3	Or pin header connectors (Dupont)
JCXCB	3	
HSTUBE	60 mm	Heat shrink tube 3 x approx. 20 mm
NEOP	1	
C0.5x2	100 cm	2 × approx. 50 cm, with only one conductor from one piece used for the signal line

7.6.1.2 Assembly Steps

Remove the original connector from the NeoPixel LED strip NEOP.

Extend the power supply wires (red and black) using a 50 cm cable C0.5x2 .

Separate the two wires of a second cable.

Use the black wire to extend the green signal wire of the LED strip .

Crimp JST contacts onto all open wire ends using appropriate crimping tools .

Insert the crimped wires into the JST socket housing JBX03.

With the connector latch facing upward, the pin assignment from left to right is as follows:

Negative (–) ⟶ black wire of the power pair

Positive (+) ⟶ red wire of the power pair

Signal (D) ⟶ single black wire (signal line)

Verify the pin assignment with the mainboard connection details in section 7.2.2.3.

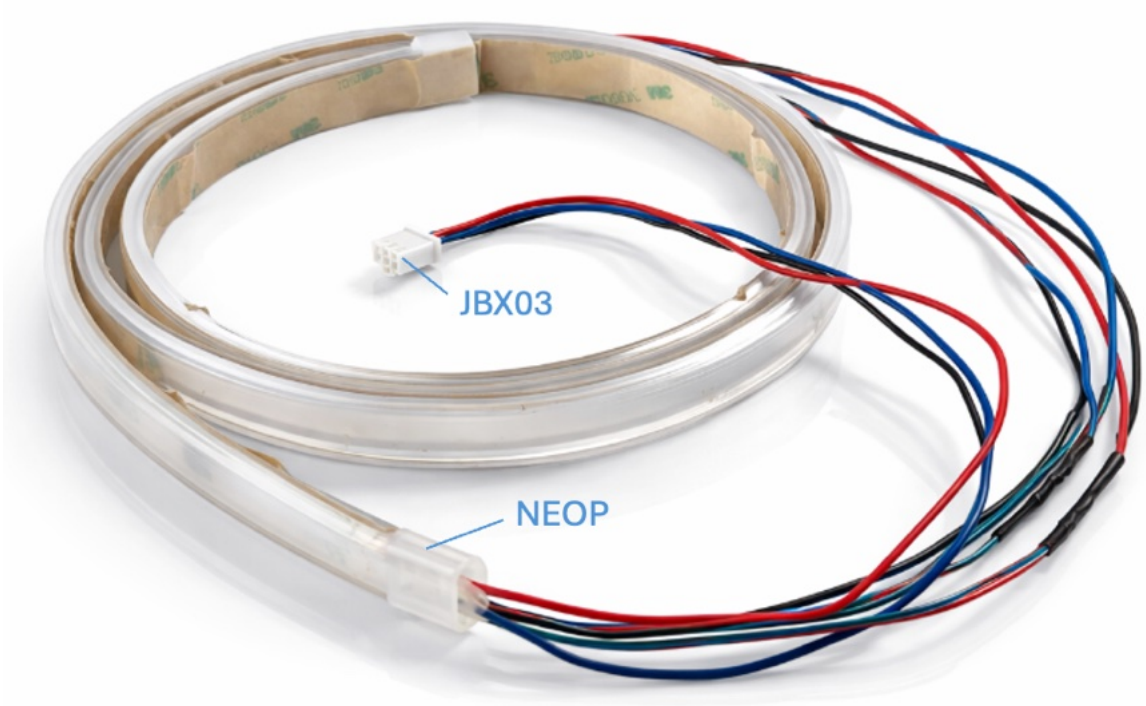


Figure 33 Adafruit NeoPixel NEOP with extended wires and JBX03.

8 Firmware and Programming

For updates of an already functioning system, it is only necessary to flash the firmware again.

If the ESP32T has been erased or during initial setup, the bootloader and partition table must also be flashed.

8.1 Programming /Flashing the Firmware

8.1.1 Preparation

Open the following website in the Chrome browser: https://espressif.github.io/esptool-js/

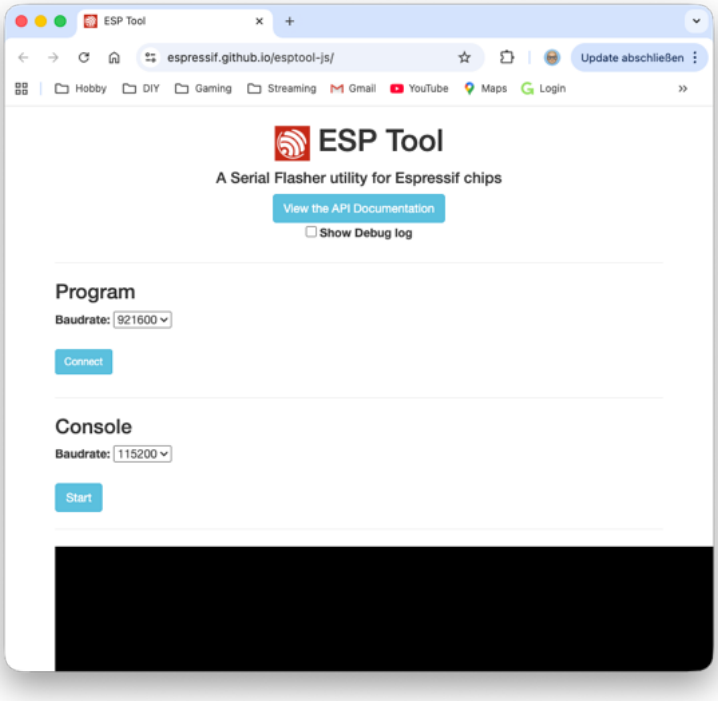


Figure 34 ESP32T Firmware programming Step 1.

8.1.2 Steps

V Connect the ESP32T to your computer via USB.

Press and hold the “BOOT” button, then briefly press the “RST” button.

After that, release the “BOOT” button.

Click the “Connect” button on the ESP tool website.

In the dialog window, select your ESP32T device (usually named “USB JTAG/serial…”).

Confirm the selection by clicking “Connect”.

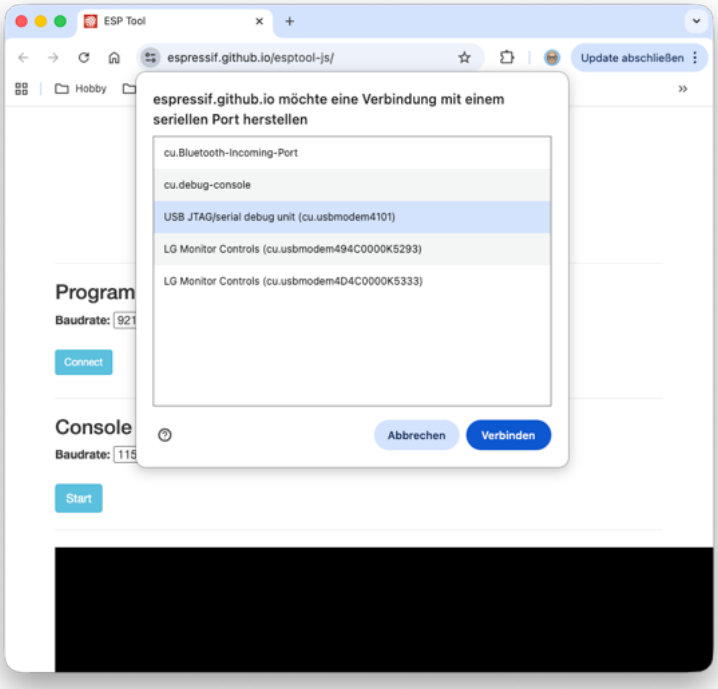


Figure 35 ESP32T Firmware programming Step 2.

Enter the following value in the “Flash Address” field: 0x00010000

Click “Choose File” and select the file “firmware.bin” from the download.

Click “Add File” and repeat the process with: Address: 0x00000000 and file “bootloader.bin”

Click “Add File” again and repeat the process with: Address: 0x00008000 and file: “partitions.bin”

Click the “Program” button to start the flashing process.

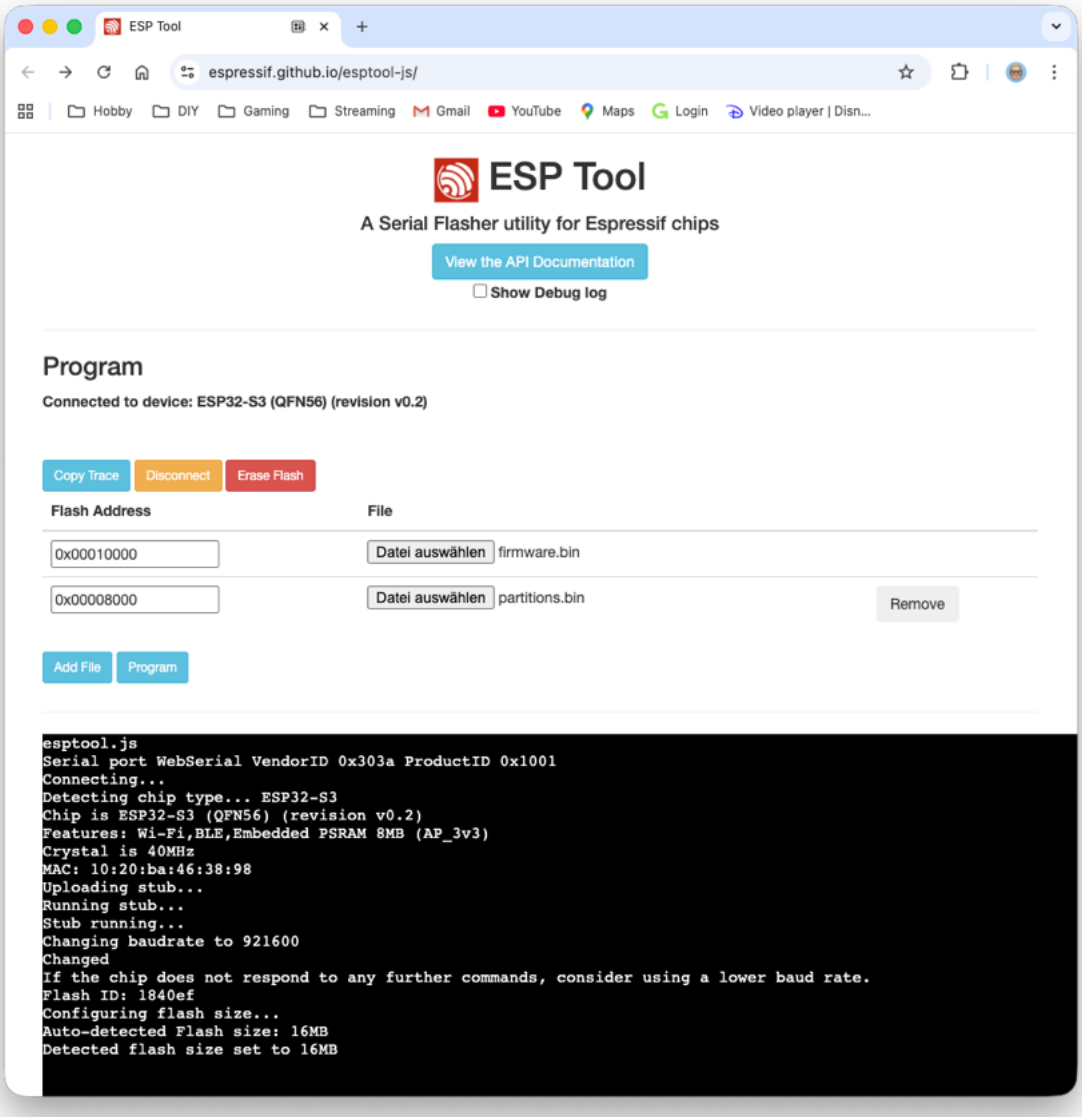


Figure 36 ESP32T Firmware programming Step 3.

You can monitor the progress in the output window.

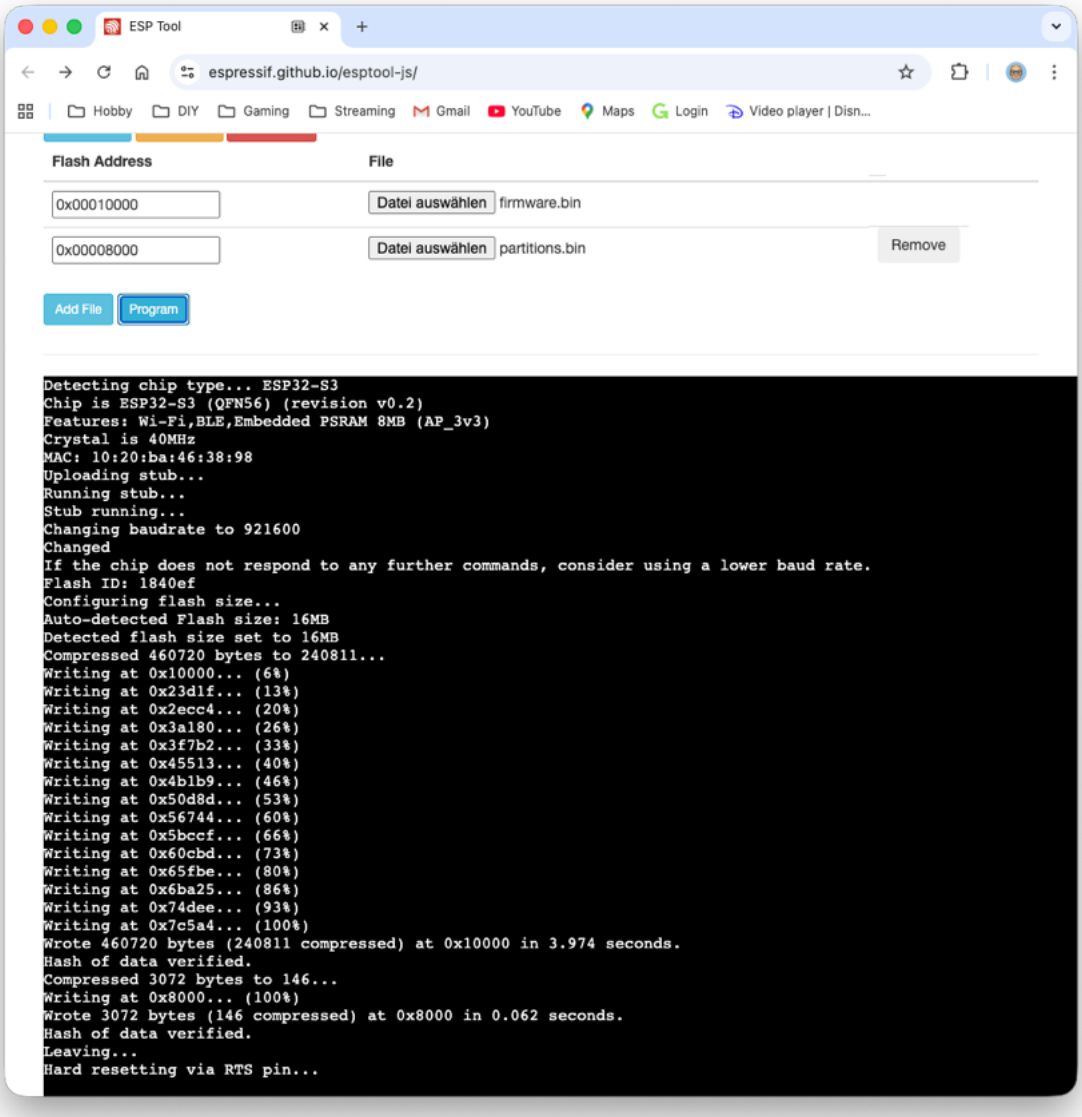


Figure 37 ESP32T Firmware programming Step 4.

After the process is completed, press the “RST” button on the ESP32T.

The microcontroller should then start with the 3D Precision logo.

8.2 Used Software Libraries

Table 19 Used Software Libraries.

Library	Verwendungszweck / Bemerkung
Adafruit_MCP23X17.h	I/O-Multiplexer https://github.com/adafruit/Adafruit-MCP23017-Arduino-Library
Adafruit_NeoPixel.h	NeoPixel https://github.com/adafruit/adafruit_neopixel
U8g2lib.h	Font https://github.com/olikraus/u8g2
Arduino_GFX_Library.h	Graphics https://github.com/moononournation/Arduino_GFX/tree/master
cst816t.h	Touch Sensor https://github.com/koendv/cst816t
TCA9548.h	I2C Multiplexer https://github.com/RobTillaart/TCA9548
AS5600.h	Magnetic rotation meter https://github.com/RobTillaart/AS5600
DHT20.h	Temp. & Humidity https://github.com/RobTillaart/DHT20
WiFiManager.h	Captive WLAN https://github.com/tzapu/WiFiManager
mqtt_client.h	MQTT Communication https://github.com/tuanpmt/esp_mqtt
Chart.js	Html Charts https://github.com/chartjs/Chart.js
JQuery	JavaScript https://github.com/jquery/jquery

9 Operation

9.1 WiFi Connection

Open the WiFi settings on your smartphone and select the network “SmartRewinder” from the list of available networks.

Figure 38 Smartphone WLAN Settings.

Once connected, the WiFiManager will open automatically.
Select “Configure WiFi”.

Figure 39 Start Screen WiFi Manager.

Choose the network that the controller should connect to and enter the corresponding password.

Figure 40 Captive WLAN selection.

Scroll down and define a device name .

The username and password will later be used to log in via the web interface .

These credentials can also be viewed at any time directly on the device under “Info”.

Finally, click the “Save” button.

The controller will attempt to connect to the network.

A successful connection is indicated by a white WiFi icon in the status bar of the display .

Figure 41 Captive WLAN zusätzliche Eingaben.

9.2 Web Interface

The controller web interface can be accessed by entering the IP address (see “Information” on the touch-display) in a browser.

Alternatively, you can use: http://<device name>.local

9.2.1 Login

After opening the web interface, you must log in if you are not already authenticated.

Use the username and password defined during WiFi setup.

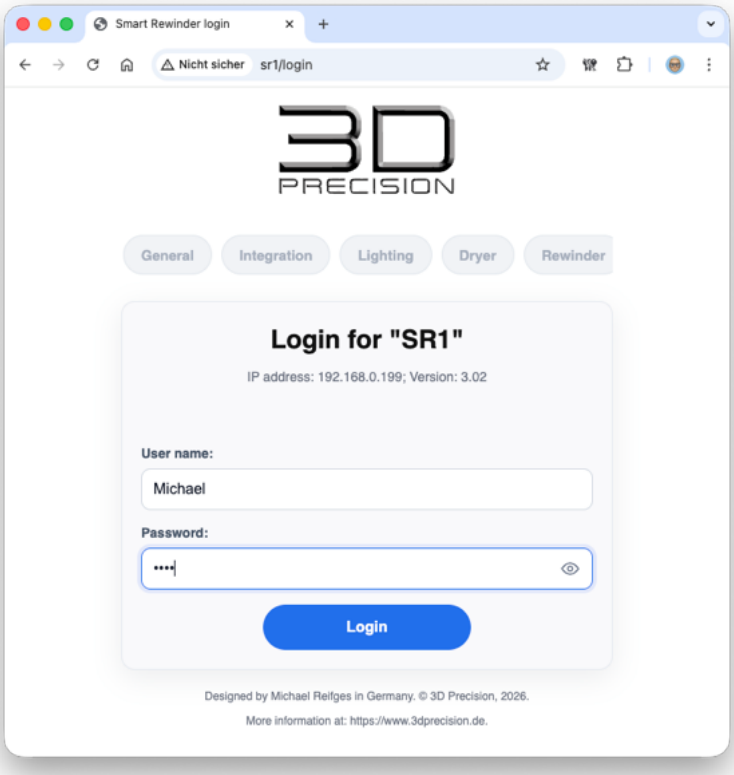


Figure 42 Web Interface Log in.

9.2.2 General Settings

After successful login, the general settings page is displayed.

The available menu options depend on the mainboard and installed features.

On this page, you can change: Device name, user name and password

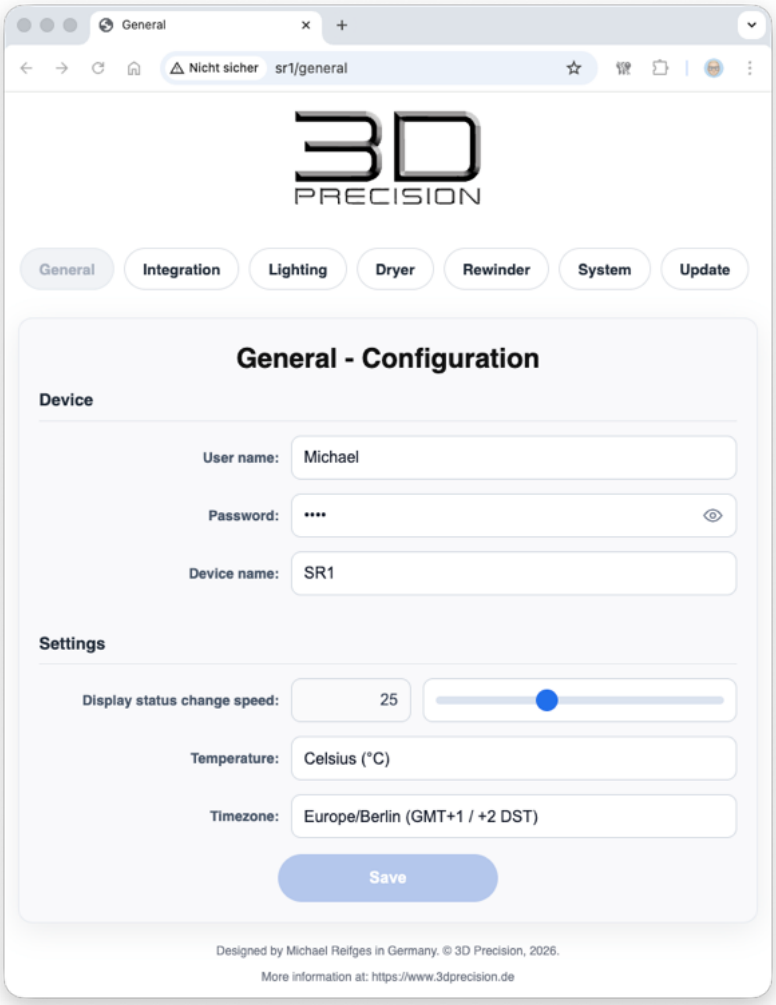


Figure 43 Web Interface Gerneral Settings.

9.2.3 Integration Settings

Enter the configuration details for integration with PrusaLink and Home Assistant .

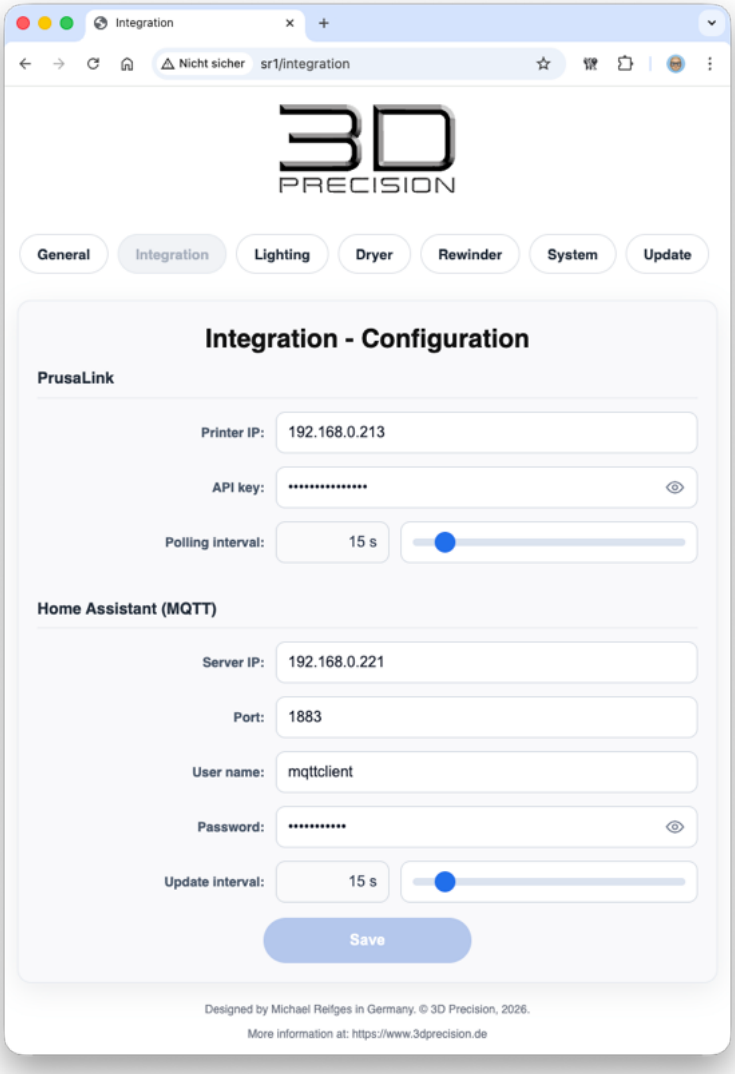


Figure 44 Web Interface Integration Settings.

9.2.4 Lighting Setting

The LED lighting is only active/visible when enabled.

You can define individual colors for each printer state.

The color black (0, 0, 0) represents the off state.

Status colors are only applied if the corresponding option is enabled.

If not enabled, the idle color is used.

The Smart Rewinder lighting function is not yet implemented. It will be introduced in a future update depending on the selected LED strip.

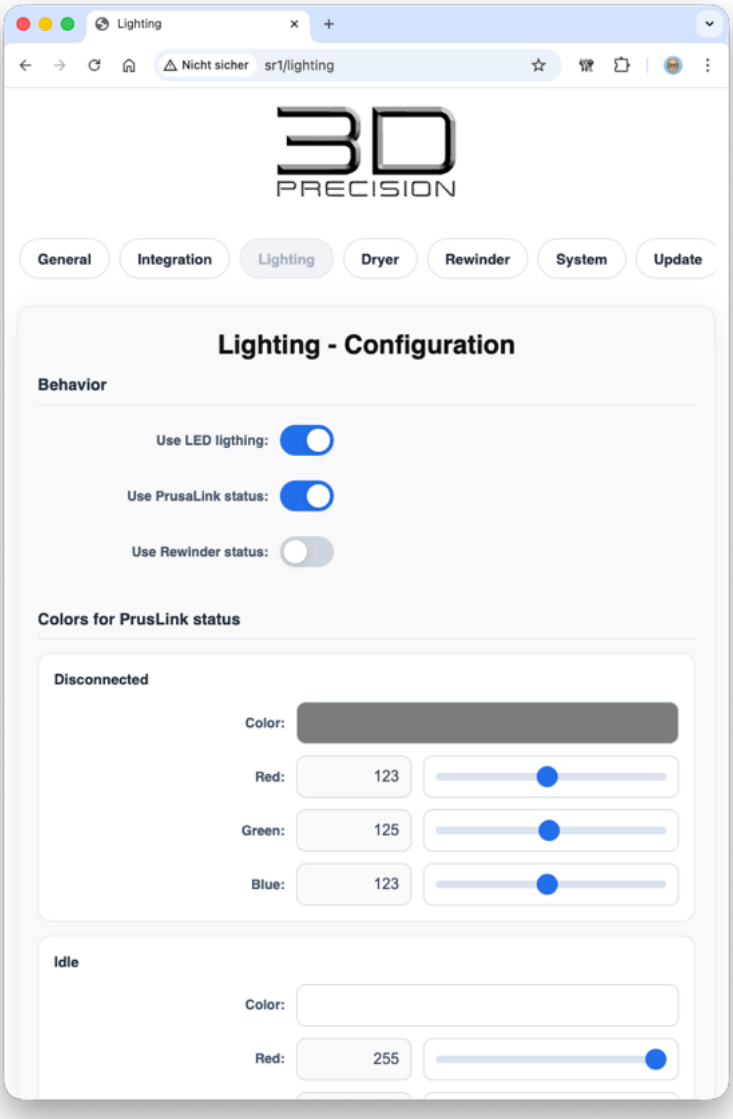


Figure 45 Web Interface Lighting 1.

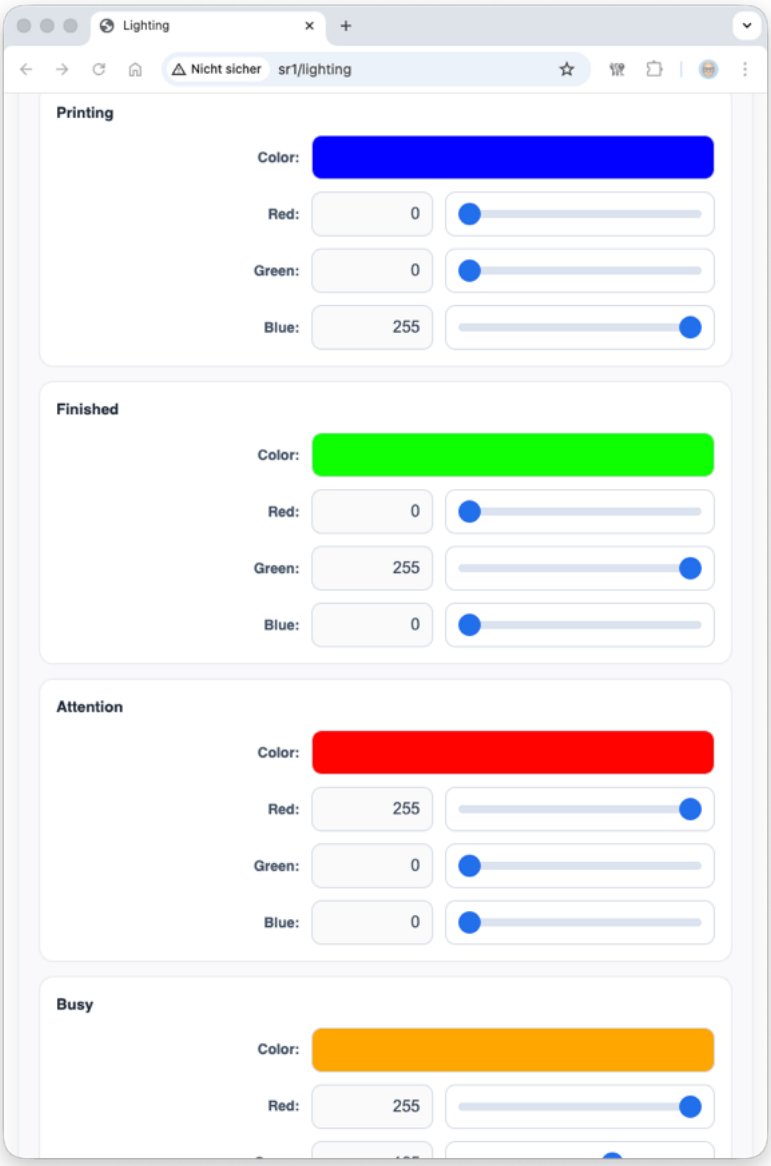


Figure 46 Web Interface Lighting 2.

9.2.5 Dryer Settings

The chart displays temperature and humidity values over the last 60 minutes at one-minute intervals.

You can configure whether the dryer should return to its previous operating state after a restart.

Default values are used if no custom settings are defined.

Figure 47 Web Interface Dryer Settings.

9.2.6 Rewinder Settings

Individual parameters can be configured for each Smart Rewinder .

Use the “Default” button to reset values to their default settings.

Changes are only applied after clicking the “Save” button.

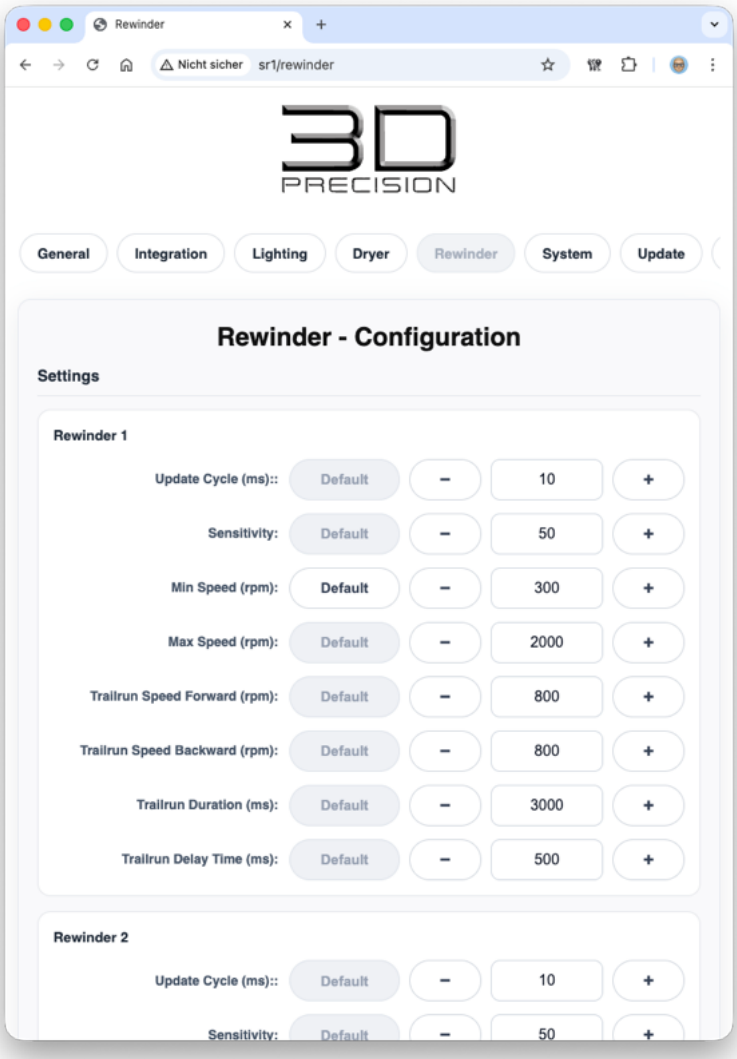


Figure 48 Web Interface Rewinder Settings.

9.2.7 System Information

This page displays internal system information such as hardware, firmware , memory status, and network data.

The information is updated automatically approximately every 60 seconds.

You can also refresh the data manually.

Additionally, the controller can be restarted from this page.

In the hardware section, installed board versions can be configured and saved.

After changes, the controller will restart automatically.

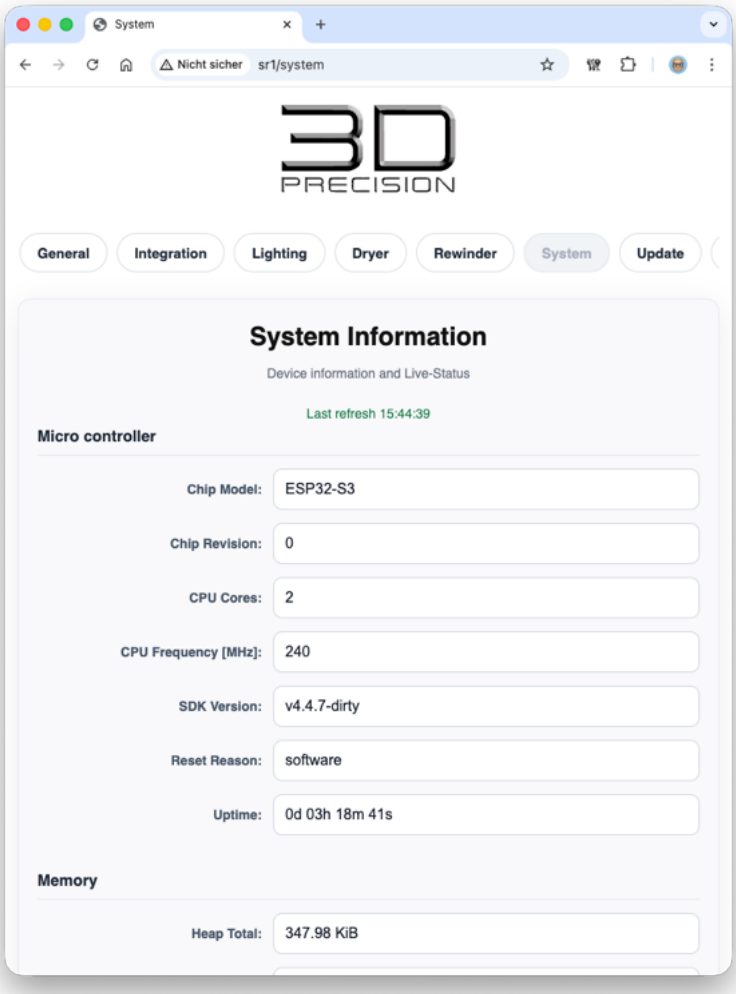


Figure 49 Web Interface System Informationen 1.

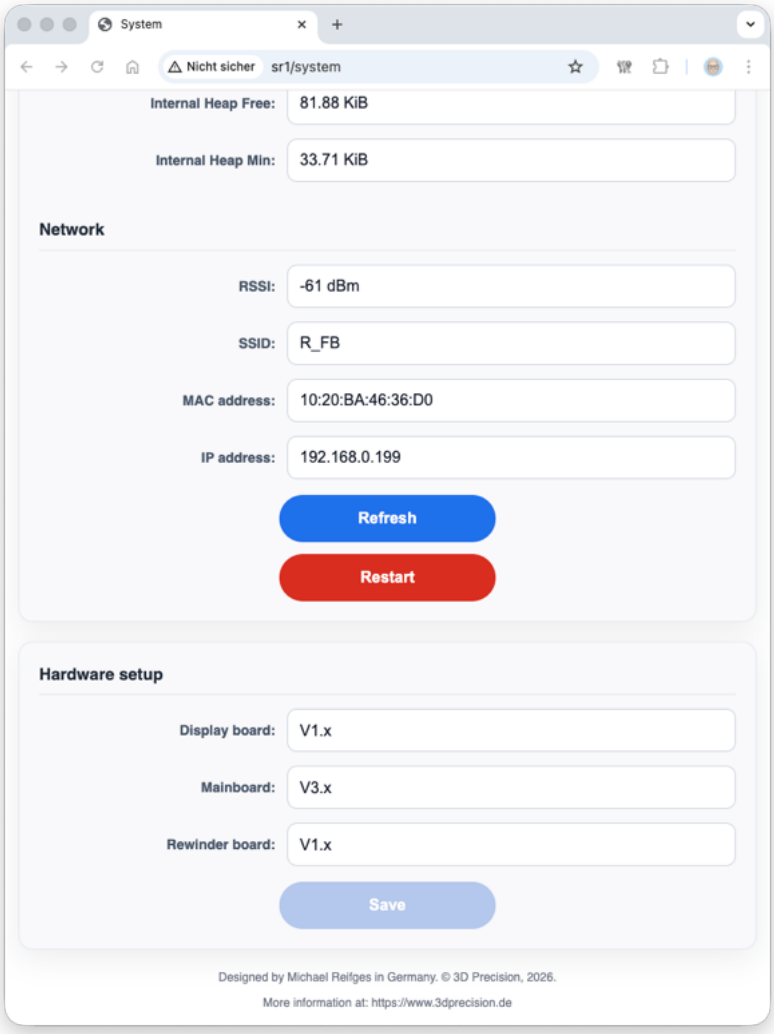


Figure 50 Web Interface System Informationen 2.

9.2.8 Firmware Update

Select the firmware file by drag and drop or using the file selection dialog.

Important: The system does not verify whether the selected file is valid firmware. If an invalid file is uploaded, the ESP32T may no longer start. In this case, the device must be reflashed using the web tool.

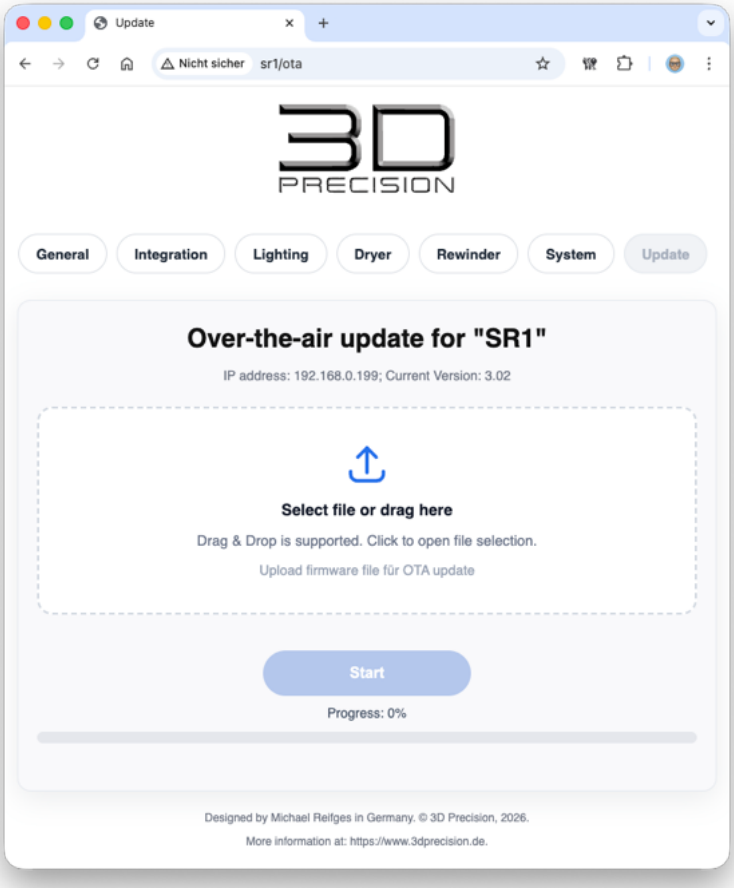


Figure 51 Controller Web-Interface Firmware Update File Selection.

After selecting the file, the “Start” button becomes active.

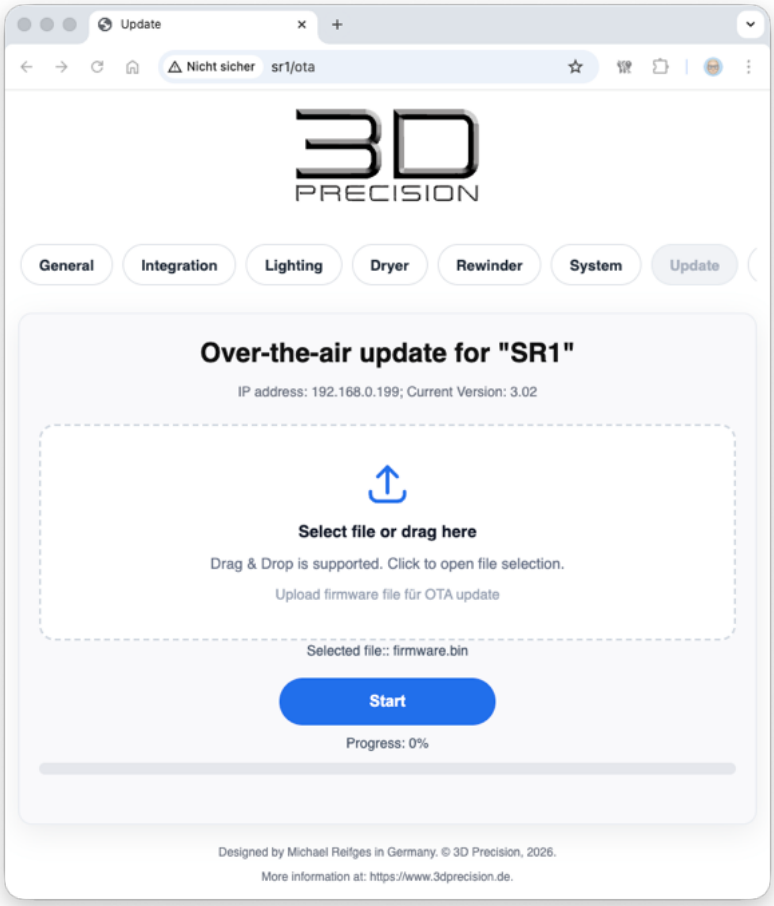


Figure 52 Controller Web Interface Start Firmware Update.

Click “Start” to begin the upload process.

The progress is displayed below the button.

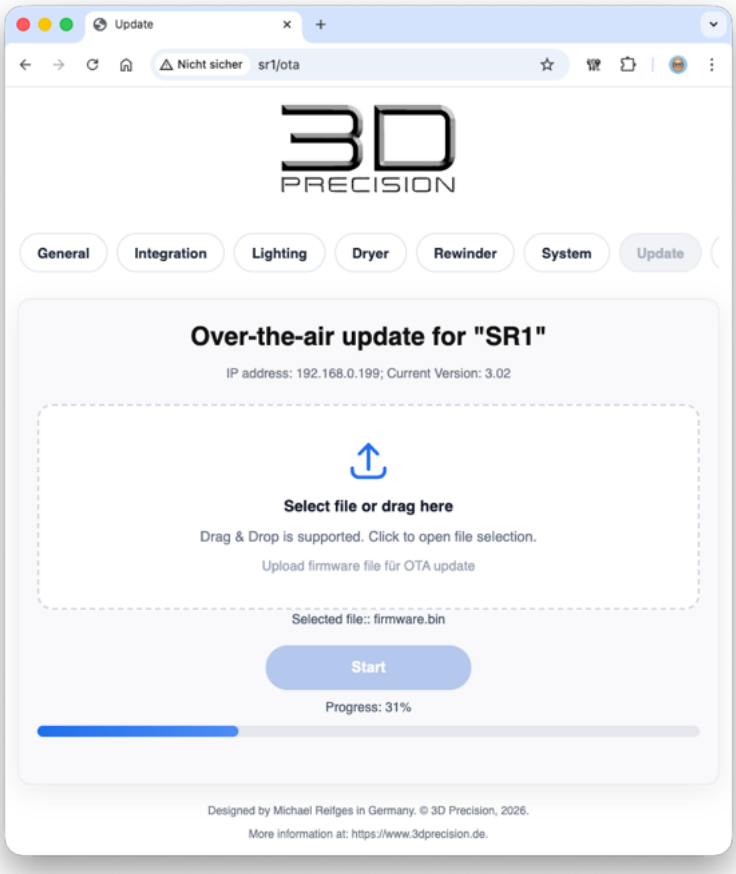


Figure 53 Controller Web-Interface Firmware Update File Transfer.

After successful completion, the new firmware is activated automatically by restarting the device.

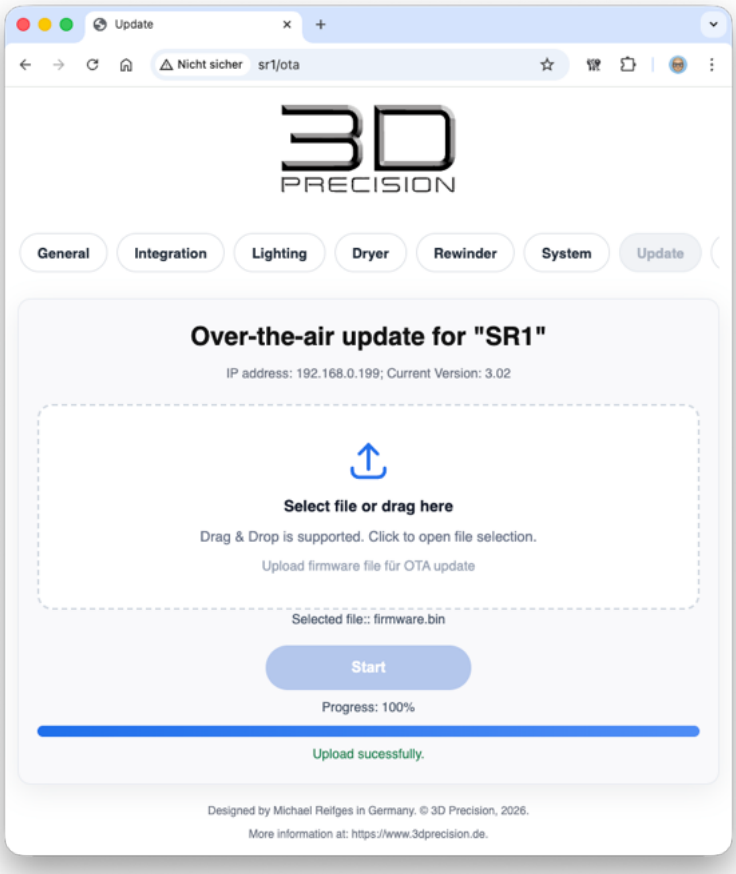


Figure 54 Controller Web-Interface Firmware Update finished.

9.3 Touch-Display GUI

9.3.1 Main Screens and Operation

After startup, the controller switches to the main screen depending on the detected hardware configuration :

A) Dryer only
B) Smart Rewinder only
C) Smart Rewinder and Dryer
D) No hardware detected

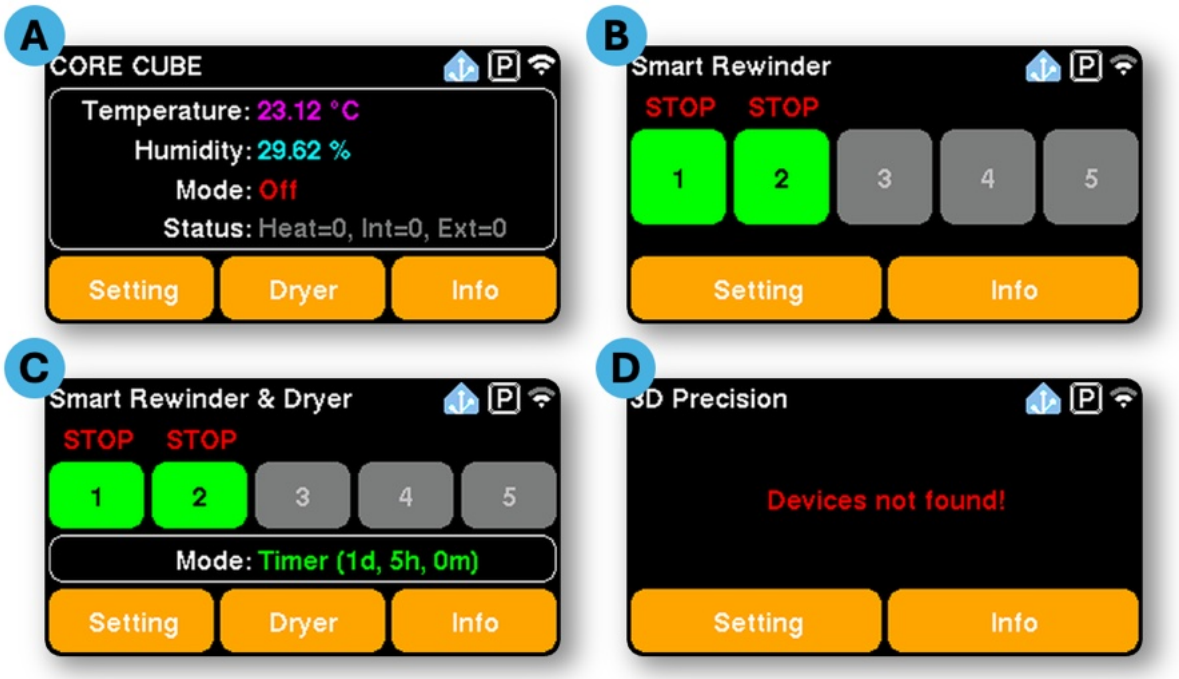


Figure 55 Display GUI: Main screen views

All interaction is performed via touch buttons on the touch display .

The interface shown in this documentation is in English, but the language can be changed.

9.3.2 Main Screens Elements

The main screen includes the following elements:

A) Page title
B) Status of Home Assistant integration (grayed out if not connected)
C) Status of PrusaLink integration
D) WiFi connection status and signal strength
E) Current Smart Rewinder status

F) Touch button for Smart Rewinder control (s. 9.3.7). Color indicators:
   a. Light green = automatic mode
   b. Red = manual mode
   c. Dark green = Twin-Drive mode
   d. Gray = not available or not detected
G) Inactive button for Smart Rewinder
H) Navigation area
I) Touch button for settings (s. 9.3.5)
J) Touch button for information (s. 9.3.6)

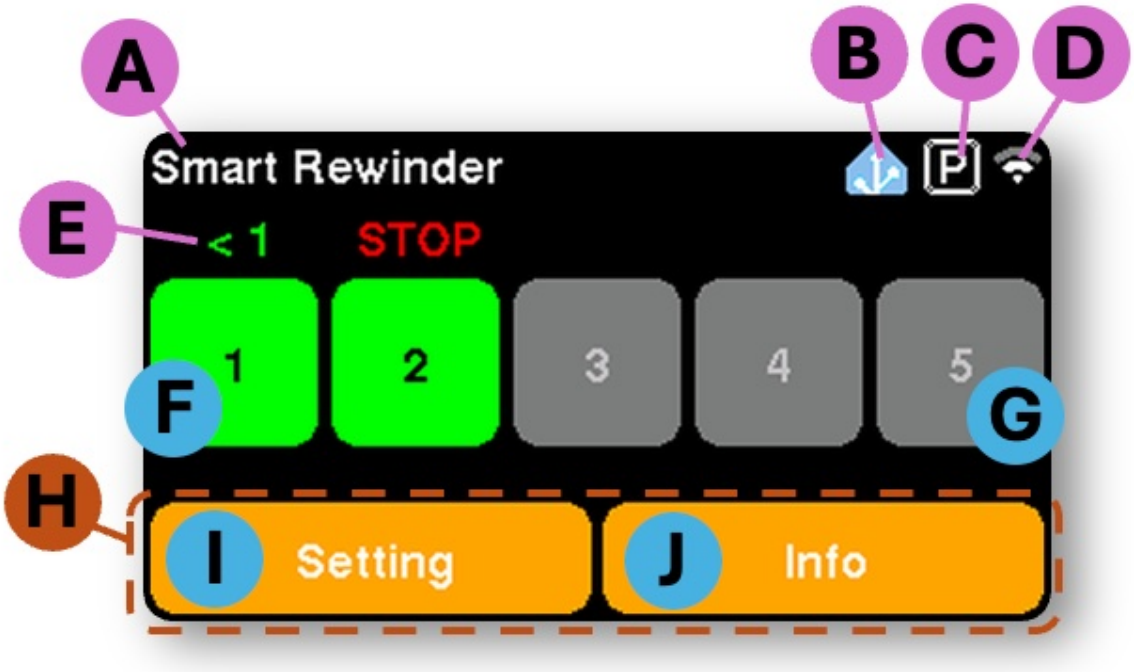


Figure 56 Display GUI: Elements on main screeen.

9.3.3 Combined View (Smart Rewinder and Dryer)

If both Smart Rewinder and Dryer are installed, the rewinder status (A) remains visible.

The rewinder control buttons (B) are slightly smaller, and the dryer status (C) is displayed below.

A dedicated button (D) allows access to the dryer control screen.

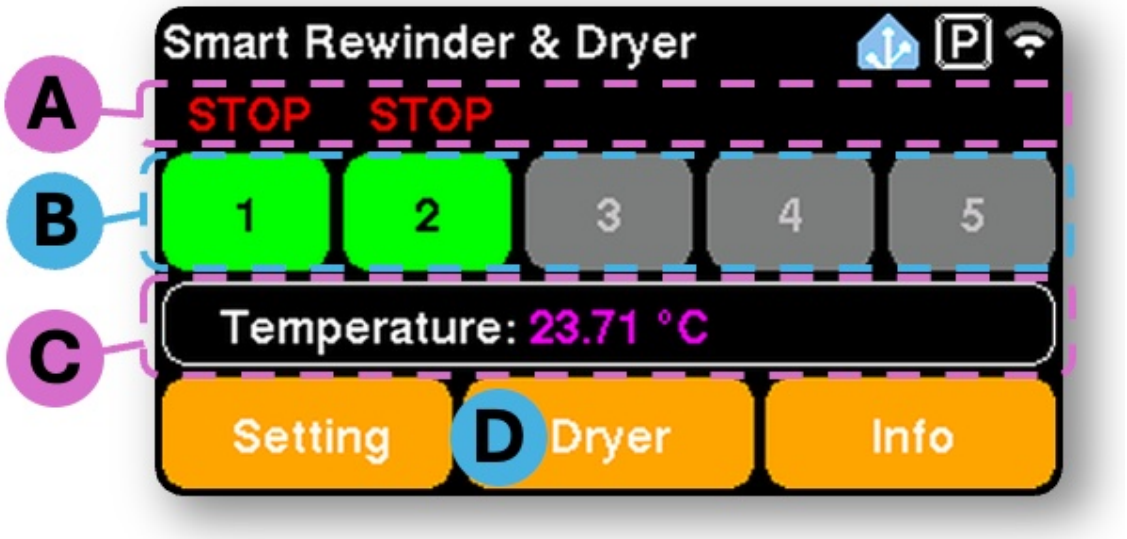


Figure 57 Display GUI: Elements on Smart Rewinder and Dryer main screen.

9.3.4 Dryer only view

If no Smart Rewinder is installed, the dryer status (A) occupies the central area of the screen.

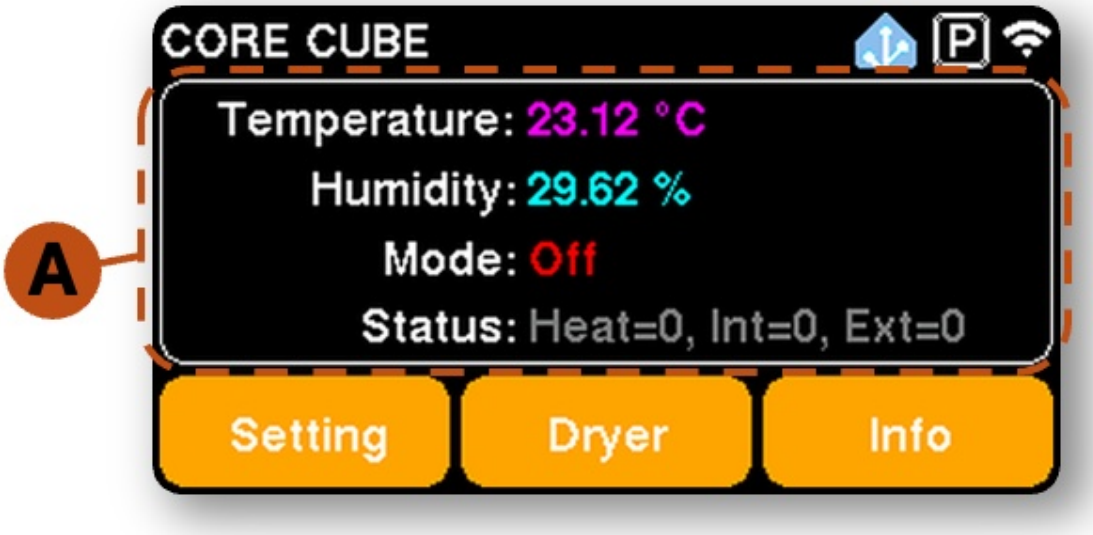


Figure 58 Display GUI: Elements on Dryer main screen.

9.3.5 Settings

9.3.5.1 Language Settings

The currently selected language is displayed in the center (A).

Use the direction buttons (B)/(C) to change the language.

Changes are applied only temporarily when using the back button (D).

Use the Next… button (E) to switch to the screensaver settings.

Use the confirmation button to save the settings permanently.

Figure 59 Display GUI: Language setting.

9.3.5.2 Screensaver Settings

H The screensaver timeout (A) can be configured.

At the lowest setting, the screensaver is disabled.

Otherwise, the selected time interval is displayed.

Temporary changes apply if leaving with the back button (B).

Permanent changes incl. language settings require existing with the save & exit button (C).

Figure 60 Display GUI: Screensaver settings.

9.3.6 Information

This screen displays system information such as firmware version , IP address, device name, username, and password.

Use the restart button (A) to reboot the controller.

You can also reset WiFi settings from this screen (B).

A confirmation prompt with OK (C) and cancel (D) option will appear before performing the reset.

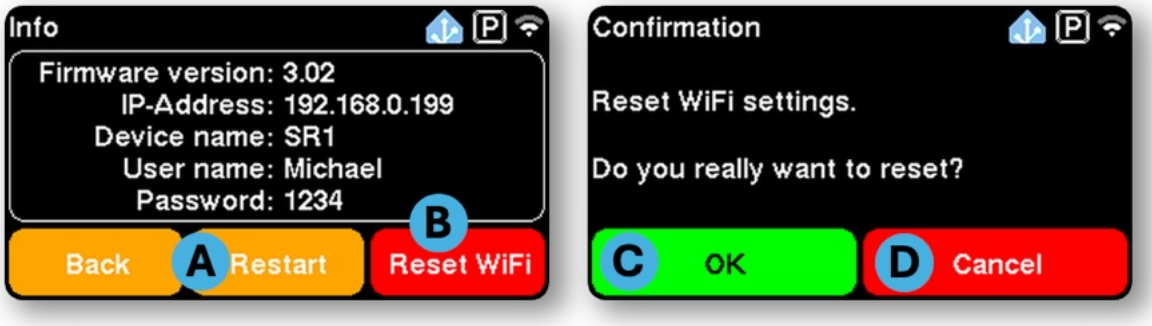


Figure 61 Display GUI: Information.

9.3.7 Smart Rewinder Control and Settings

Selecting an active Smart Rewinder touch button on the main screen opens the Smart Rewinder control page.

9.3.7.1 Smart Rewinder Control

The current status of the Smart Rewinder is displayed in the status bar (A). Touch button (C) allows switching between Automatic (normal operation) and Manual mode.

In automatic mode, the current filament consumption is displayed next to it. This counter can be reset to zero using touch button (D).

In manual mode, the Smart Rewinder does not respond to filament movement. Instead, the spool movement can be controlled using touch buttons (H) and (I).

Touch buttons (F) and (G) provide access to the Smart Rewinder and Twin-Drive settings.

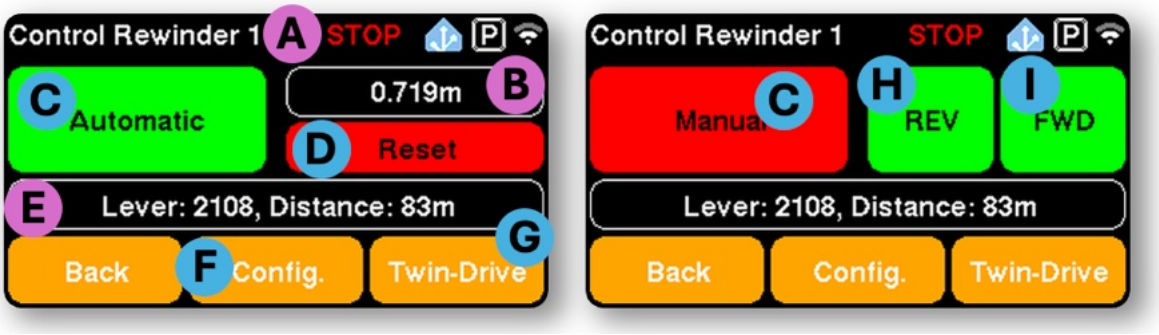


Figure 62 Display GUI: Smart Rewinder control.

9.3.7.2 Smart Rewinder Settings

Using touch button (A), the stepper motor direction can be changed. This depends on the specific cable used.

The current position of the filament sensor lever is displayed in the status field (B). This information is useful for functional testing or calibration.

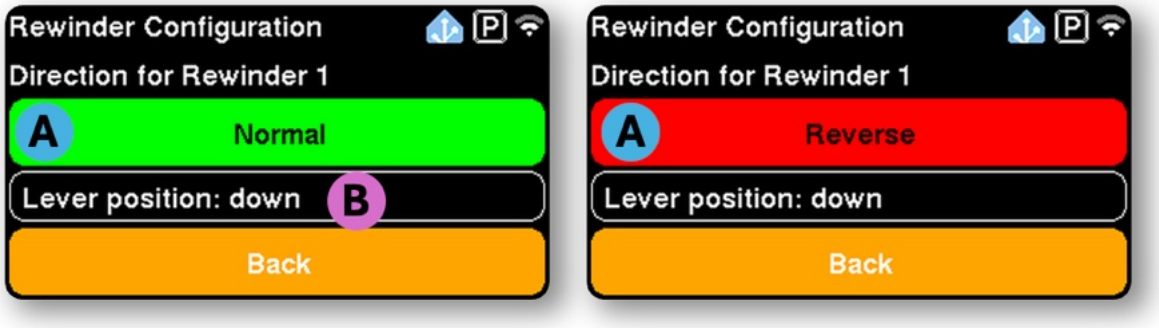


Figure 63 Display GUI: Smart Rewinder configuration.

9.3.7.3 Smart Rewinder Twin-Drive Settings

In the Twin-Drive settings, the selected primary Smart Rewinder is shown as a blue tile (B). The Smart Rewinders that can be assigned on the left or right side are displayed as buttons. These can have three states:

- Red (A): The Smart Rewinder is not assigned and can be selected for assignment by tapping.
- Gray (C): This Smart Rewinder cannot be assigned because it is not installed, already has another Smart Rewinder assigned, or is already assigned to a different Rewinder.
- Green (D): The Smart Rewinder is assigned to the selected Smart Rewinder. Tapping it again in this state removes the assignment.

Touch button (E) returns to the control screen and applies the current settings. As long as the base configuration of the Smart Rewinders does not change (e.g., by adding or removing devices), the settings will persist after a restart.

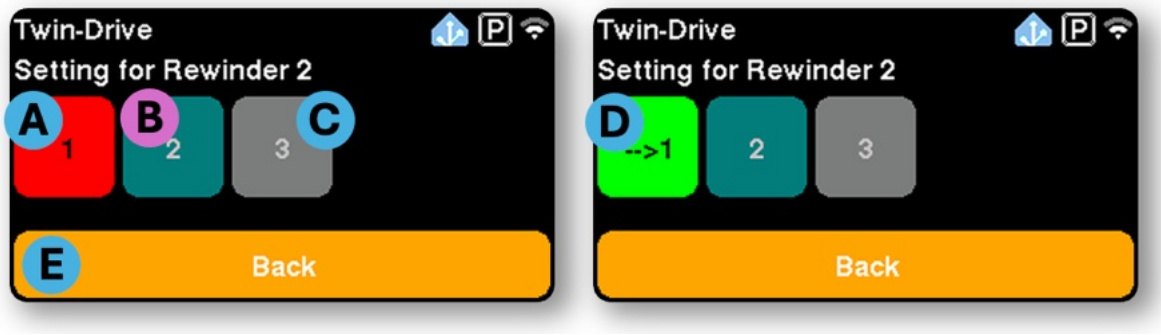


Figure 64 Display GUI: Smart Rewinder Twin-Drive setting.

9.3.7.4 Smart Rewinder Twin-Drive on Main Screen

Twin-Drives are displayed on the main screen as dark green, inactive tiles with their assigned configuration (A).

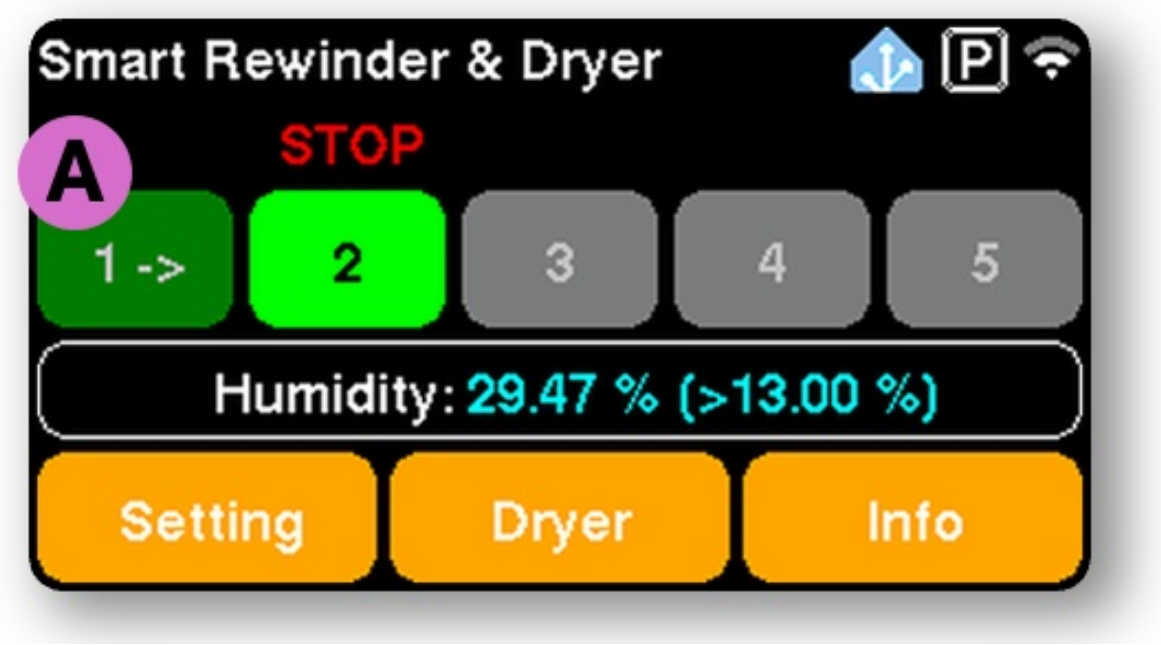


Figure 65 Display GUI: Twin-Drive on main screen.

9.3.8 Dryer Status

If both Smart Rewinder and Dryer are installed, the Dryer information is displayed in rotation in the status field below the Smart Rewinder tiles. The rotation speed can be adjusted via the web interface on the General settings page.

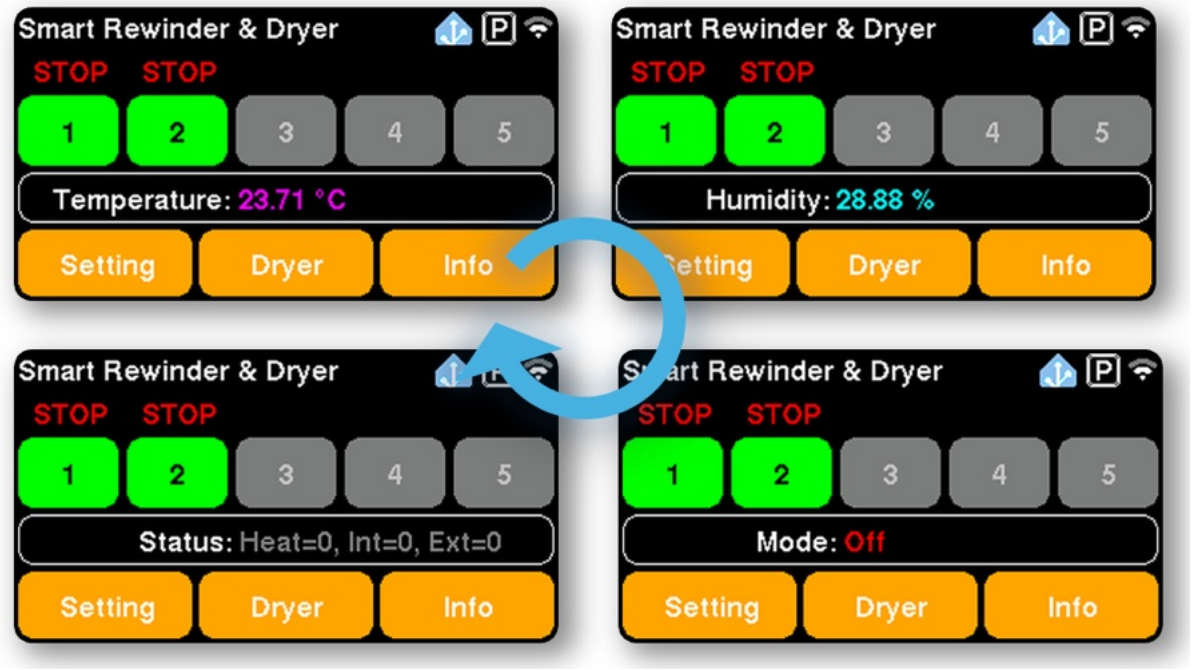


Figure 66 Display GUI: Dryer Information on main screen with Smart Rewinder.

Without Smart Rewinder, the status occupies the entire central area of the screen. Touch button (A) opens the Dryer settings.

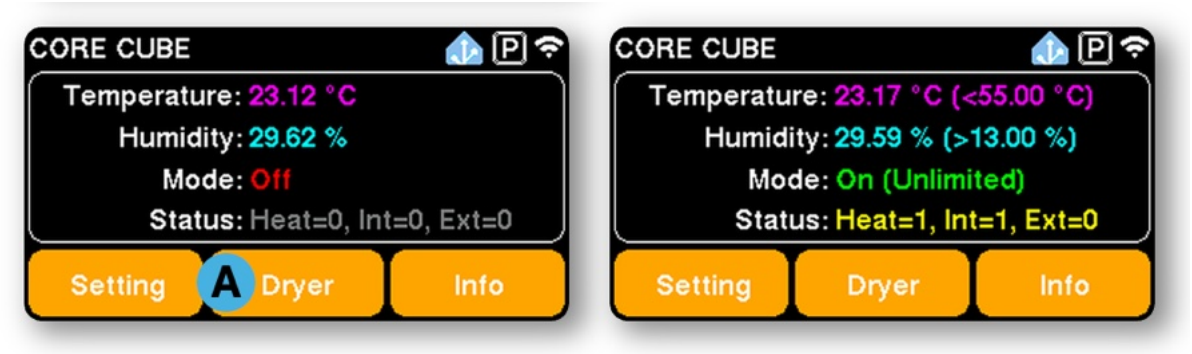


Figure 67 Display GUI: Dryer Information on main screen without Smart Rewinder.

The Dryer is controlled using three parameters: temperature, humidity, and time. These values can be set using the tabs (A) Temperature, (B) Humidity, and (C) Time.

The active tab is always highlighted in the same color as the corresponding touch button, as shown for (A) and (D).

The currently set value (F) is displayed between the adjustment touch buttons (D) and (E). At the lowest setting, the default value is applied for temperature and humidity. For the time setting, the lowest value corresponds to unlimited operation.

Note: The default values can be configured via the web interface on the Dryer settings page. The temperature unit can be set on the General settings page.

Touch button (G) turns the Dryer on or off. However, changes are only applied after confirmation using touch button (I). Touch button (H) discards all changes.

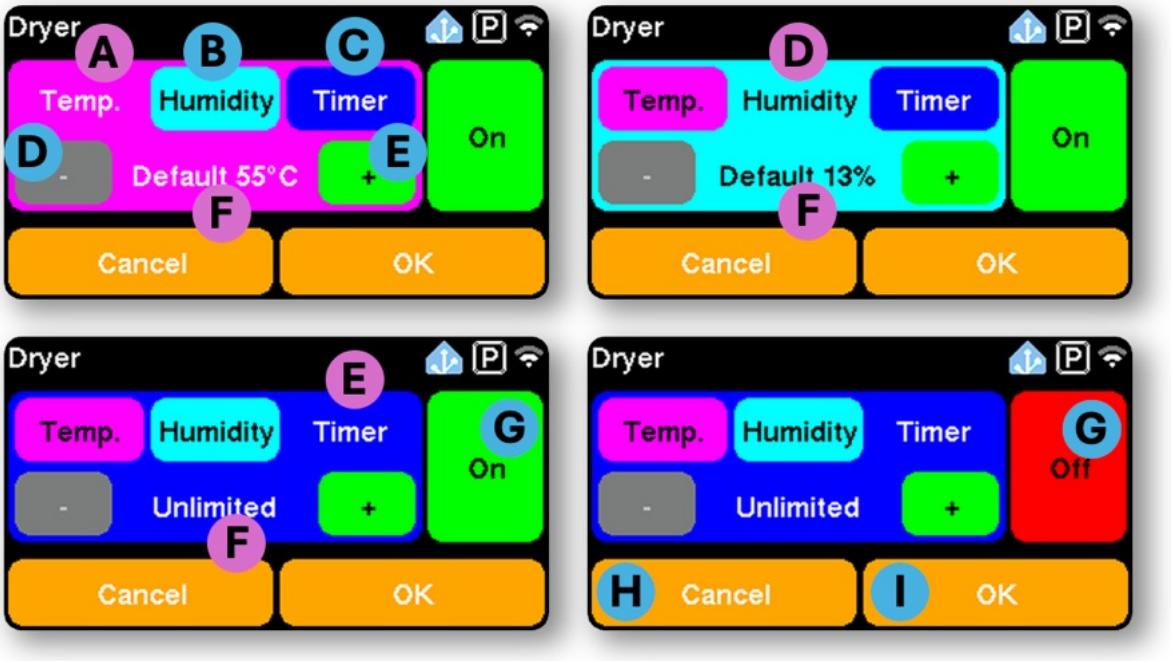


Figure 68 Display GUI: Dryer Settings.

9.4 Home Assistant (MQTT) Integration

The Home Assistant integration is activated by entering all required information in the web interface on the Integration page. A prerequisite is an active MQTT server and its integration into Home Assistant.

9.4.1 Devices in MQTT

If all prerequisites are met, the controller registers three connected devices during the initial setup as follows:

1. <Device Name> (Model: CORE CUBE)
2. <Device Name> Dryer (Model: Dryer)
3. <Device Name> Smart Rewinder (Model: Smart Rewinder)

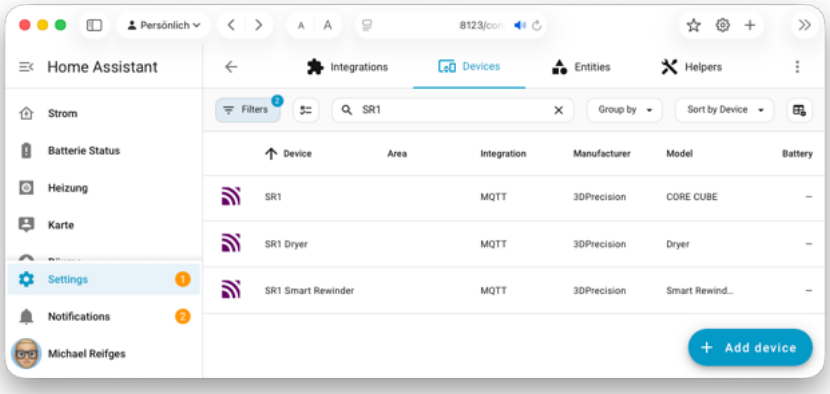


Figure 69 Home Assistant MQTT Integration.

9.4.2 Device Information Controller

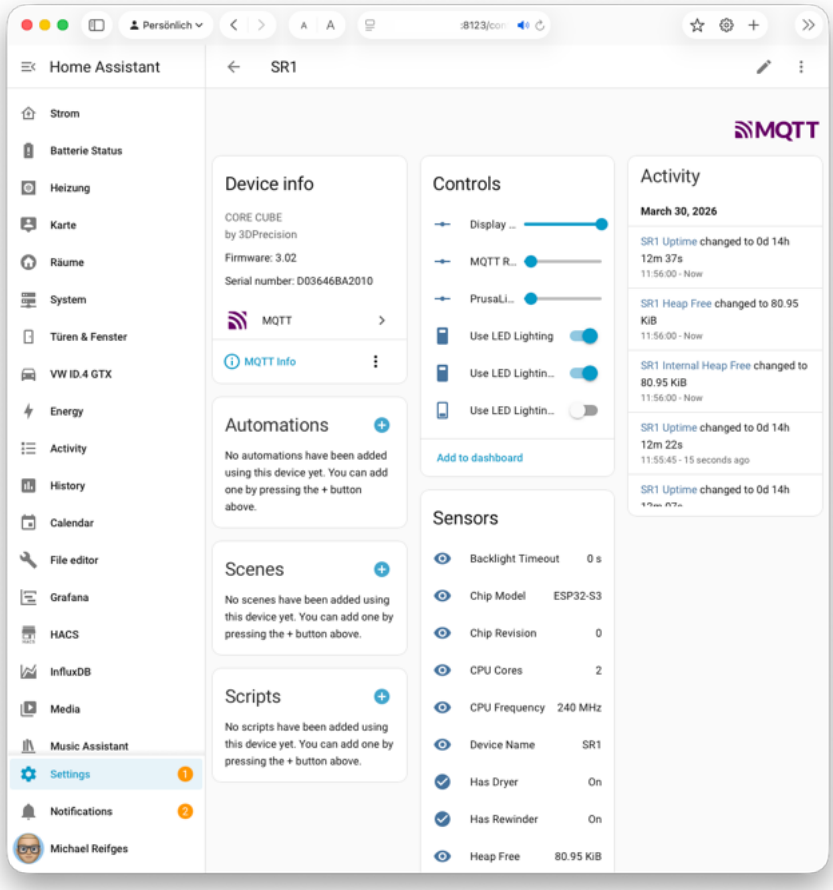


Figure 70 Home Assistant device information.

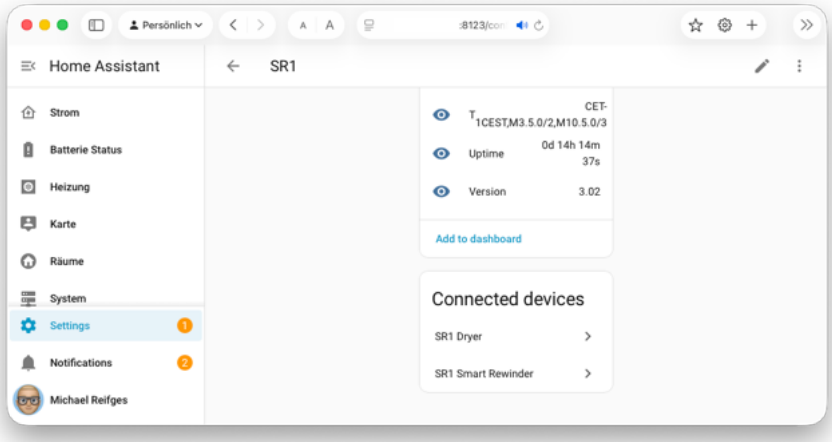


Figure 71 Home Assistant device information connected devices.

9.4.3 Device Information Dryer

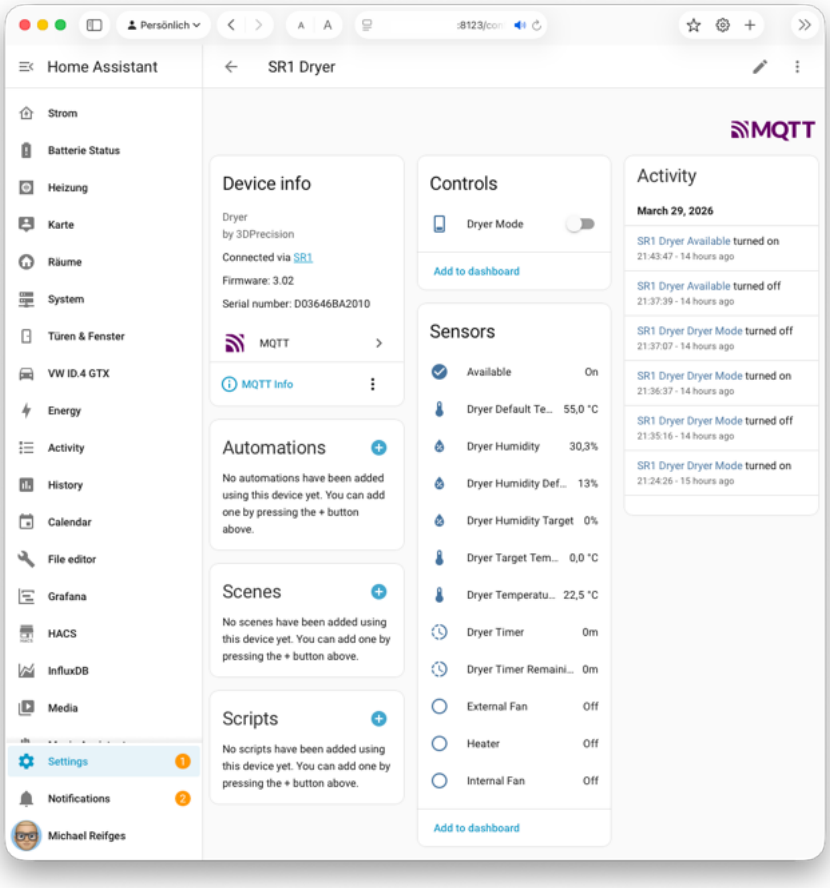


Figure 72 Home Assistant device Information Dryer.

9.4.4 Device Information Smart Rewinder

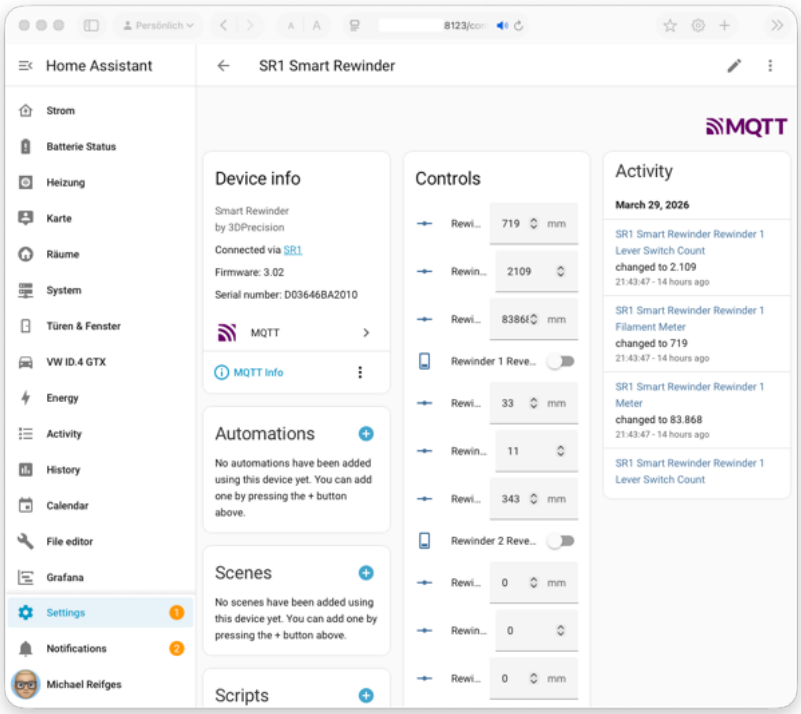


Figure 73 Home Assistant device information Smart Rewinder control.

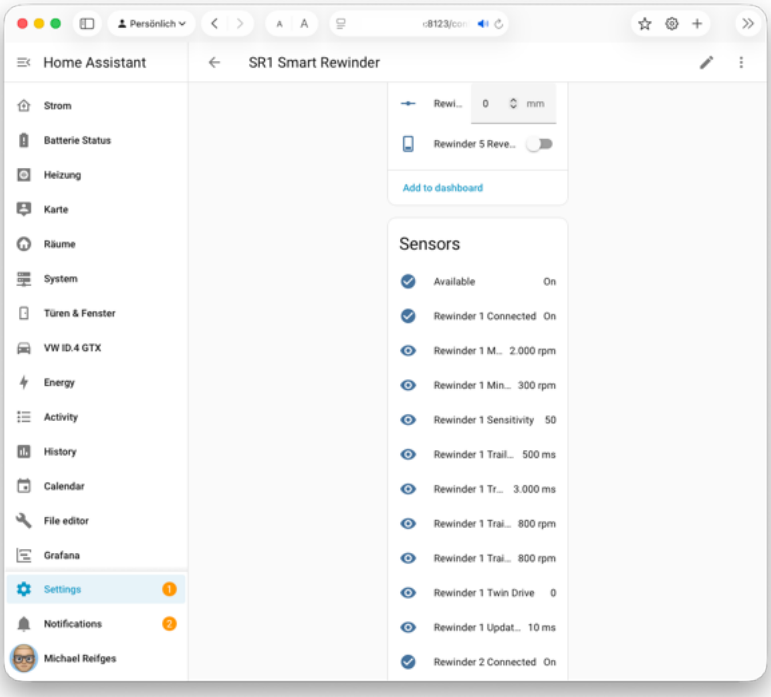


Figure 74 Home Assistant device information for Smart Rewinder sensors.

10 Troubleshooting

For support and assistance, we have also set up a Discord server: https://discord.gg/hNZkaaDxHN

10.1 Identifying and Resolving Issues

10.1.1 Troubleshooting and Solutions During Assembly

Table 20 Selected Issues and Solutions During Assembly

Problem	Possible Reason	Resolution

This section will be expanded in future versions.

10.1.2 Troubleshooting and Solutions During Operation

Table 21 Selected Issues and Solutions During Normal Operation.

Problem	Possible Reason	Resolution
Motors do not rotate or lack torque.	The current is too low.	Adjust the current limit using the potentiometer on the driver breakout board. Turning the potentiometer to the left increases the current. The adjustment is very sensitive—usually only a few degrees are required.
The motor shuts off after a short period of operation.	This is a protection mechanism of the stepper motor drivers designed to prevent overheating.	Adjust the current limit using the potentiometer on the driver breakout board. Rotating the potentiometer clockwise reduces the current. The adjustment is very sensitive; typically only a few degrees are required.

This section will be expanded in future versions

11 Final Remarks

11.1.1 About this Manual

We have made every effort to keep this manual as simple and clear as possible, focusing on the essentials. We hope it provides helpful support during assembly. However, as no manual is perfect, we always welcome feedback, suggestions, and ideas for improvement. If you have any questions, please do not hesitate to contact us.

We wish you success and enjoyment while building.

12 Referenzen

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12.1 Figures

12.2 Tables