

# Operation



The high-resolution 10"-TFT touchscreen mounted at the front panel enables direct operation of the VP75.

This manual describes the [initial commissioning](#) of the AMS after [installation](#), the [operation](#) via the *RepRapOnRails* operating software and all manual operating tasks that must be performed during normal day-today use.

## Starting the machine

There are two possible states from which to start the AMS: "switched off" and in "standby". Either way starting the machine is a one-button-only procedure. After the boot sequence the operating screen starts with the [Print screen](#) in IDLE mode.

### Switching on

If the machine is [switched off via the main switch](#) at the rear cover (position <0>) toggle the switch to <I> (ON).

The VP75 will boot automatically.

It may take a few minutes until the touchscreen has fully loaded the operating screen - wait patiently without interfering.

The first screen will be the **Print** screen with the (empty) print-job queue and the top-left status message displaying **Idle**.



Powering up the machine.

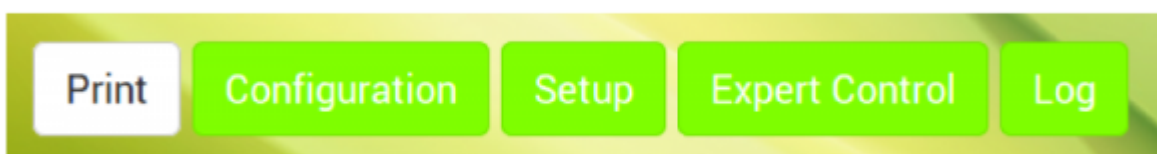
### Waking from standby

If the machine has been shut down via the touchscreen and set into standby mode (see section [Print screen](#)), press the wake button. The light ring of the button lights up and the machine boots automatically.



Waking the VP75 from standby.

## Graphical User Interface (GUI)





Menu selection of the RepRapOnRails operating software.

The start-up **Print** screen provides all basic operating functions.

The **Configuration** menu enables the operator to preselect temperature profiles for the extruders and the print bed and build chamber more directly which simplifies preheating and priming according to current needs.

**Setup** offers system information.

More advanced features such as program-independent operation of the axes can be found on the **Expert control** screen which also provides direct setting of the extruder temperatures and test extrusion.

The **Log** menu contains the history of machine code input and output as well as the keyboard for direct input of operating instructions.

The following paragraphs provide detailed information of the software's operating screens and explain the specific functions.

Additional information for the preparation of print jobs can be found in [Tips and tricks](#) and the manual of the [slicing software](#).

## [Print] screen

After starting the VP75 *Print* screen will appear as the start-up screen. Here you activate the machine and start the manufacturing process of previously uploaded part data to the queue via the web interface.



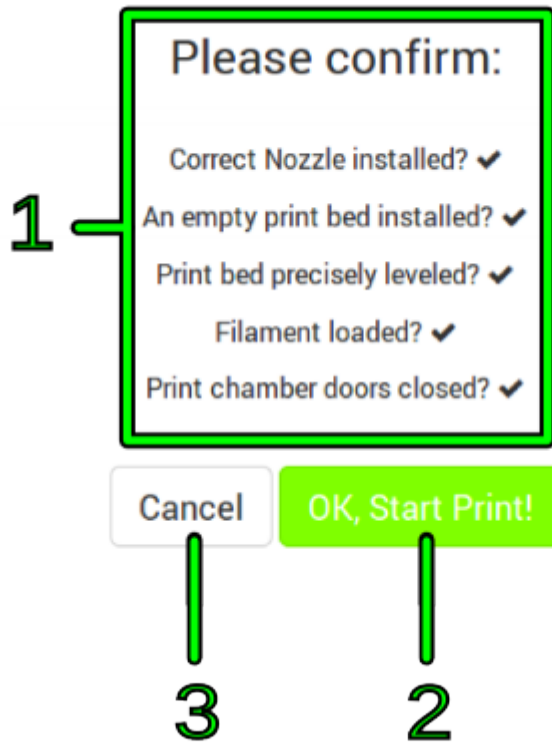
Print screen (descriptions may apply to other screens as well if not explicitly given there)

No.	Description	Content/Function
1	Status message	<b>Idle</b> : machine is waiting for next user input <b>Printing</b> : machine is busy printing

No.	Description	Content/Function
2	Menu tabs	Select the operating menu and mode: <b>Print</b> redirects to the main production mode <b>Configuration</b> allows choosing material based temperature profiles for each extruder and bed/chamber <b>Setup</b> provides system information <b>Expert Control</b> provides access to motor controls and direct temperature settings <b>Log</b> represents the communication history of the control board
3	Queue	List of uploaded part data sorted by time/date (oldest first); estimated time required for processing the respective part.
4	Temperature/profile overview	Displays current and set temperature of extruder, build plate and build chamber as well as the selected material profile (see <a href="#">Configuration</a> ). Temperatures colored red are set and currently being actuated.
5	[Emergency STOP] button	see also → <a href="#">Emergency stop</a> → <a href="#">Safety information in the Manual</a>
6	[Shut-down] button	Tap to shut down the machine properly.
7	[Build Chamber ON/OFF] button	Tap to activate/deactivate drives and heaters after start-up.
8	[Preheat Chamber/Bed ON/OFF] button	Tap to activate/deactivate preheating of the build chamber/print bed according to the settings made under <a href="#">Configuration</a> .
9	[delete] button	Tap to delete the respective part data from the queue.
10	[print] button	Tap to <a href="#">start processing the respective part data</a> .
11	Browse buttons	Use [Previous], [Next] and [ <i>page number</i> ] to browse the part data list.

## Starting the manufacturing process

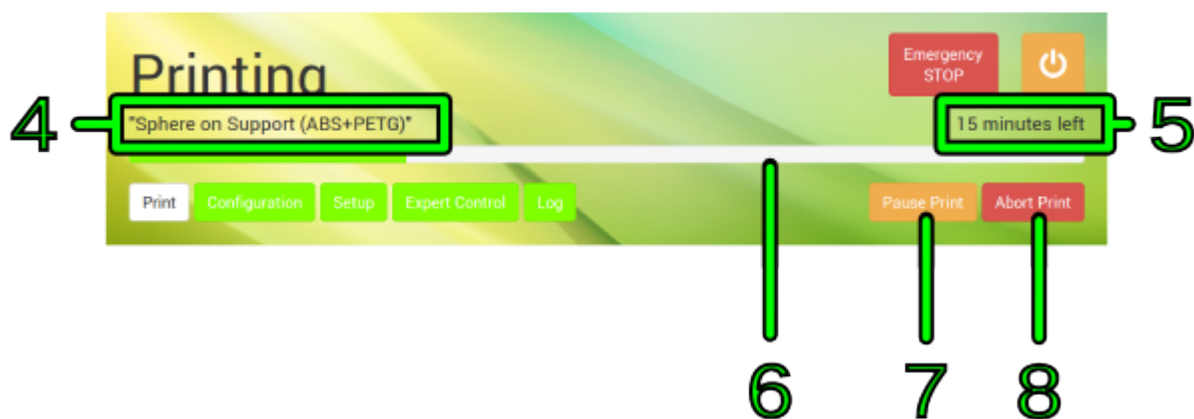
Tap the [print] button next to a part data set in the queue to start the process. You will be asked to confirm that all preparations have been performed. Tap [OK, Start Print] to definitely begin processing or [Cancel] to return to the queue.



“Ready to print?” query

No.	Description	Content/Function
1	Checklist	Please make sure that all displayed requirements have been met before proceeding.
2	[OK, Start Print] button	If all preparations have been made, tap to proceed.
3	[Cancel] button	Tap to abort if any requirements has not been met.

After confirmation the VP75 starts processing the part and the status message changes to *Printing*. All other menus are deactivated during a manufacturing. The part data name, the current progress, and the estimated time remaining are displayed and the [Abort Print] button is active.



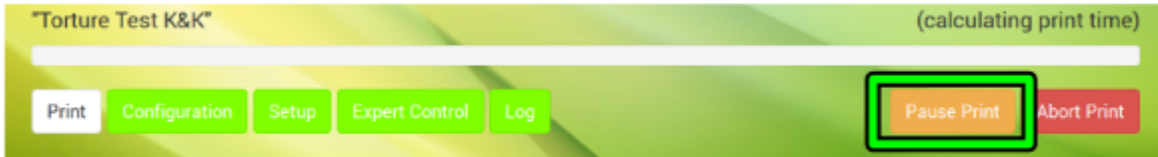
Status screen (top half only).


No.	Description	Content/Function
4	Part specification	The name of the G-code file uploaded to the queue.
5	Countdown	Displays the estimated remaining time (calculated from the G-code).
6	Progress bar	Indicates the progress graphically.

No.	Description	Content/Function
7	[Pause/Resume Print] button	Allows interrupting a process for interference and subsequent resumption.
8	[Abort Print] button	Tap to <a href="#">abort a process</a> irreversibly.

## Pause function

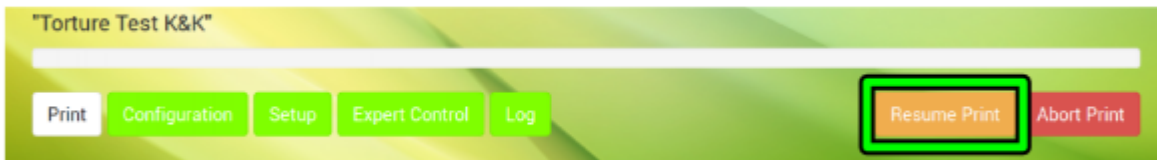
The pause function was built in for the case that a print job needs to be interrupted and later resumed for other reasons than “out-of-filament” (see [below](#)).




 Interrupting the print with the pause function.

After tapping the [Pause Print] button, the printer keeps printing until the cache is empty. This may take a few minutes, according to the complexity of the current g-code. Afterwards, the print bed is lowered into its home position, the extruders are turned off and the print head moves to the maintenance position.

Now you have access to the [Expert Controls](#) and some of the [Setup](#) functions to adjust whatever might be necessary.



 Continuing the print after pause.

To continue printing tap [Resume Print] (replaced [Pause Print]). Print bed and extruder head move to their last position and after re-heating the extruders the print seamlessly continues.

## Finishing a manufacturing process


There are two ways to finish the manufacturing process: automatic finish after completion or abortion by the operator.

After regularly completing a manufacturing process all axes are moved to their home position and the extruder heating is switched off.

If you need to abort a process because the outcome does not meet expectations for example or mechanical problems appear during the process, tap the [Abort Print] button. The system will then execute the last G-code information from cash and afterwards move the extruder head to its home positions.

Either way, the VP75 returns to idle mode and displays a status message and a request how you wish to continue. Simply tap the respective button on the screen to proceed.  
 After standstill of all drives you can remove the build plate and take off the model.



 Manufacturing process finished.


No.	Description	Content/Function
9	[Keep in Queue]	Returns to the <i>Print</i> menu.
10	[Print Again]	Immediately <i>restarts</i> the current manufacturing process.
11	[Delete Printjob]	Deletes the finished part data from the queue <b>without</b> confirmation and returns to the <i>Print</i> menu.

## Switching the machine off

### NOTICE

Switch off the machine via the power button without turning it into standby may cause damage of the heating elements and neighboring components due to residual heat.  
 The cool-down performed during shut-down ensures that the fans are only switched off after the heating elements could shed all residual heat.



 Always use this button for regular shutdown.

For switching the VP75 into standby tap the shut-down button. The system will then perform the cool-down sequence for safety reasons before deactivating the preheating and the build chamber.

The VP75 is in standby mode when:

- the screen turns black,
- the illuminated ring of the wake button dims,
- the build chamber lighting switches off.

To wake the machine from standby see [Starting the 3D Printer](#).

For completely shutting down the VP75, perform the procedure described above and set the main switch at the rear cover to **<0>** (OFF) afterwards. The VP75 is now powered off and the green status indicators of the limit switches darken.

To reactivate the VP75 see [Starting the machine](#).

#### INFO

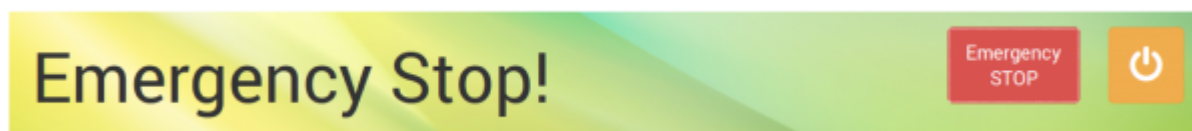


*For day-to-day use, the power supply should stay connected to mains power (main switch in position **<1>** (ON)).*

## Emergency stop

### NOTICE

The emergency stop function does not provide a cool down sequence. **Do not** use the emergency stop button to abort current print jobs, as this may lead to damage of the VP75 due to uncontrolled heat accumulation. **Do not** use the main switch as an emergency stop button. You risk losing or corrupting data.



Status display after triggering the emergency stop. The machine returns to IDLE state after a short time. The emergency stop is written into the log-file.

When the emergency stop is triggered:

- The microcontroller board is reset, all movement of the axes stops, lights, heaters and fans are turned off. The status indicator displays Emergency Stop! .
- After a few seconds the microcontroller returns to Idle state.

The VP75 now is in a safe state for troubleshooting.

For repairing **any defects of the electronic equipment** or major mechanical damages **shut down the machine completely**:

- Open the *Print* screen.
- Shut down the machine by tapping the **[Shutdown]** button and switching off the main switch (**<0>** position) after the shutdown procedure has been finished.

### NOTICE

Before restarting or reactivating the machine:

- Make sure that the axes are in no collision position.
- Make sure that the reason for the emergency stop has been detected and fixed, before

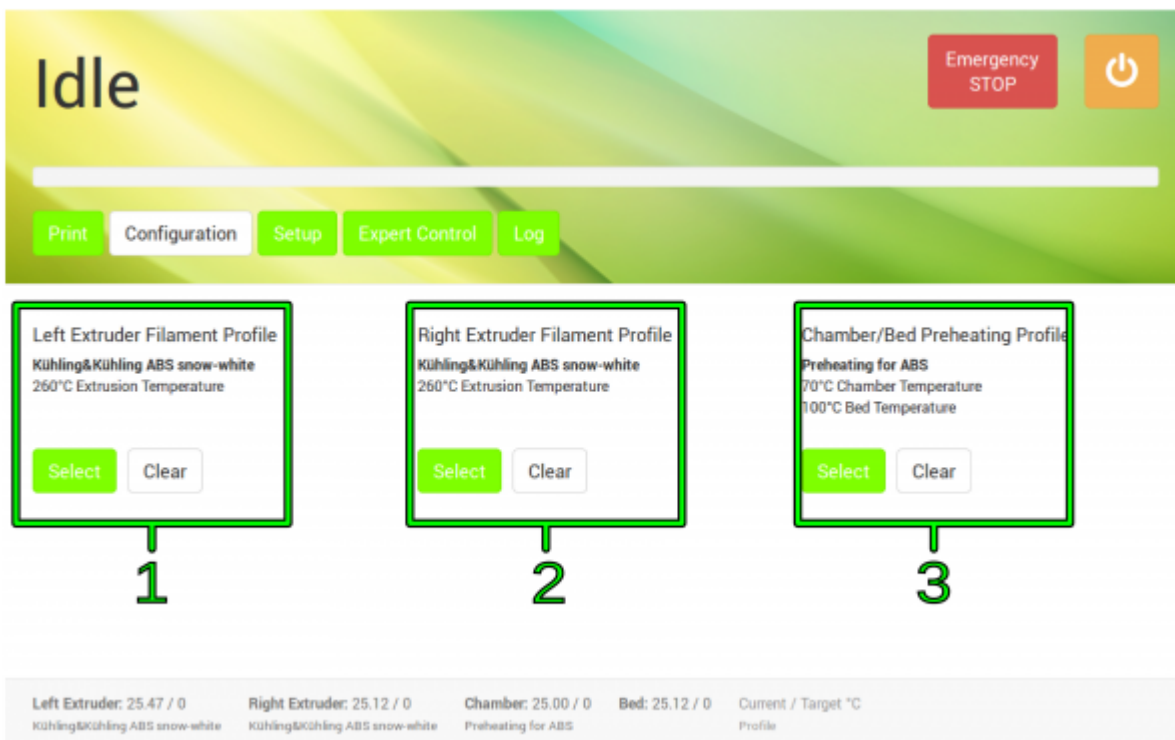
resuming production.

After troubleshooting or if the reason for the emergency stop was minor and you want to continue production:

- Remove the build plate from the build chamber and replace or clean it before further use.
- **Restart** the machine (if necessary).
- Open the *Print* screen.
- Switch on the build chamber. The machine will run the homing routine.
- You can now resume normal operation.

## [Configuration] screen

The *Configuration* menu enables you to preselect material-specific temperature profiles for the extruder and, in combination, the build plate/build chamber. The latter was developed to make preheating more precise with regard to different material settings. The according profiles can be set up at the [web interface setup menu](#).

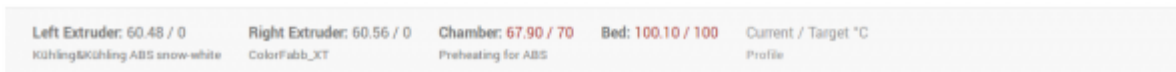
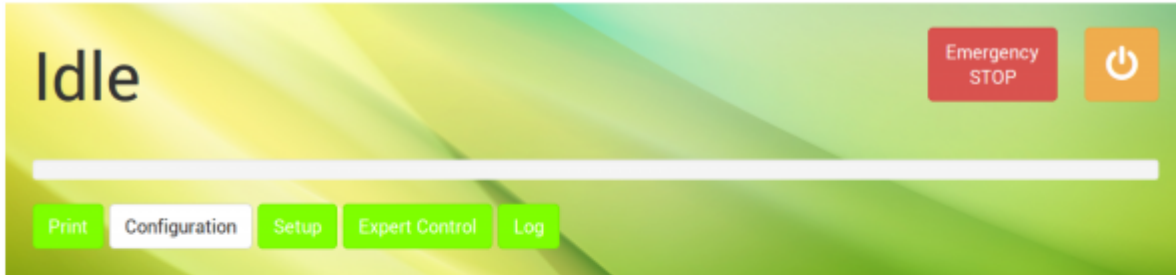


GUI Configuration screen with temperature profile selection.

No.	Description	Content/Function
1	Left extruder profile selection	The currently selected profile is displayed.
2	Right extruder profile selection	Tap <b>[Select]</b> to open the list of available filament profiles or <b>[Clear]</b> to delete the active profile.



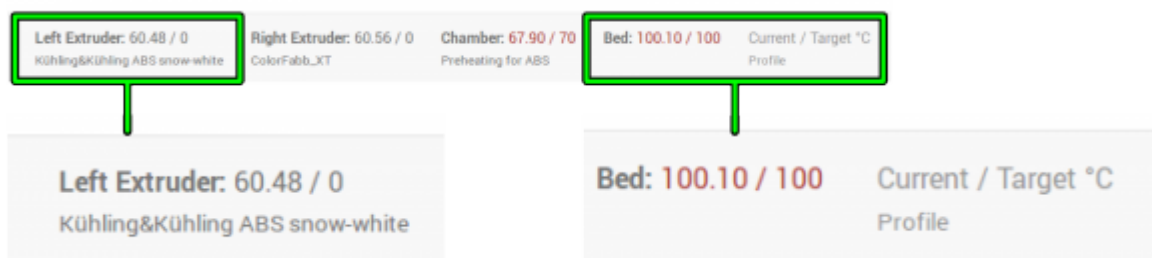
No.	Description	Content/Function
3	Bed/chamber profile selection	The currently selected profile is displayed. Tap [Select] to open the list of available filament profiles or [Clear] to delete the active profile. After selection of a profile, deactivate the preheating function in the <i>Print</i> menu (touch button no. 8) and activate it by tapping the button again to apply the settings.



The list of filament temperature profiles of the configuration menu. More profiles can be added via the web-interface.

After opening the list, tap [Set] to choose a profile for the selected component. The profile is set and the screen returns to the prior menu.


To activate the selected profile open the *Print* screen and first deactivate, then re-activate the chamber/bed preheating.



The selected profiles are displayed in the footer of the GUI on every screen.

The selected profiles are displayed in the footer of every screen in the order *Current* and *Target* (= set) temperature. While aiming for a target temperature, both values are highlighted red. When displayed gray, the temperature value is either not set or currently not triggered.

**INFO**

 Observe that the temperature shown in the footer is measured at the hot end heater and may be 5 - 10 °C lower at the nozzle tip.

If no filament profile is activated for an extruder, the default temperature is 180 °C.



See section [Extrusion temperature](#) in the knowledgebase for information on finding the suitable extrusion temperature.

## [Setup] screen

This screen provides system information and the web address needed to connect to the VP75 via the network.

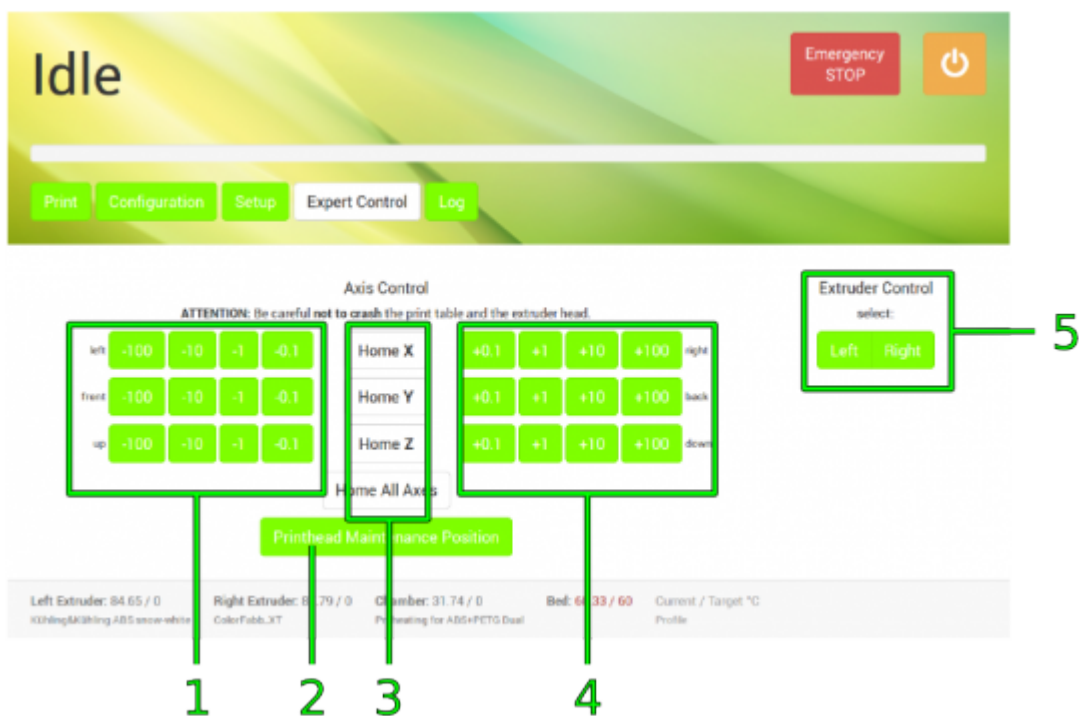
## [Expert Control] screen

### NOTICE

*The Expert Control menu should be used by skilled operators only. It has been designed for test and troubleshooting purposes. Persons unfamiliar with the 3D Printer must not use the functions provided here.*

*The positions of the extruder head and the print table are not compared during manual operation. Incautious operation may lead to massive damage of the extruder head and the print bed. Be careful not to crash the print table and the extruder head.*

For maintenance and test reasons, after a crash or to reduce lead times, e.g. if you still need to work on a print file but want the 3D Printer to be ready for operation, manually moving the motors or preheating the build chamber and the print table may be necessary or advantageous.





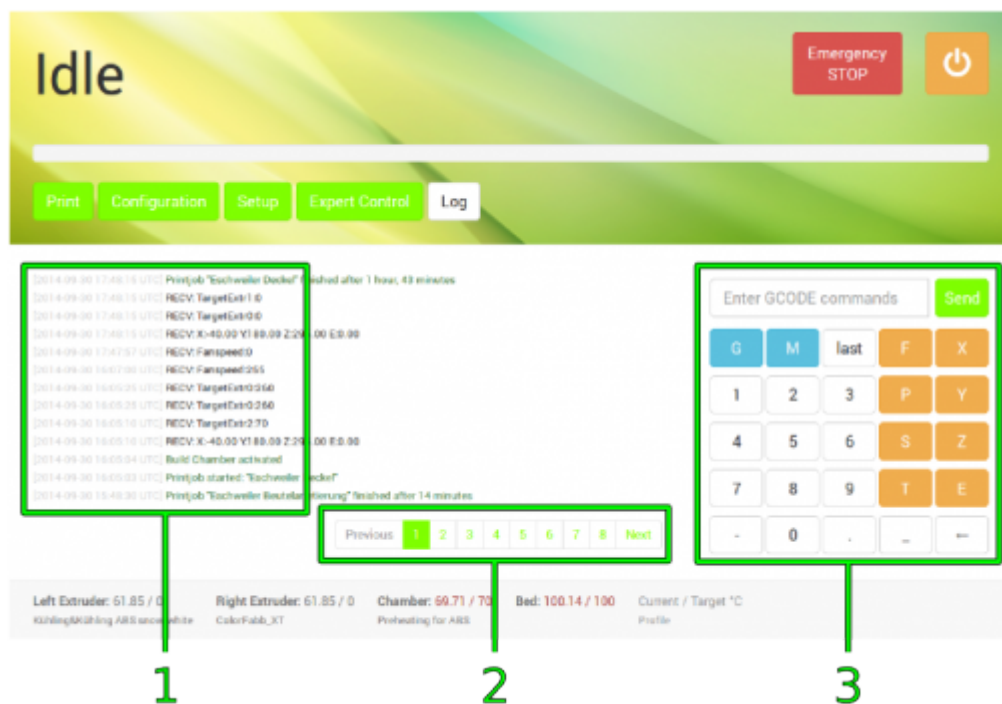
## Expert Control screen

No.	Description	Content/Function
1	Drive control - negative direction	Moves every axis individually once for every tap in <b>negative direction</b> , according to the selected step width.
2	[Printhead Maintenance Position]	Tap to move the extruder head into a preset position in the upper center of the build chamber directly in front of the doors where it is easily accessible for maintenance purposes.
3	Homing buttons	Tap to separately or simultaneously move the <b>axes</b> to their starting positions.
4	Drive control - positive direction	Moves every axis individually once for every tap in <b>positive direction</b> , according to the selected step width.
5	Extruder temperature control	Enables directly setting the temperature and extruding filament (see the chapter " <b>Extrusion temperature</b> " in the "Material" section of the knowledgebase).

## [Log] screen

All communication between touchscreen, BeagleBone Black and microcontroller is stored and displayed on the log screen. Print job statuses are stored also.

Direct G-code programming can be effected via the G-code input field.



The log screen provides additional information about sent and received G-code commands and the possibility of directly influencing the 3D Printer via G-code command input.

No.	Description	Content/Function
1	History list	communication history sorted top down by date and time <sup>1</sup> <i>SENT</i> : BeagleBone Black to microcontroller <i>RECV</i> : microcontroller to BeagleBone Black
2	Browse buttons	Use [Previous], [Next] and [ <i>page number</i> ] to browse the history.
3	G-code input field	Enter G-code lines here and [Send] them.

<sup>1</sup> The time is stated in *universal time coordinated* (UTC) notation so do not wonder if does not match your local time.

## NOTICE

*The G-code input field is an advanced feature and requires sound knowledge of GCODE programming. Inappropriate G-codeing may damage the 3D Printer massively.*

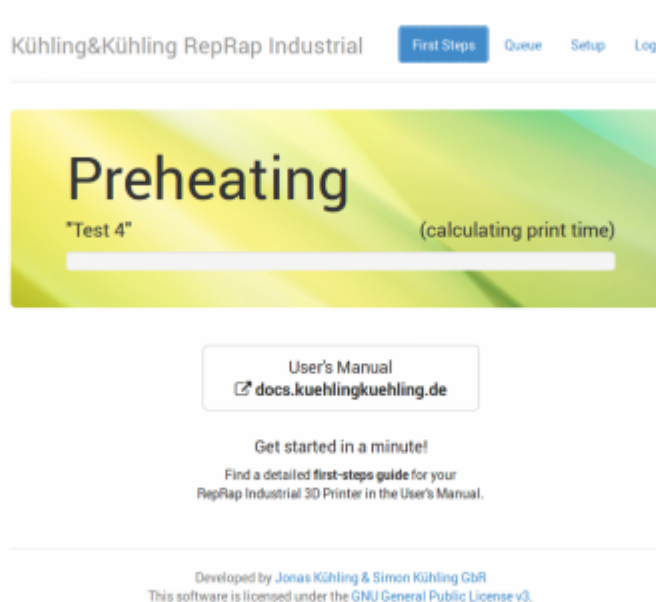
## The web interface

The web interface provides the communication between your PC and the 3D Printer. Uploading print job GCODES to the 3D Printer and creating temperature profiles are the main functions. You can also check system's information and settings, install firmware updates and download the LOG-file for troubleshooting purposes.

To open the web interface enter the web interface URL into the address line of your internet browser. You can find the web interface URL on the [Setup screen](#) of the GUI.

## First Steps

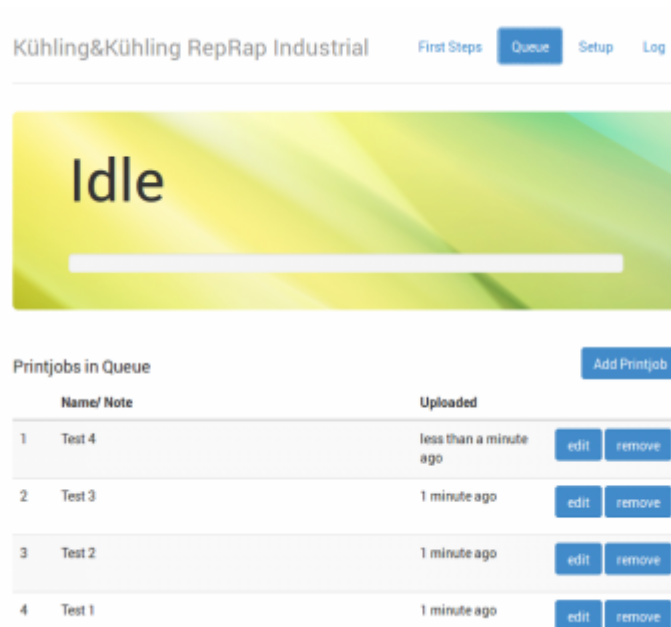
This is the start screen of the web interface. Here you find a direct link to the online documentation. In the header of this and all following screens you find live information about the currently active print job, the remaining print time and the status of the 3D Printer.



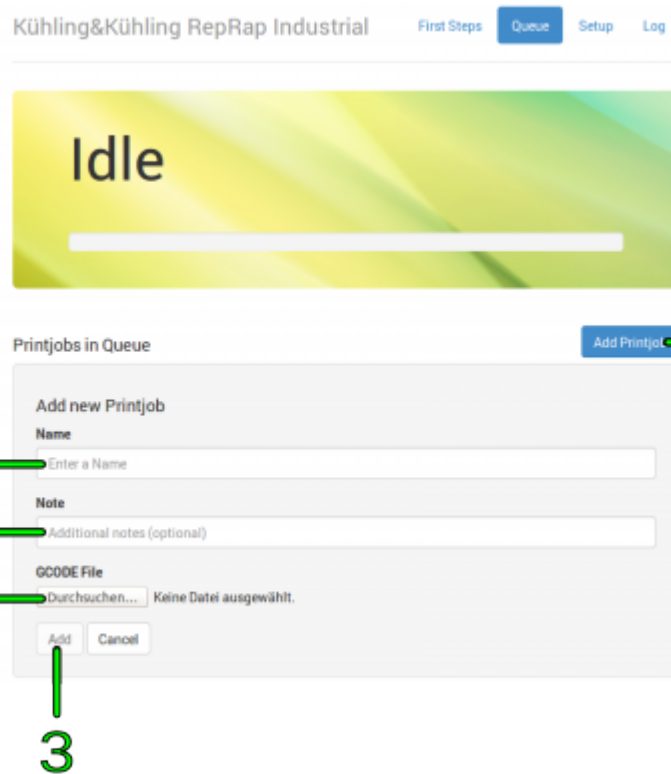
*First Steps* screen of the web interface.

## Queue

Print jobs are managed via the *Queue*. Here you can upload GCODES, individually name, edit, or delete them.



The *Queue* contains list of uploaded print jobs in a top-down order with the last upload first.



Uploading print jobs to the *Queue*.

To create a print job:

1. Click [Add Printjob].
  1. Enter the identification (name or number or the like) of the print job in the text field **Name**. This will be shown in the status field during the print job is conducted.
  2. If required, add additional information via the text field **Note**.
2. Click [Browse] to select a GCODE from the valid directory.

3. Click [Add] to upload the selected file to the printer. The print job is added to the list as the first entry.  
Click **[Cancel]** to abort the procedure.

The print job is now available for printing on your HT500 and can be selected directly for printing via the touchscreen controller on the 3D Printer.

Name/ Note	Uploaded		
1 Test 4	less than a minute ago	edit	remove

1 2



Editing or deleting print jobs from the web interface queue.

1. To subsequently renaming print jobs or altering information click on **[edit]** and use the text fields.
2. To delete a print job from the queue click on **[remove]** and acknowledge the query by clicking **<OK>**.

## Setup

In the *Setup* menu [temperature profiles](#) for materials and print bed/chamber can be managed, system information can be viewed, firmware updates can be conducted and, EEPROM-data can be set.

Kühling&Kühling RepRap Industrial [First Steps](#) [Queue](#) [Setup](#) [Log](#)

Idle

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Filament Profiles [Add Profile](#)

Name	Extrusion Temperature		
Kühling&Kühling ABS snow-white	260°C	edit	remove
PA 12	275°C	edit	remove

Chamber/Bed Preheating Profiles [Add Profile](#)

Name	Chamber Temperature	Bed Temperature		
Preheating for ABS	70°C	100°C	edit	remove
Test Setting 1	50°C	110°C	edit	remove



Temperature profiles on the *Setup* screen of the web interface.

System Information	
Hostname	lab1
Hardware Revision	RepRap Industrial v1.0.0
Software Version	RepRapOnRails v1.3.1
Microcontroller Firmware Version	Repetier Firmware v0.91-rr11.0.0-03 (compatible) Repetier Firmware v0.91-rr11.0.0-03 (currently installed)



System information that can also be found on the *Setup* screen of the GUI. Please always provide these in case you contact the [Technical Support](#).

**Upload Arduino Firmware Update**

To update the Arduino Firmware on this printer, please upload the new .hex file through the following form. Next, properly shut down the printer through the touchscreen menu ("Manual Control" → "Shutdown"). During the next boot the Arduino will be automatically reprogrammed with the new firmware file.

Take a look at the log for a note if the programming was successful.

Select Firmware .hex file

Keine Datei ausgewählt.



Installing a new Arduino firmware - which may only be done when explicitly requested by Kühling&Kühling - is done via the *Setup* menu. Find additional information in the [Upgrade](#) section.

**EEPROM Editor**

The RUMBA board inside this printer is an Arduino compatible microcontroller board that controls all processes of the printing process, i.e. the motors, the heating resistors, heating fans and the temperature sensors

A number of configuration settings for the microcontroller are stored in its integrated EEPROM memory and can be altered at runtime.

**ATTENTION:** Do not change any of these unless you know exactly what you are doing. Wrong settings can result in severe damage of the printer!




The EEPROM editor may only be used by experienced users or if explicitly stated in this manual and strictly within the specified parameters. Its main purpose is helping the [Technical Support](#) during troubleshooting.

## Creating temperature profiles

During a print job all necessary temperature data are provided by the respective G-code. For priming the extruders outside a print job the temperature setting required for extruding a material is provided by the *Filament profiles*.

Similarly, precise print bed leveling needs defined bed and chamber temperatures according to the printed material before a G-code is executed. These settings are provided by the *Chamber/Bed Preheating Profiles*.



 Filament profile setup via the web interface.

To create a filament profile open the web interface of your 3D Printer, choose the *Setup* menu and:

1. Select *Filament Profiles* and click [Add Profile] to set material properties.
    1. Enter the material **Name** in the according input field.
    2. Enter the **Extrusion Temperature** in °C in the according input field.
  2. Click [Add] or press <Enter> to save the settings. The new filament profile is added to the list, newest at the bottom.
- To change the settings click [edit] and enter the new properties.
  - To delete a profile click [remove] and confirm the safety query.



Kühling&Kühling RepRap Industrial [First Steps](#) [Queue](#) [Setup](#) [Log](#)

Idle

Filament Profiles [Add Profile](#)

Name	Extrusion Temperature		
Kühling&Kühling ABS snow-white	260°C	<a href="#">edit</a>	<a href="#">remove</a>
PA 12	275°C	<a href="#">edit</a>	<a href="#">remove</a>

Chamber/Bed Preheating Profiles [Add Profile](#) **1**

Name	Chamber Temperature	Bed Temperature		
Preheating for ABS	70°C	100°C	<a href="#">edit</a>	<a href="#">remove</a>

Add new Profile

**a**

**b**

**c**

**2**

 Preheating profile setup via the web interface.

To create a preheating profile open the web interface of your 3D Printer, choose the *Setup* menu and:

1. Select *Chamber/Bed Preheating Profiles* and click [Add Profile] to set material properties.
  1. Enter the profile **Name** in the according input field.
  2. Enter the required **Chamber Temperature** in °C in the according input field.
  3. Enter the necessary **Bed Temperature** in °C in the according input field.
2. Click [Add] or press <Enter> to save the settings. The new preheating profile is added to the list, newest at the bottom.
  - To change the settings click [edit] and enter the new properties.
  - To delete a profile click [remove] and confirm the safety query.

## Log

The *Log* screen contains the same entries as the [Log menu](#) of the GUI. Here you can download the

log-file if required for reasons of troubleshooting. A description of the download procedure can be found in the [Service Guide](#).



Kühling&Kühling RepRap Industrial    First Steps    Queue    Setup    Log

# Idle

Download log file

```
[2016-01-06 12:54:25 UTC] RECV: EPR:3 446 0.000 Extr:3 advance L [0=off]
[2016-01-06 12:54:25 UTC] RECV: EPR:0 454 255 Extr:3 extruder cooler speed [0-255]
[2016-01-06 12:54:25 UTC] RECV: EPR:1 452 0 Extr:3 distance to retract when heating [mm]
[2016-01-06 12:54:25 UTC] RECV: EPR:1 450 150 Extr:3 temp. for retraction when heating [C]
[2016-01-06 12:54:25 UTC] RECV: EPR:1 439 1 Extr:3 temp. stabilize time [s]
[2016-01-06 12:54:25 UTC] RECV: EPR:2 435 0 Extr:3 Y-offset [steps]
[2016-01-06 12:54:25 UTC] RECV: EPR:2 431 0 Extr:3 X-offset [steps]
[2016-01-06 12:54:25 UTC] RECV: EPR:0 430 255 Extr:3 PID max value [0-255]
[2016-01-06 12:54:25 UTC] RECV: EPR:3 426 58.3200 Extr:3 PID D-gain
[2016-01-06 12:54:25 UTC] RECV: EPR:3 422 1.6400 Extr:3 PID I-gain
[2016-01-06 12:54:24 UTC] RECV: EPR:3 418 19.5600 Extr:3 PID P-gain/dead time
[2016-01-06 12:54:24 UTC] RECV: EPR:0 445 60 Extr:3 PID drive min
[2016-01-06 12:54:24 UTC] RECV: EPR:0 417 255 Extr:3 PID drive max
[2016-01-06 12:54:24 UTC] RECV: EPR:0 416 0 Extr:3 heat manager [0-3]
[2016-01-06 12:54:24 UTC] RECV: EPR:3 412 10000.000 Extr:3 acceleration [mm/s^2]
[2016-01-06 12:54:24 UTC] RECV: EPR:3 408 5.000 Extr:3 start feedrate [mm/s]
[2016-01-06 12:54:24 UTC] RECV: EPR:3 404 45.000 Extr:3 max. feedrate [mm/s]
[2016-01-06 12:54:24 UTC] RECV: EPR:3 400 1.000 Extr:3 steps per mm
[2016-01-06 12:54:24 UTC] RECV: EPR:3 346 0.000 Extr:3 advance L [0=off]
[2016-01-06 12:54:24 UTC] RECV: EPR:0 354 255 Extr:2 extruder cooler speed [0-255]
[2016-01-06 12:54:24 UTC] RECV: EPR:1 352 0 Extr:2 distance to retract when heating [mm]
```

 Download the log-file for support requests via the *Log* screen.