INSTRUCTIONS

SAFETY

CERTIFICATION

PWS 3D PRINTER

PRINT WITH SMILE, SE

PWS400K

1. VISUAL DESCRIPTION OF THE PRINTER
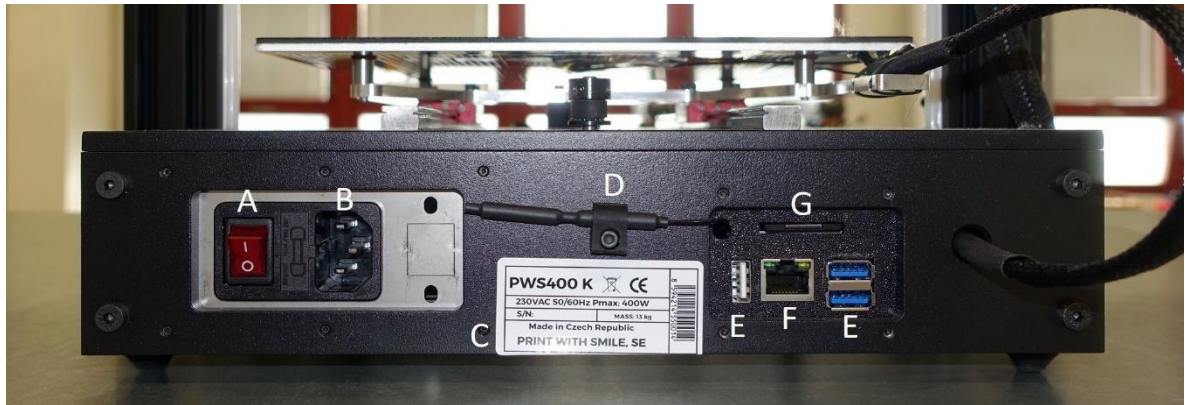
A. Power rocker switch	**E. USB cables**
B. Socket for power cable	**F. LAN cable**
C. Printer identification label	**G. OrangePi system SD card**
D. WIFI antenna	

1. Main switch	**2. Switching on the white LED lights**
3. Display	**4. Notification bar**

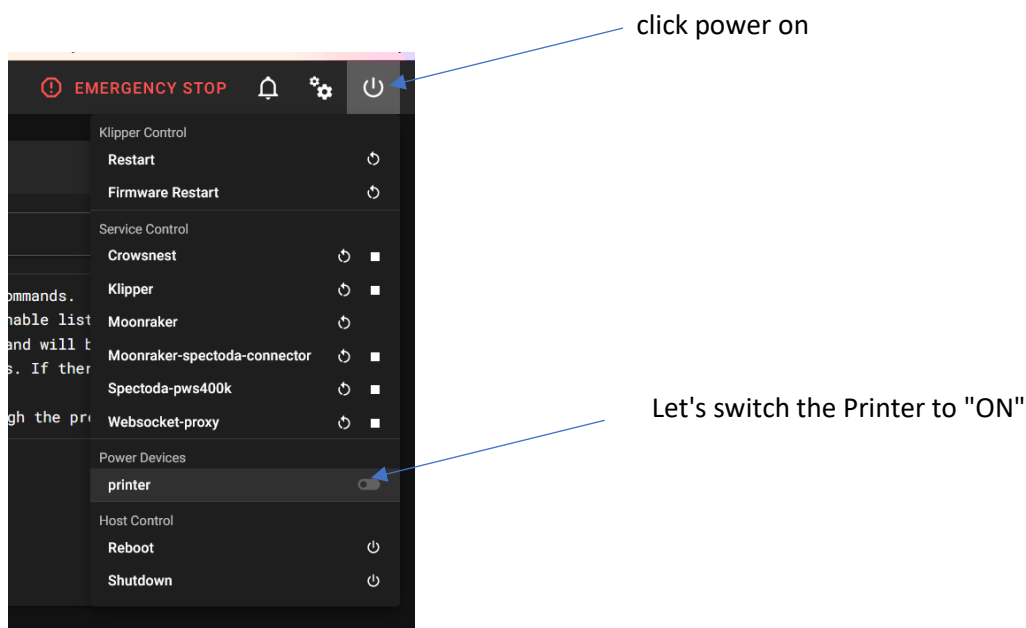## 2. FIRST START-UP – LAN Connection

We carefully take the printer out of the transport package and place it on a solid surface. According to the instructions, we turn the Z-axis up so that the foam insert can be removed. It rotates with both threaded rods at the same time in the same direction. Then we connect the LAN cable to the Orange PI connector (F) on the back panel of the printer. Connect the 230V supply cable (B) and turn the rocker switch (A) to position I.

Turn on the printer by pressing the switch (1) on the left side of the front panel. The PWS400K has a remote on/off relay installed, so it does not visually react to the switch being pressed. However, pressing the switch to the on state is necessary for the functionality of the printer. The button has a similar function to "TOTAL STOP".

IMPORTANT: WE DO NOT RECOMMEND SWITCHING THE ROCKER SWITCH ON THE BACK OF THE PRINTER TO THE "0" POSITION WITHOUT FIRST SWITCHING OFF THE SYSTEM CORRECTLY! RISK OF DAMAGE TO THE PRINTER OPERATING SYSTEM!

Shutting down while running is permissible only in the event of a necessary - emergency hard restart of the printer's operating system. To turn off the printer completely, for example before disconnecting it from the mains, you use the web interface and the command Host Control/Shutdown - Host control/shutdown. The printer's operating system is designed to run in standby mode in the background, with minimal power consumption. Therefore, it is not necessary to switch it off.

The first start after connecting to the electrical networks.

click power on

Let's switch the Printer to "ON"

3. FIRST START-UP – WI-FI Connection

Take the printer out of the shipping box, remove the foam according to the instructions, and plug it in using power cord.

Then press in the switch no.1 (left from the front view) and then switch on the cradle in the back (A).

The printer turns on and lights up with blue color.

Prepare an empty USB drive formatted as FAT32. FAT32 file format is necessary.

Insert it to the PC. Open the PrusaSlicer and click on configuration -> WI-FI configuration.
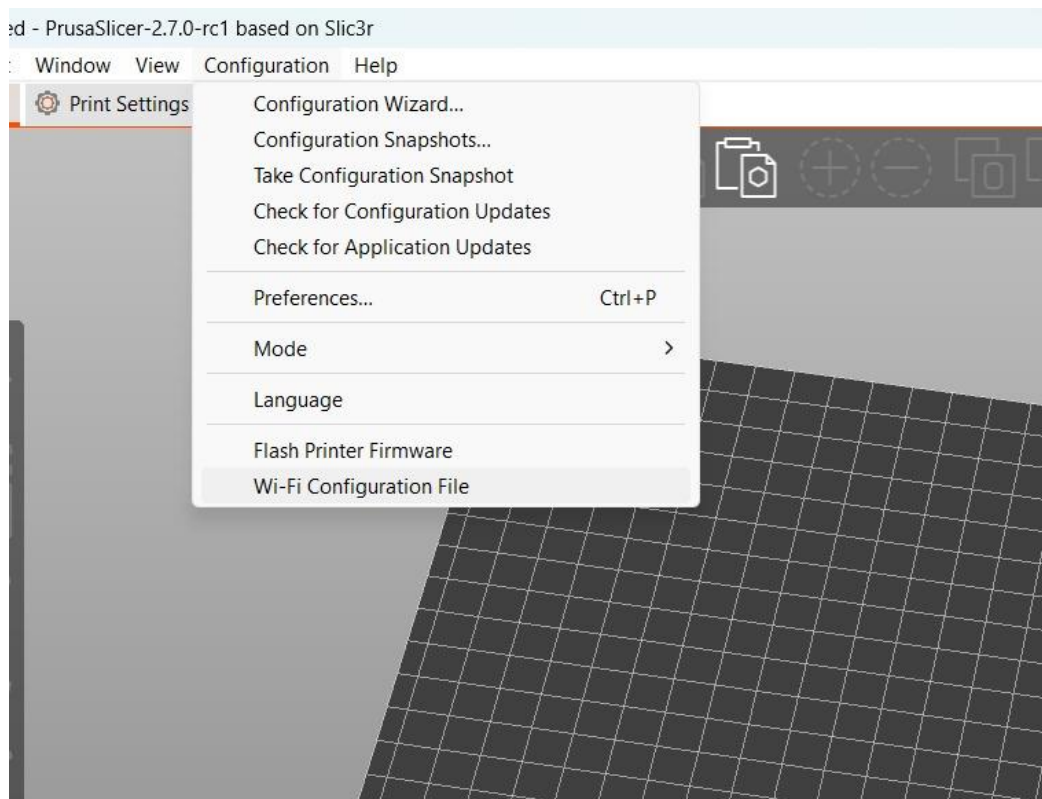
A WI-FI configuration window will open.

WI-FI network your device is connected now will be prefilled. IF you what to connect printer to different WI-FI fill SSID and password, as in picture below.
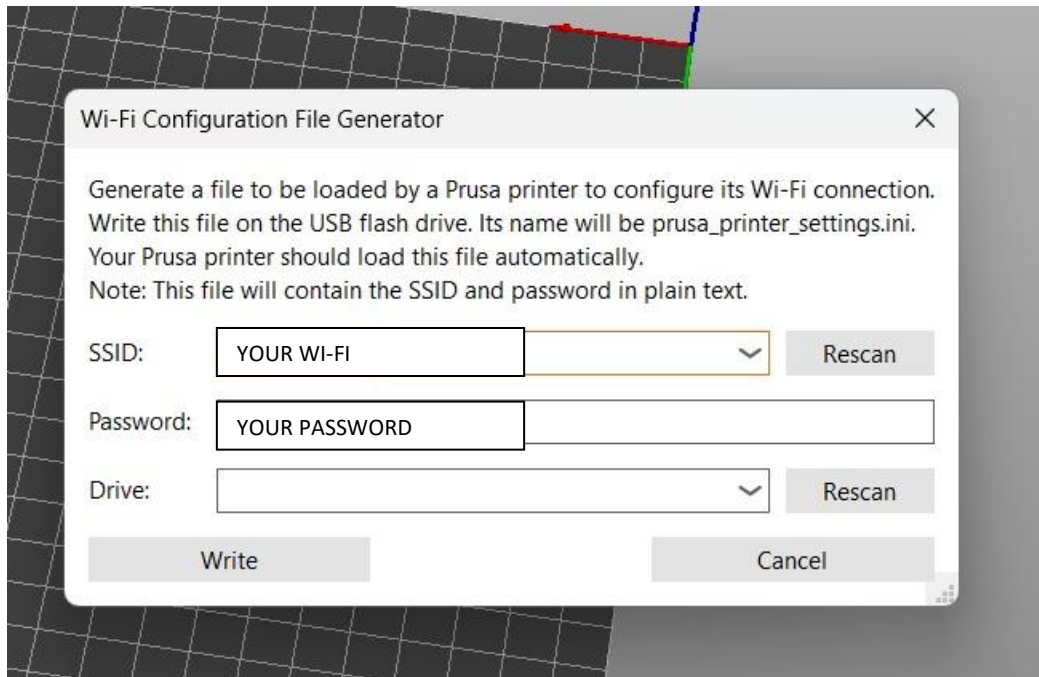
Click on Write, PrusaSlicer will confirm saving configuration file on to the USB drive, safely eject USB drive using eject icon.

 Then insert prepared USB drive into any USB slot on the printer back panel (E).

The printer beeps once as it registers the USB drive and tries to connect to WI-FI using configuration file. Connecting to WI-FI will take approximately 15 seconds.

If printer successfully connects to WI-FI it beeps with one long tone lights turn GREEN and configuration file on USB drive is changed to "wifi_ok".

Printer is than accessible via the web browser on pws400k.local URL with Mainsal UI.

If connection is not successful, printer beeps 3 times, lights turns RED and file name is changed to "wifi_nok". Please check that your WI-FI network is accessible, has reasonable signal strength and your WI-FI SSID (name) or PASSWORD is correct. And try again with new WI-FI configuration file.

The USB must be new formatted and empty.

4. CONNECTING THE PRINTER TO WIFI WITH SSH

If you plan to use a wireless network to connect to the printer, you must connect the printer to the network using the following steps.

If you are a Windows user, please open a command prompt.

If you are a MAC OS user or use a variant of the Linux distribution, then use the terminal application.

The Windows system is used here, but the commands are the same for all systems.
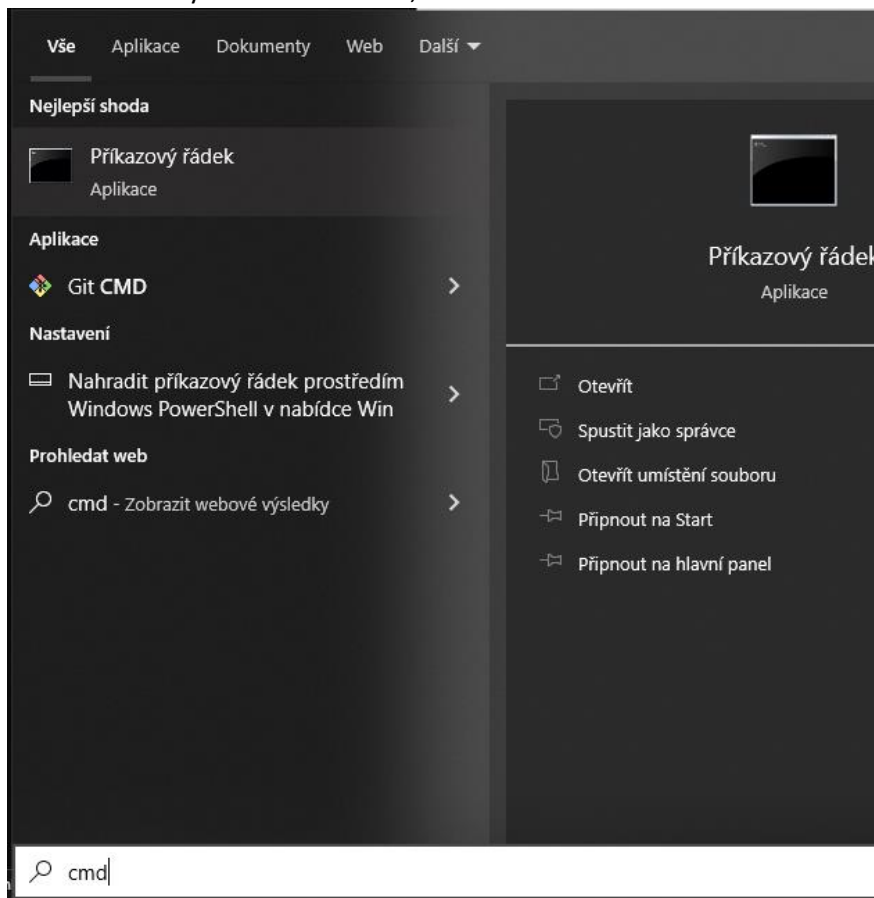
We enter the command in the format ssh pi@pws400k.local

To the question whether the connection to the printer can be trusted, we answer by writing - YES, confirm with the ENTER key.
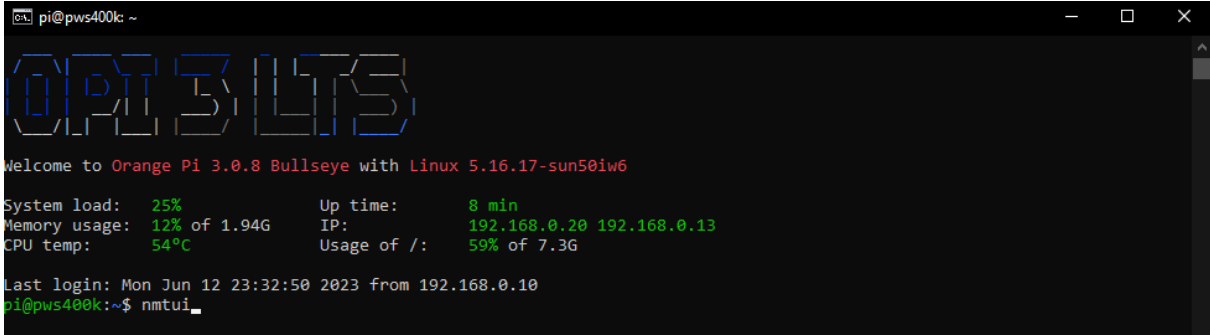
Subsequently, the printer will request an access password. The password is orangepi1234. When entering it, the characters are not visible.

After confirmation, we will be greeted by the welcome window of the Linux distribution. Here we enter the **nmtui** command. By subsequently confirming it with the Enter key, the subprogram for connecting to the Wireless Network will open.


Use the cursor keys to select the "Activate a connection" line and confirm with the Enter key.

Orange PI searches for all available wireless networks within range. Use the cursor keys to select the one to which you want to connect the printer. You confirm the selection with the Enter key, enter the password, and confirm again with the Enter key. If the connection was successful, a * will appear next to the wireless network name.
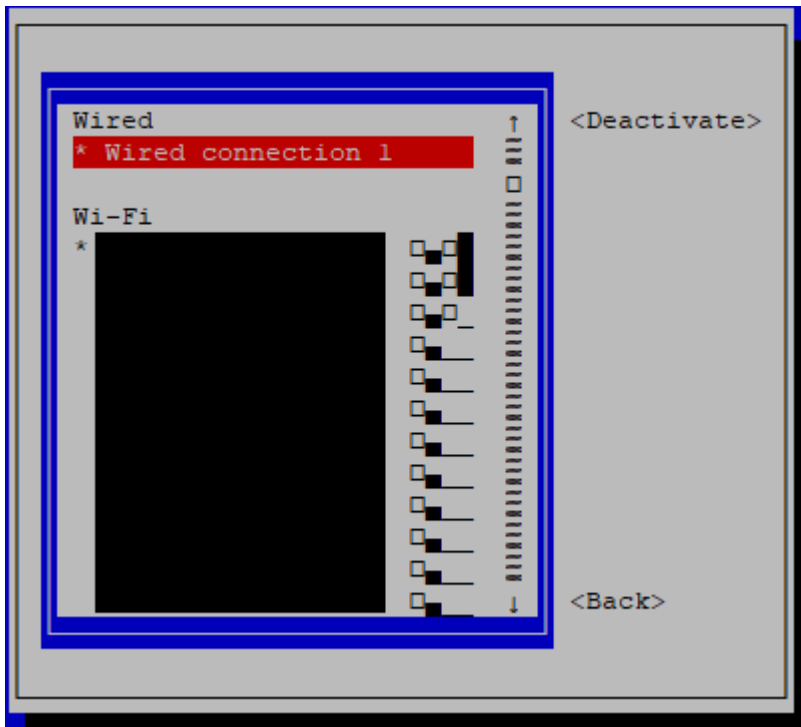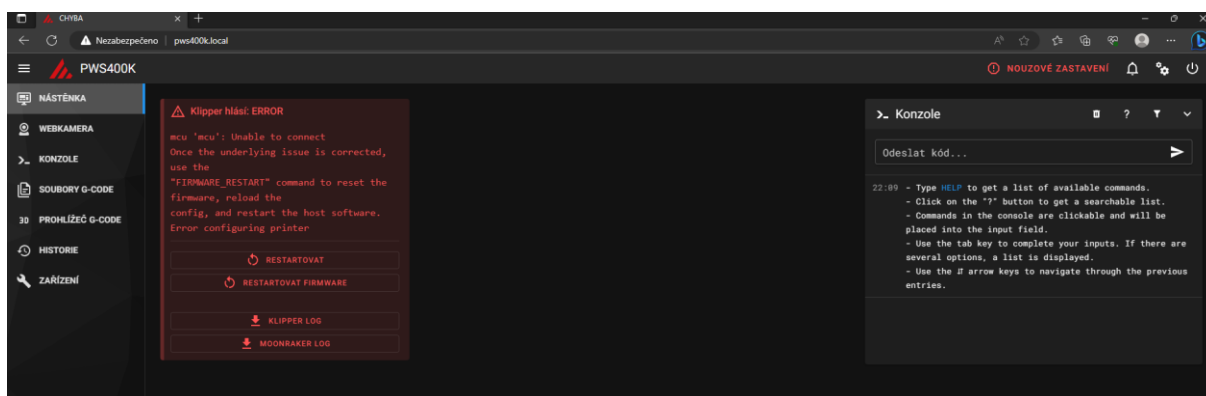

You can close the command line/terminal. This is how the printer is connected to WIFI.

## 5. PRINTER CONTROL VIA THE WEB INTERFACE AND ITS DETAILED DESCRIPTION

The primary control interface for the PWS400K printer is via a web browser at **pws400k.local**
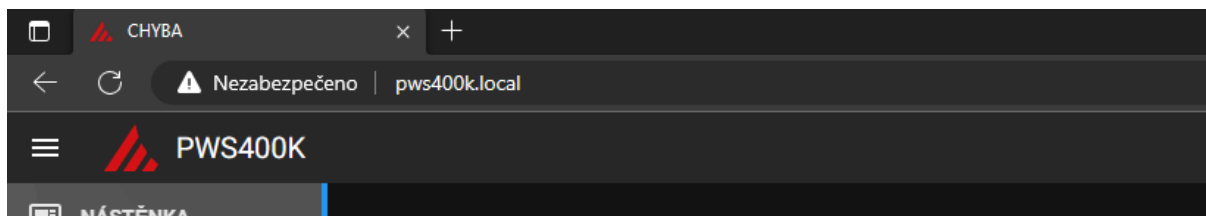

After entering this web address, the Mainsail control interface will appear.


The error message of the clipper is normal when starting the printer for the first time, using the button to restart the firmware, a correct window will appear offering to turn on the printer.
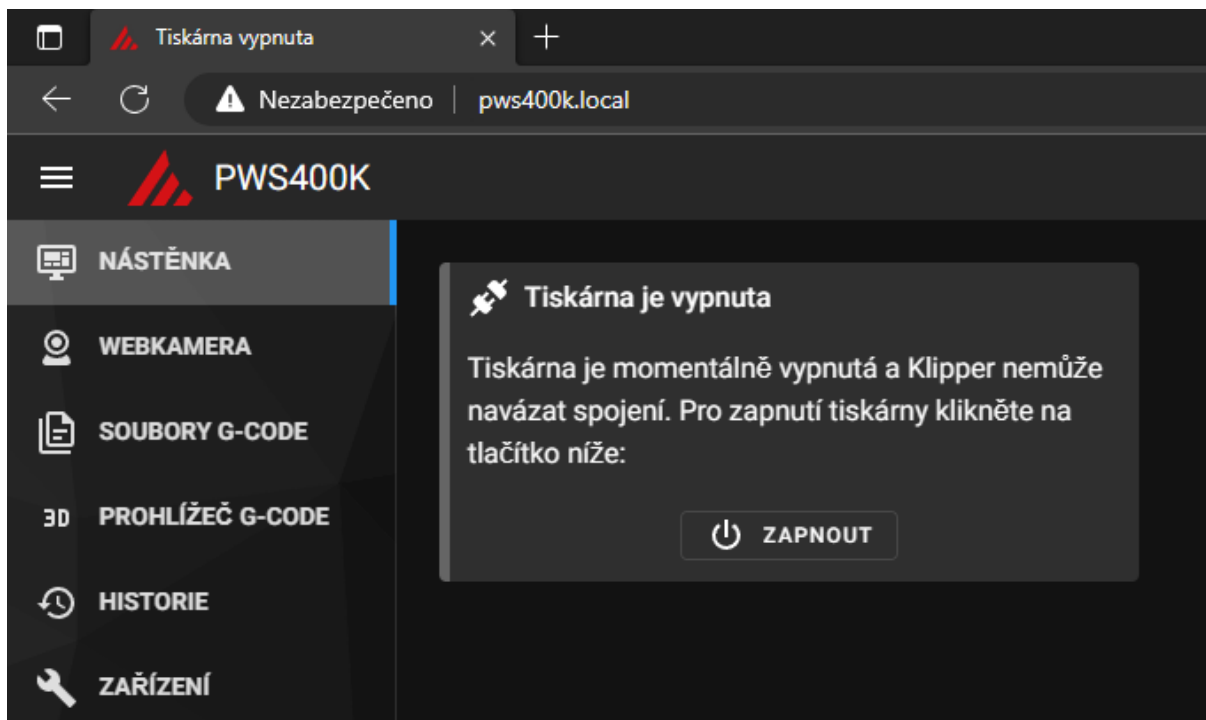
After confirming the Power off command, the power-on relay closes, the printer performs a short test and the web user interface starts. The functions of the individual blocks are explained below.
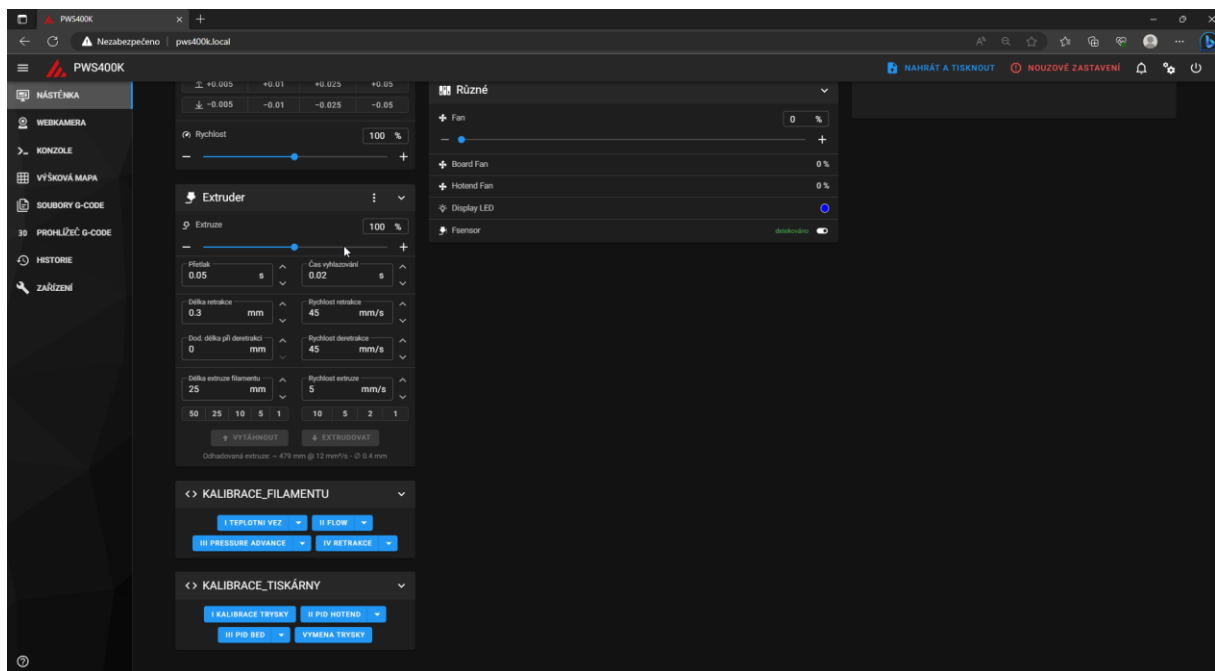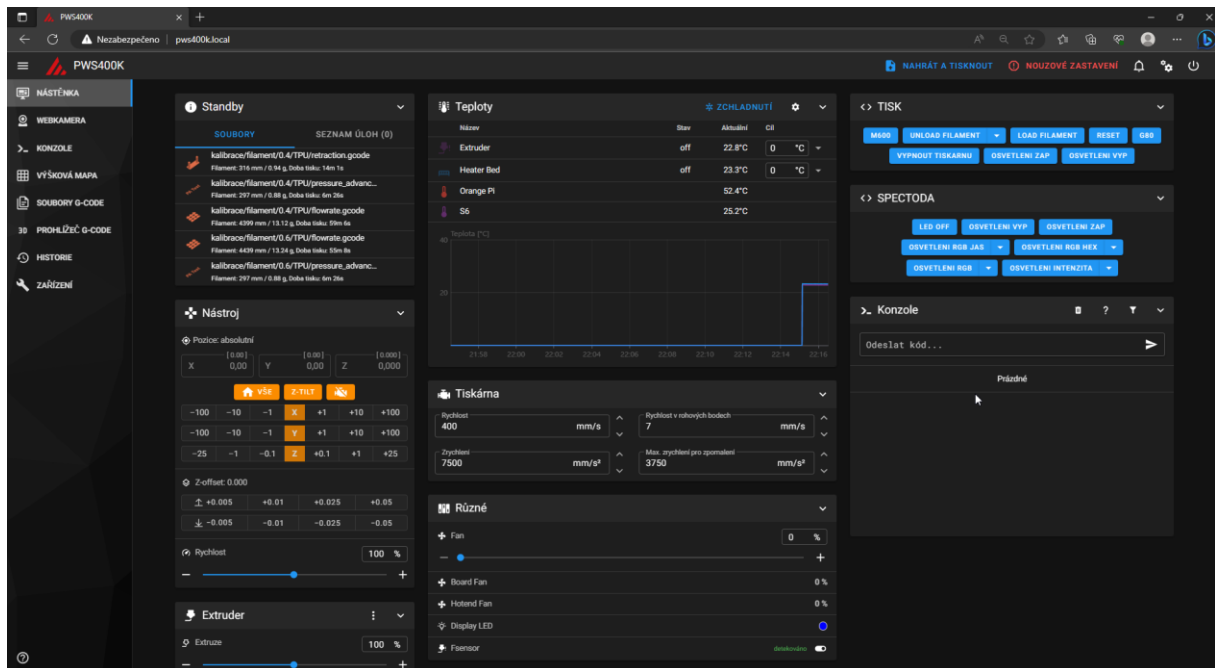
INTERFACE SECTION MENU
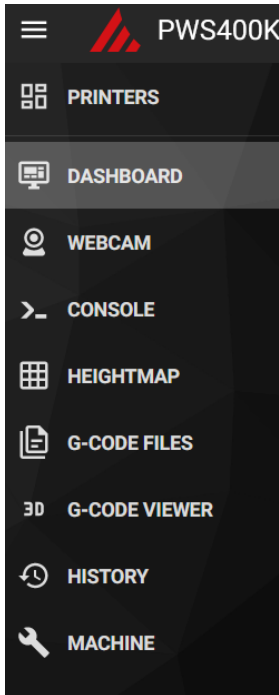
DASHBOARD - Overview section of the web interface consisting of individual functional control blocks

WEBCAM - Enlarged view of the webcam, instructions for connecting the camera below.

**CONSOLE –** Layout section with Klipper firmware command line

HEIGHT MAP – Section with an interactive overview of the flatness of the printing pad

G-CODE FILES – Comprehensive database of uploaded print files

**G-CODE VIEWER –** Interactive 3D tool for viewing a printed G-CODE file

HISTORY – List of all already printed files in the form of a clear database, including statistics

MACHINE - section containing the printer's configuration files and information about the connected network and available updates
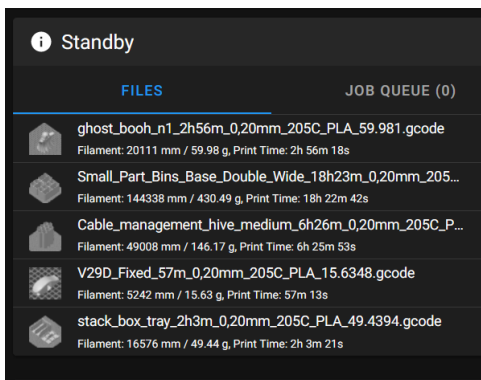
Overview of print files

Here the filament calibration prints that are needed for filament calibrations.

PWS 3D PRINTER
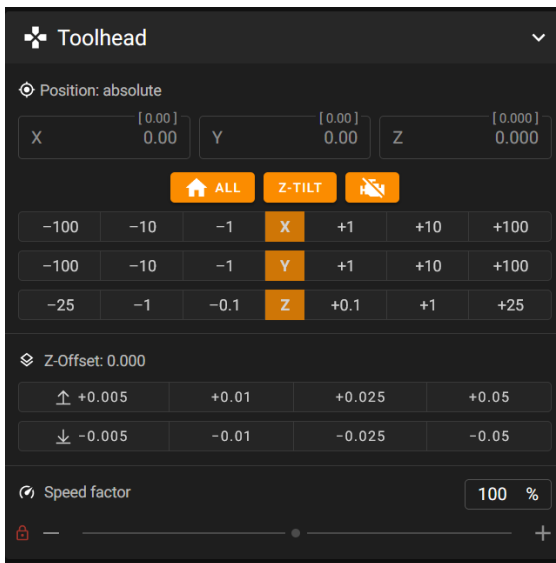
Block used to control the position of the print head

**HOME ALL** – the printer finds the physical zero positions of the OS

Z-TILT – automatic leveling of the height of the Z axis

Turn off stepper motors

Shift of individual Axis in steps of 1, 10 and 100 mm

Z-offset – fine-tuning of the real position 0 of the Z axis – after changing them, it is necessary to save the configuration for further prints by pressing the diskette
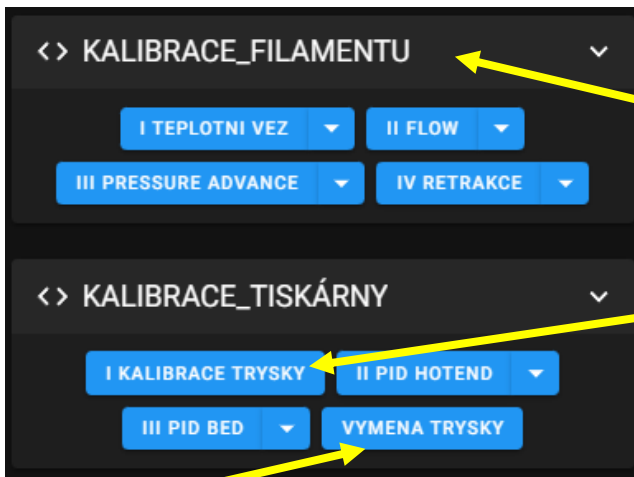
Speed – percentage of print speed
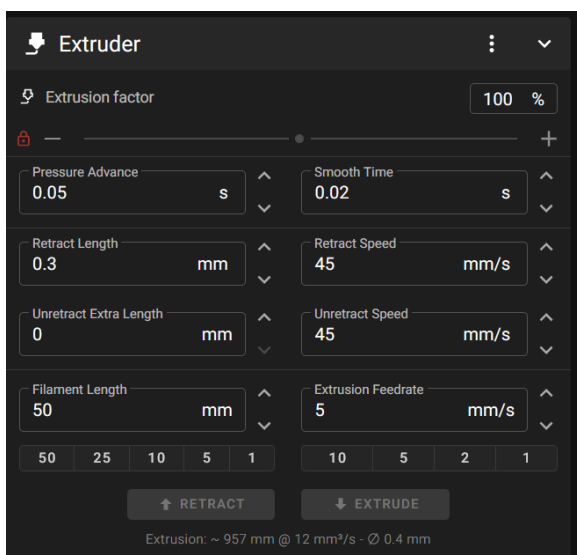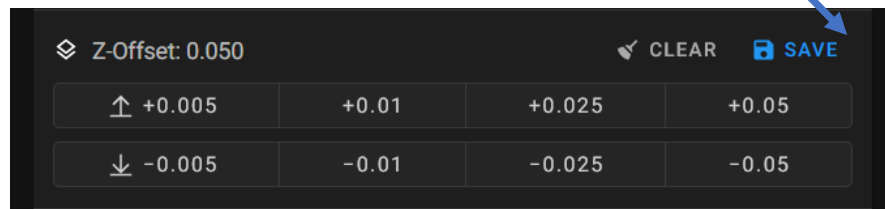
EXTRUDER SECTION

Extruzion – percentage setting of the filament flow through the nozzle (FLOW)

Overpressure and Reserve Time - Pressure Advance settings section

Retraction - Retraction settings section

Extrusion – section for manual extrusion/retraction of material, here it is necessary to first heat the nozzle to 200°C.

CALIBRATION MACROS

Filament calibration – step by step, the output is a printout specifying the ideal temperature, flow (FLOW), overpressure (PRESSURE ADVANCE) and, if necessary, the retraction value**.**

 Printer calibration

Nozzle calibration - auxiliary macro facilitating the calibration of the real 0 Z axis by the so-called paper method. After finding the value, it is necessary to send the SAVE_CONFIG command to the printer to the console.

NOZZLE REPLACEMENT – a macro that allows more convenient nozzle replacement by moving the extruder to the center of the X axis and ¾ of the maximum height of the Z axis

PID hotend – calibration of stable nozzle temperature maintenance, factory calibrated to PLA (200°C). In the case of fluctuations other than "PLA" temperature, it is advisable to carry out this calibration to the required temperature. The printer saves the values itself. The maximum temperature is 300°C

PID bed – similar to the previous macro. But the goal is a heated bed (BED). Factory calibrated to 60°C. The maximum temperature is 120°C
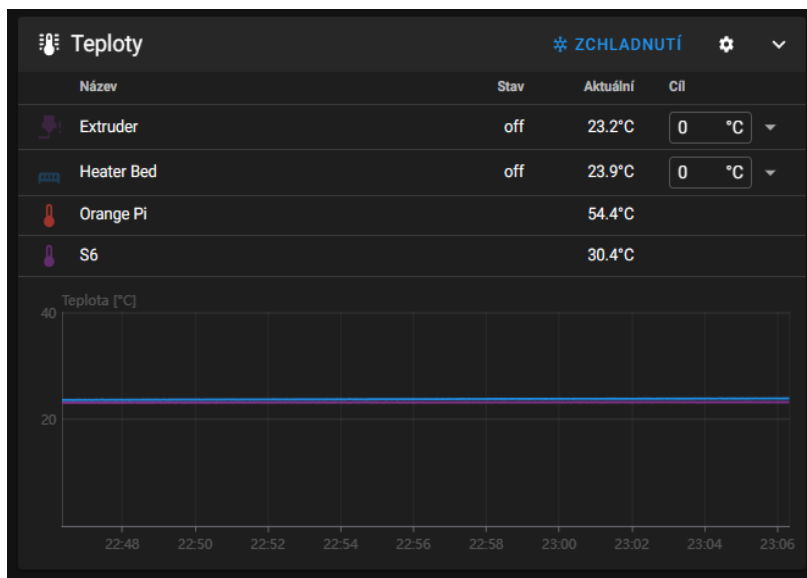
TEMPERATURE SECTION

A section allowing setting the desired temperature of the nozzle (EXTRDUER) and the heated pad (BED). And sending a command to cool them down.
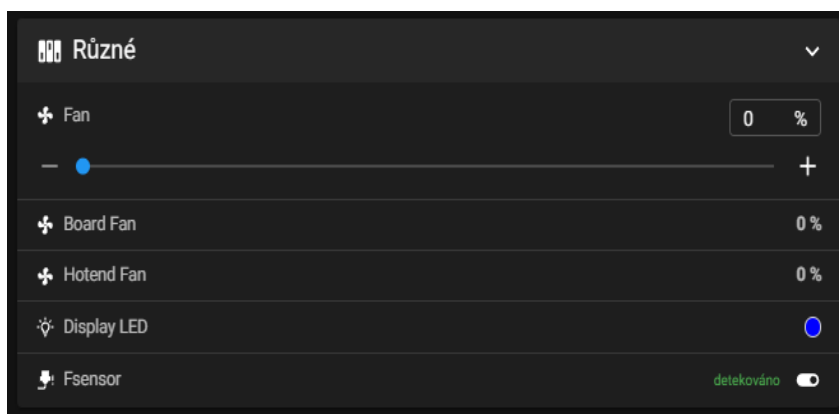
In this section, there are also information temperatures of the computing chips of the motherboards. The temperature of Orange PI can even exceed 90°C without affecting the service life, so this temperature does not indicate a malfunction.
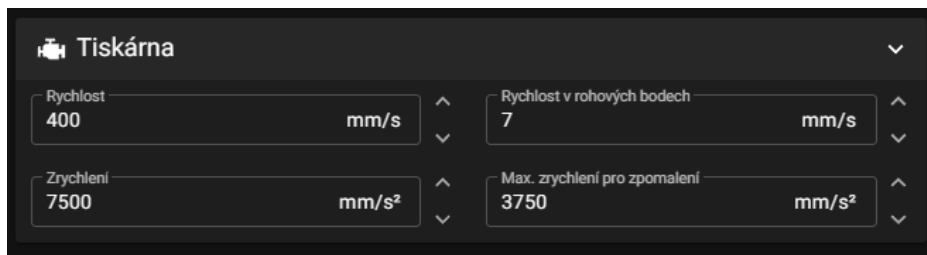
PRINTER SECTION

Section setting the maximum values of movement speed and acceleration.

SECTION MISCELLANEOUS

This section allows you to control the print cooling fan with a pull rod. It also contains informative values of the percentage speed of the hotend cooling fan and electronics cooling. It also allows you to set the color of the display backlight using the RGB color palette. The filament sensor in the print head can also be temporarily disabled here.
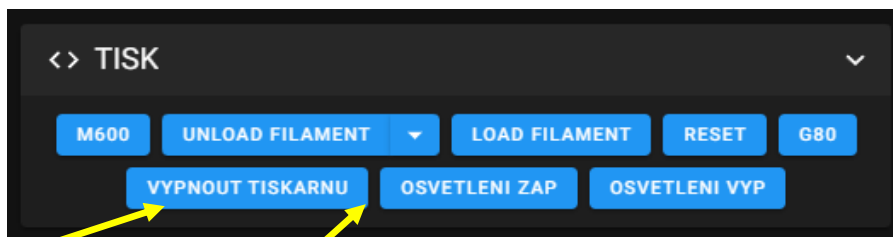
MAKER SECTION FOR PRINTING

This section allows you to run predefined macros during printing.

SHUT PRINTER OFF - macro that turns off the printer using the shutdown relay

LIGHTING ON (OSVETLENI ZAP)/ LIGHTING OFF (OSVETLENI VYP) – a macro that lights up the white LEDs in the printer frame

M600 – macro used for automated filament replacement

UNLOAD FILAMENT – macro used to eject the filament, in case of insufficient temperature, the nozzle will automatically heat up to 200°C (this value can be changed)

LOAD FILAMENT – macro used to introduce the filament, in case of insufficient temperature, the nozzle will be automatically heated to 200°C (this value can be changed)
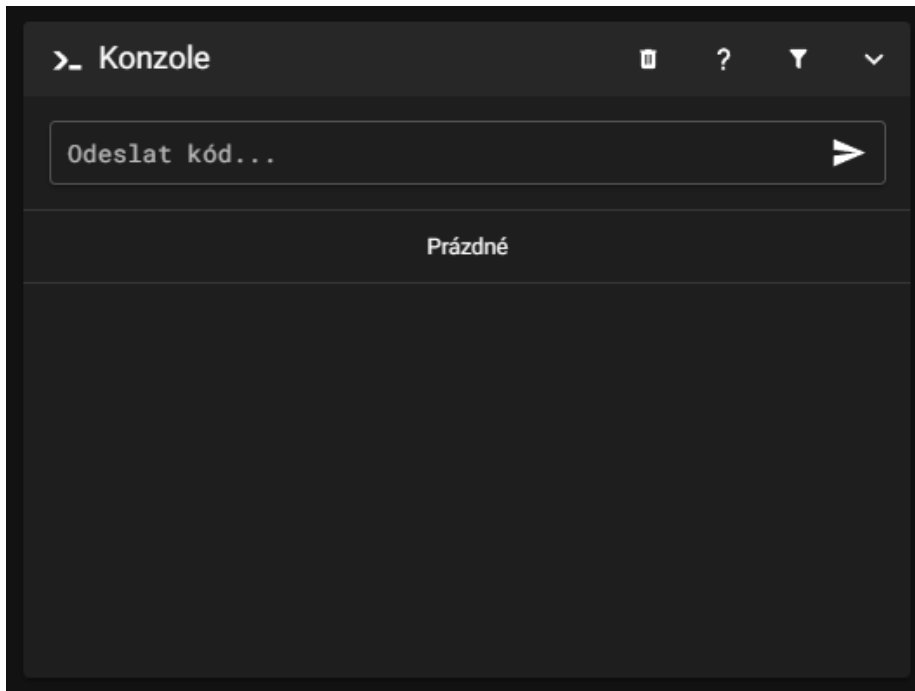
RESET – macro used to restart klipper firmware

G80 - macro for automatic alignment of the Z axis
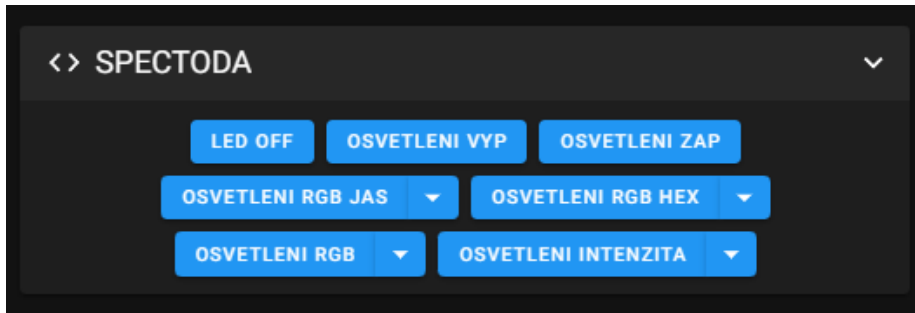
SPECTODA CONTROLLER MAKER SECTION

These macros are described below in the Spectoda section

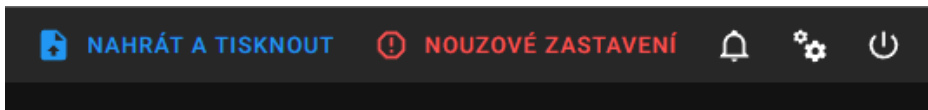**CONSOLE SECTION**

The part of the environment that enables fast sending of commands is used for listing messages or requests from macros and klipper firmware.

TOP RIGHT BUTTONS MENU

**UPLOAD AND PRINT** - one of the ways to upload G-CODE files for printing

EMERGENCY STOP - a button used to immediately stop printer functions in case of danger or malfunction, simulates the TOTAL-STOP button

NOTIFICATIONS - notification of available updates

SETTINGS – user interface settings section

PRINTER CONTROL MENU - see below

OFFER TO CONTROL THE TICKETS AND THEIR MODULES
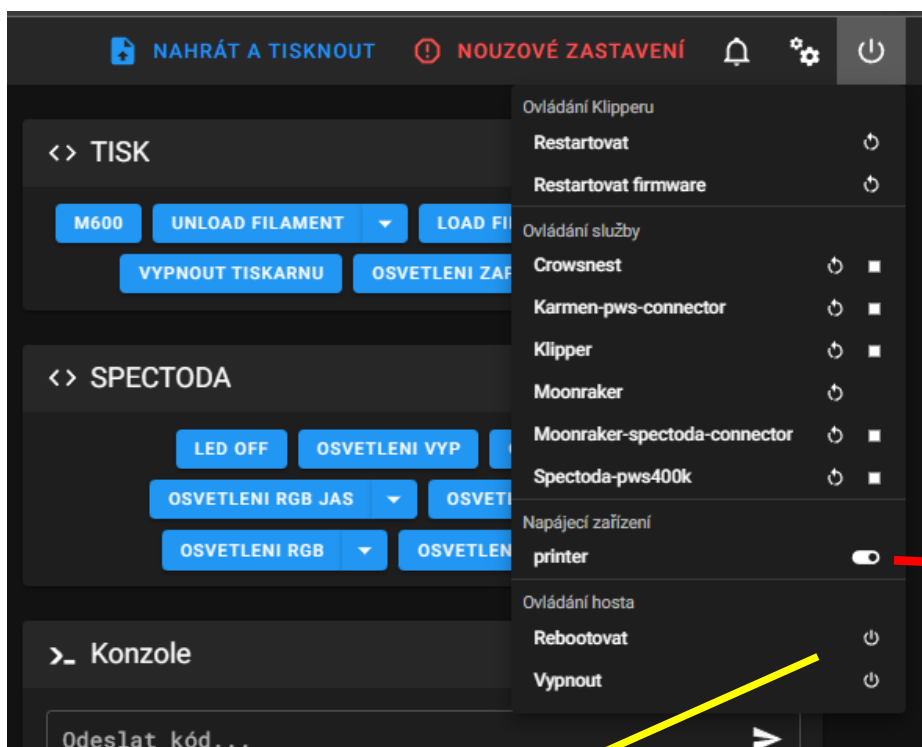
This section allows the user to reboot the Klipper and its firmware. It also allows you to stop/restart its plugins/services.

Here, the printer can also be switched on and off in an emergency using a relay (printer)
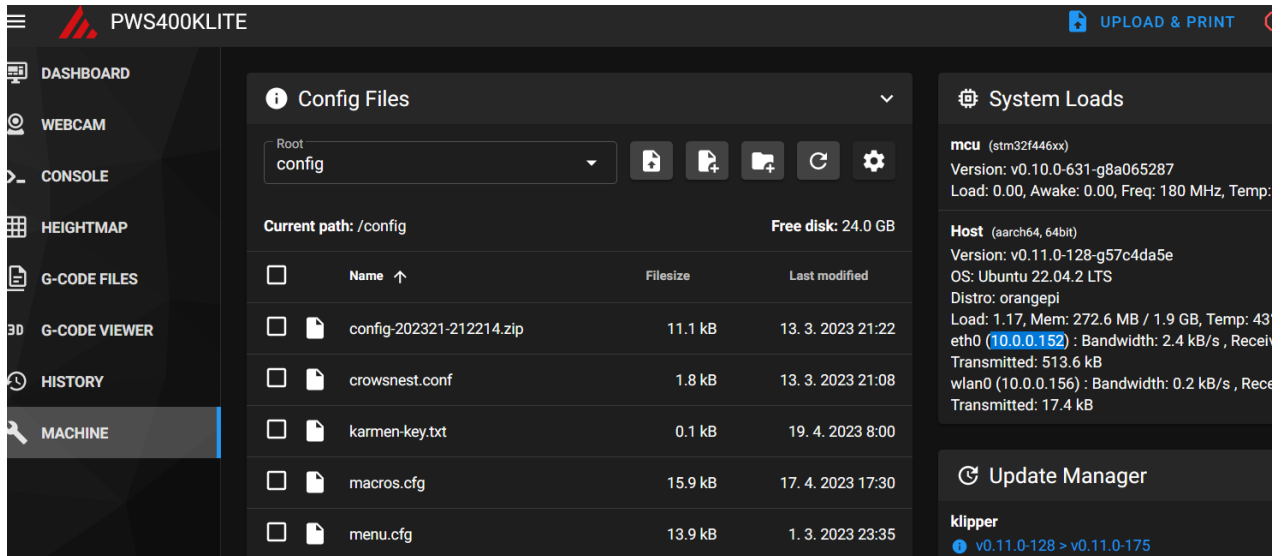
Switching off the printer with a relay - model PWS400K

! GUEST CONTROL SECTION!

This section is the only user-friendly way to CORRECTLY reboot or shut down a guest microcomputer (Orange Pi) running a Linux distribution. Only after turning off the printer from this location can the printer be safely disconnected from the power supply.

Finding the printer's IP address

We recommend using the unique IP address assigned by the router to connect to the printer.

This can be found in the Machine / Device(X) section, in the upper right corner you will find information about the version of Klipper, the Linux distribution and the specific IP address that the printer received from the router. IP addresses are displayed according to the interface used (LAN cable - interface eth0 and Wireless network - wlan0).

6. WEB CAMERA INSTALLATION

You plug the USB camera into any USB slot on the back of the printer and after opening the web environment we do the following steps.

We restart the Crowsnest service, which ensures the functionality of the web camera.
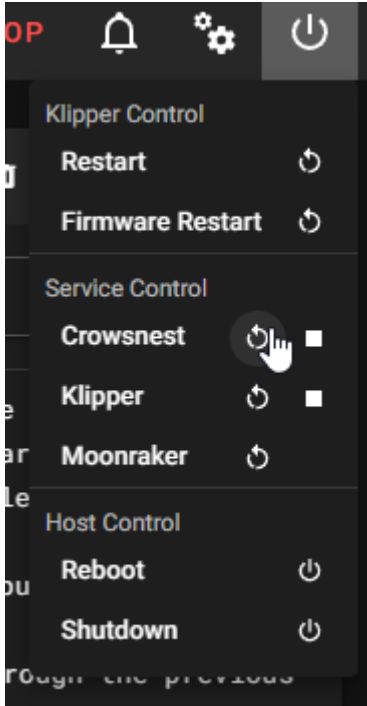
We download the log file generated by this service, open it in any text editor.
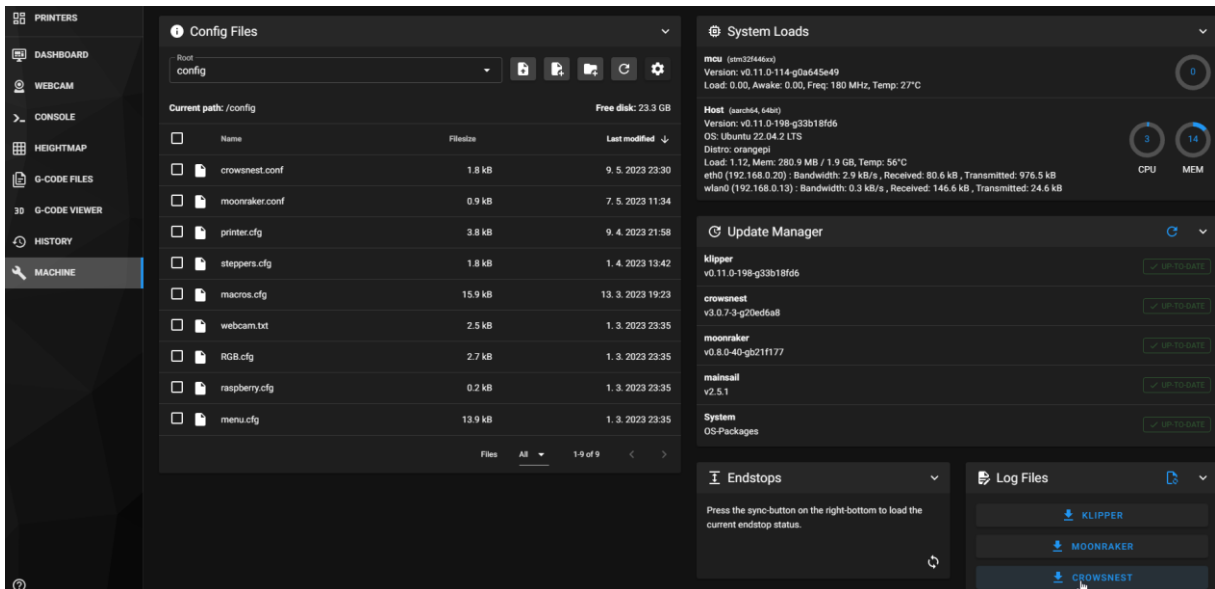
We will look for a line that indicates the UNIQUE path assigned by the Linux system to this camera. Here highlighted in blue. We will copy this path and use it in the next step.

```
Version Control: ustreamer is up to date. (v5.38)
Version Control: rtsp-simple-server is up to date. (v0.20.2)
Version Control: ffmpeg is up to date. (4.4.2-0ubuntu0.22.04.1)
INFO: Print Configfile: '/home/pi/printer_data/config/crowsnest.con
        [crowsnest]
        log_path: ~/printer_data/logs/crowsnest.log
        log_level: verbose
        delete_log: true

        [cam 1]
        mode: mjpg
        port: 8080
        device: /dev/video1
        resolution: 800x600
        max_fps: 15
INFO: Detect available Devices
INFO: Found 1 total available Device(s)
INFO: Found 1 available camera(s)
/dev/v4l/by-id/usb-0c45_USB_camera-video-index0 -> /dev/video1
Supported Formats:
```

Open the crowsnest.conf configuration file and replace /dev/video1 with the line we copied from the previous step.

FROM:

```
[crowsnest]
log_path: ~/printer_data/logs/crowsnest.log
log_level: verbose                          # Valid Op
delete_log: true                            # Deletes l

[cam 1]
mode: mjpg                                   # mjpg/rts
port: 8080                                   # Port
device: /dev/video1                         # See Log
resolution:  800x600                         # widthxh
max_fps: 15                                  # If Hardw
#custom_flags:                              # You can
#v4l2ctl:                                    # Add v4l2
```

TO:

```
[crowsnest]
log_path: ~/printer_data/logs/crowsnest.log
log_level: verbose                      # Valid Options are quiet,
delete_log: true                        # Deletes log on every res:

[cam 1]
mode: mjpg                              # mjpg/rtsp
port: 8080                             # Port
device: /dev/v4l/by-id/usb-0c45_USB_camera-video-index0
resolution:   800x600                   # widthxheight format
max_fps: 15                            # If Hardware Supports th:
#custom_flags:                         # You can run the Stream !
#v4l2ctl:                              # Add v4l2-ctl parameters
```

*Required resolution and frames per second (FPS) can also be set here

And save with service restart.

SAVE & CLOSE   **SAVE & RESTART**   **✕**
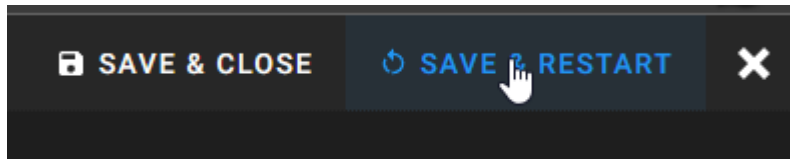
Next is adding the camera to the Mainsail environment.
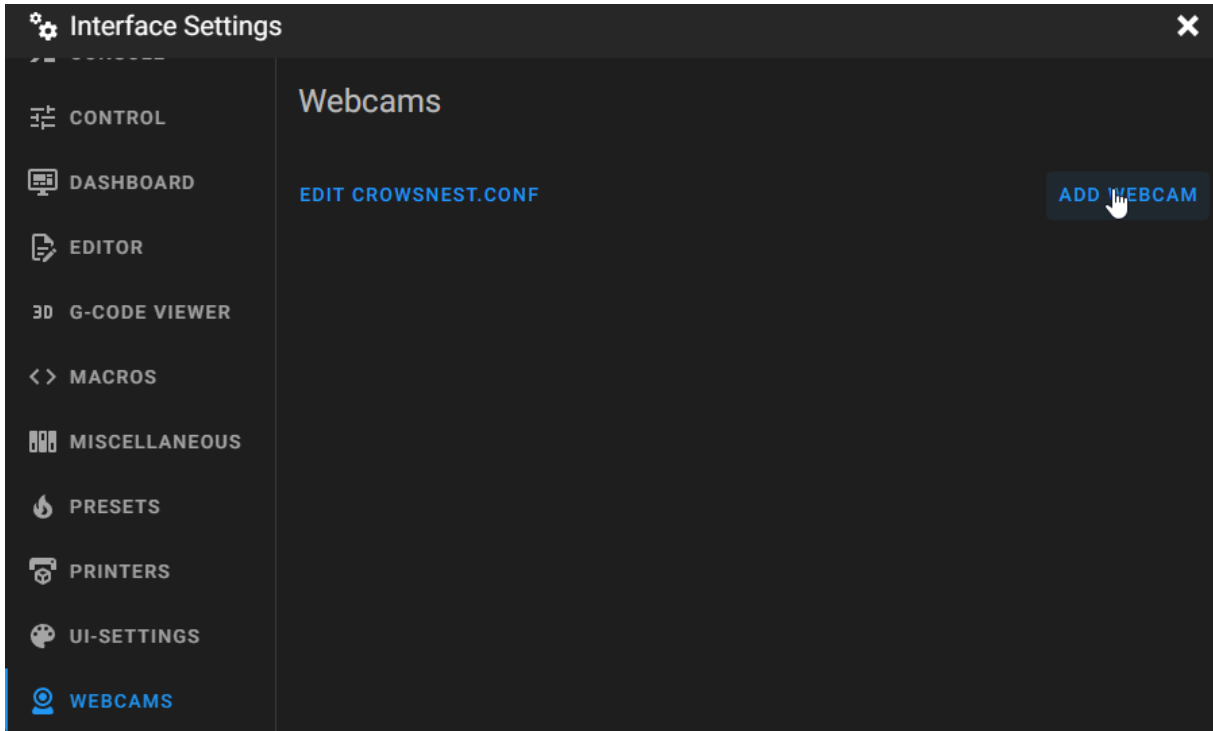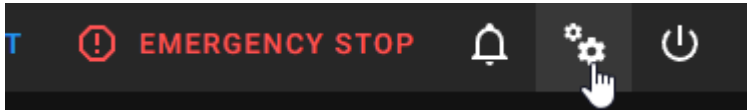
Here you can see the preview from the camera, after assigning the camera name or rotating the image, we give SAVE WEBCAM and the setting is complete
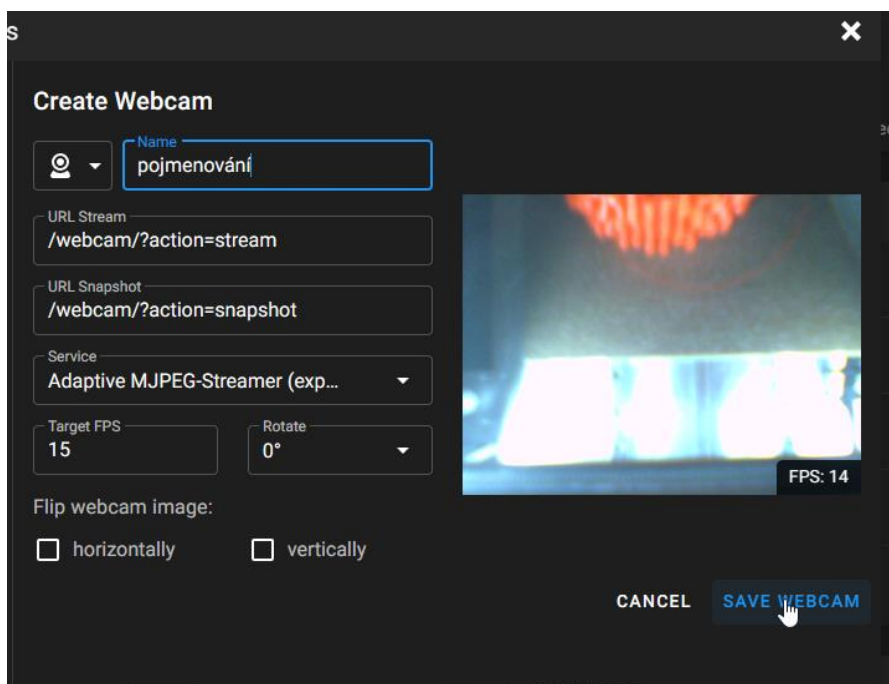
7. KARMEN TECH CLOUD LOGIN

Each printer is assigned a unique key, which can be found in the MAINSAIL interface in the configuration file see below:
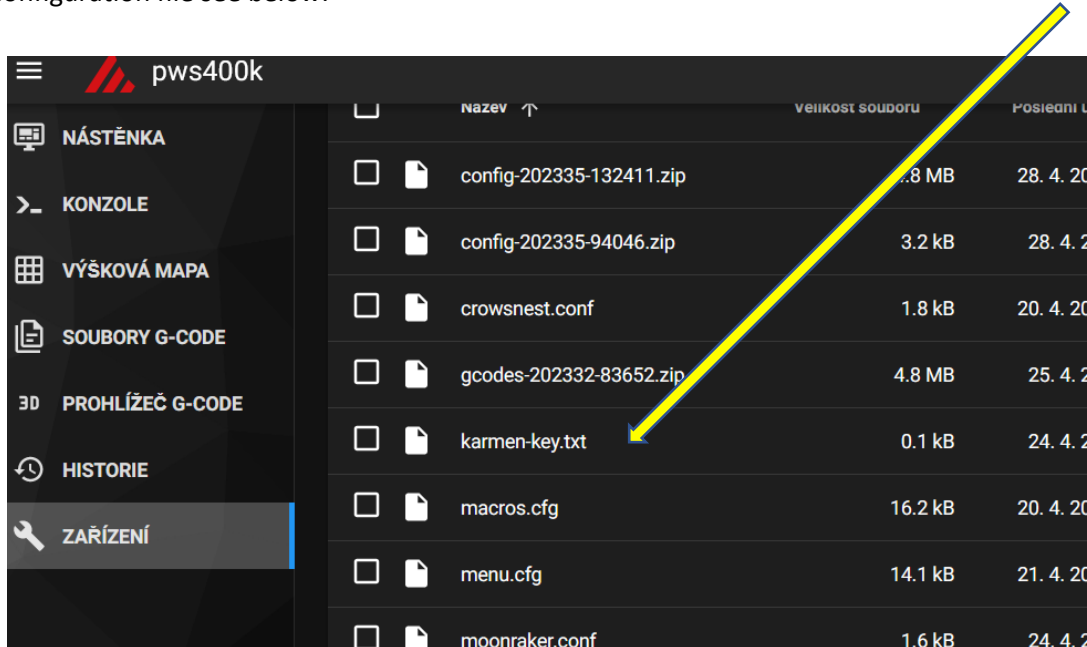
Here is the karmen-key.txt file that contains the key

Copy the key to the clipboard by pressing CTRL+C

6.1 Adding your printer to Karmen

Login or creation of a Karmen service account on the **next.karmen.tech** website

After successful login, if you do not have any printer in the group yet, you will be prompted to add a new printer.
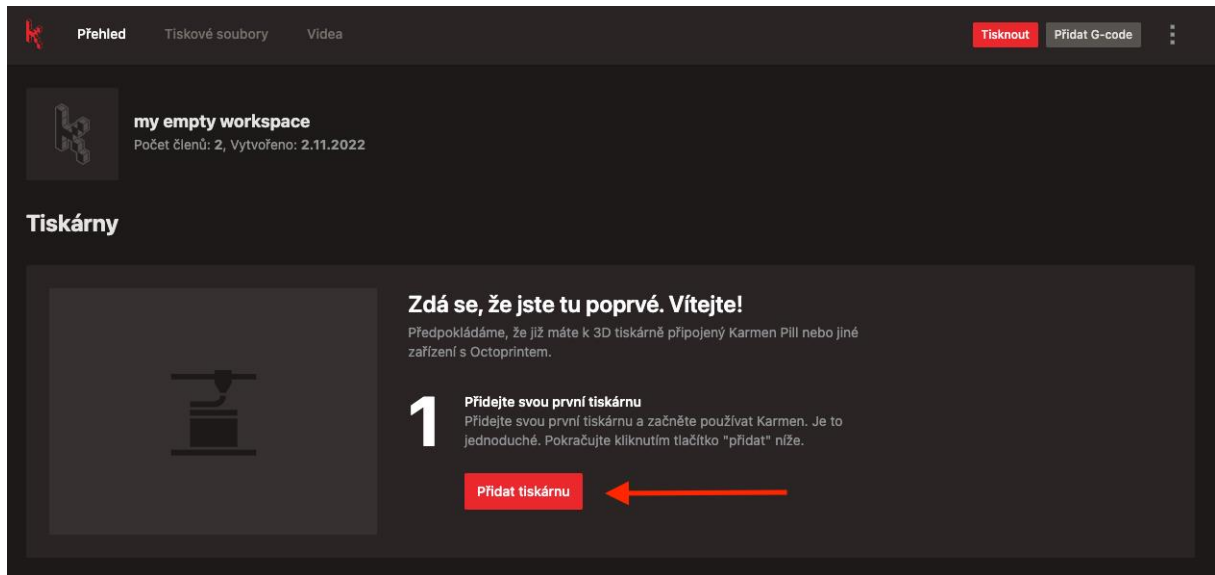
When choosing the type of device, select Klipper
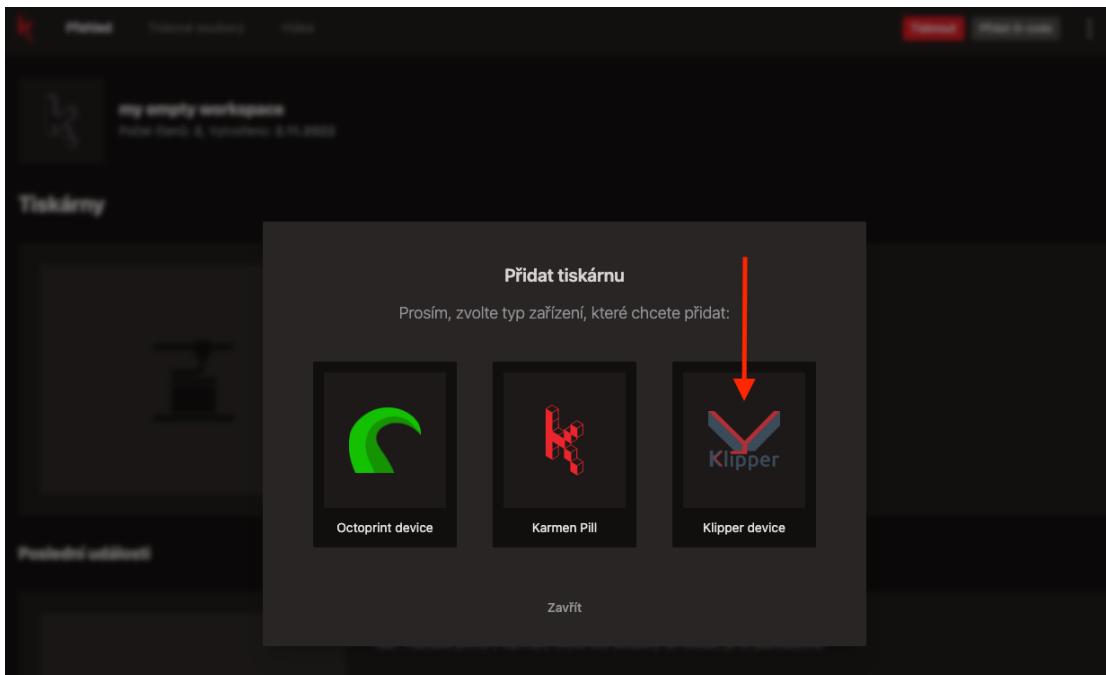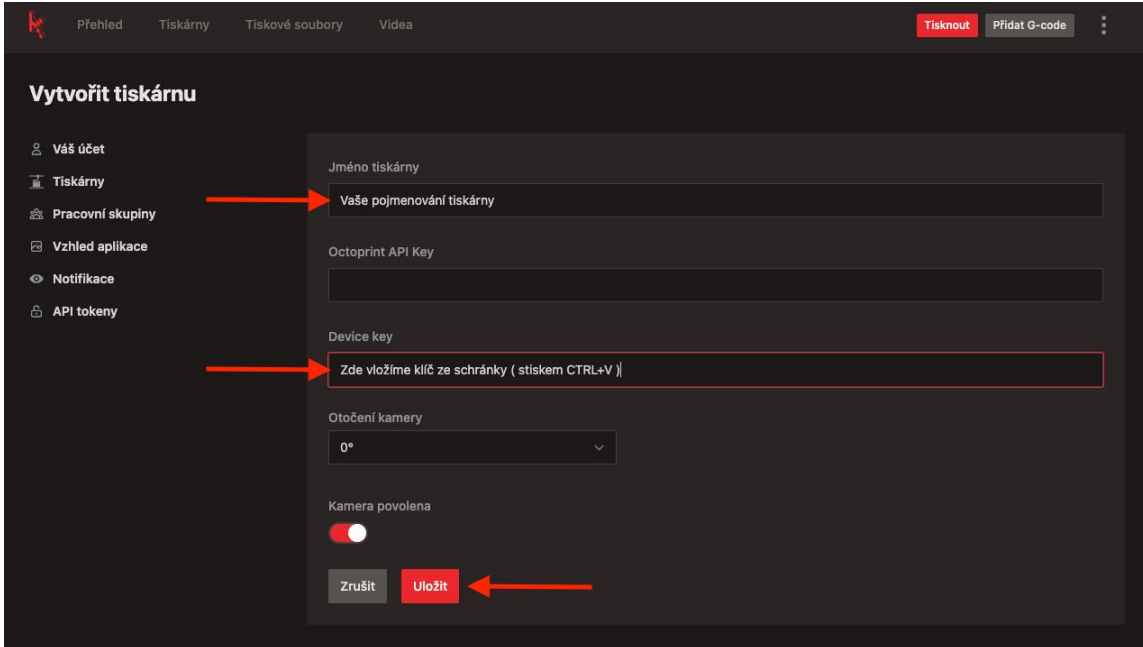
Next, we have to fill in the data

Your printer name

DEVICE KEY -> the key we copied to the clipboard from the Fluid/Mainsail interface, now just paste the key "CTRL+V")

We're done! Let it print!

*If you are adding another printer
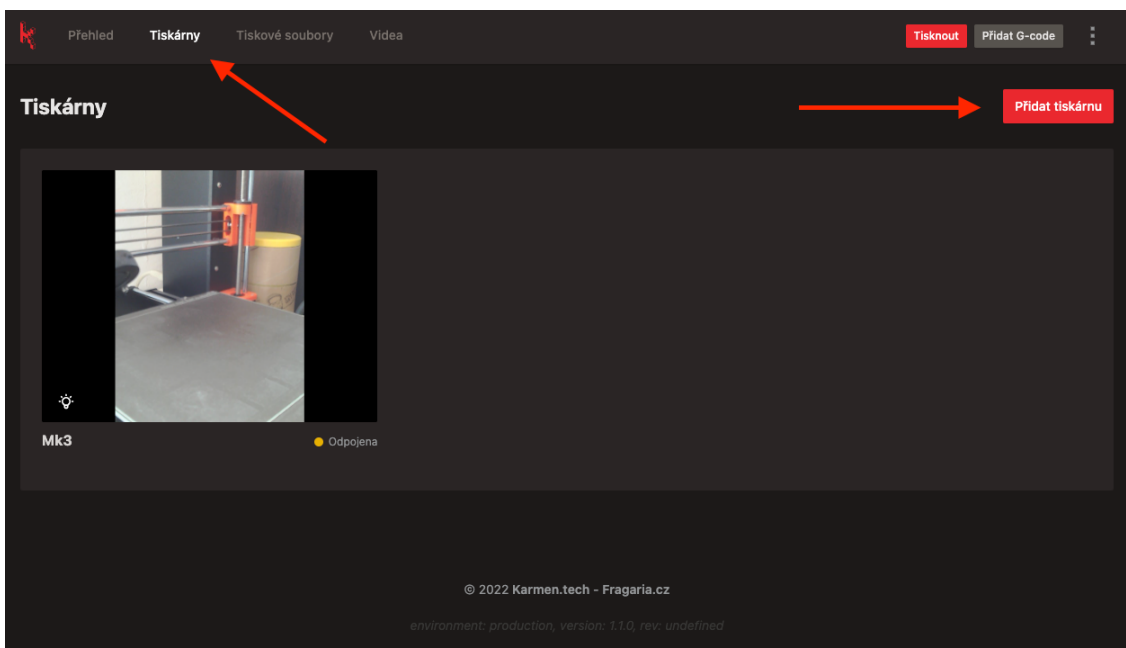
Open the Printers panel. Here is the Add Printer button-Assigning the printer to your account is done using the same procedure

8. ADDING A PRINTER AND PWS PRINTING PROFILES TO PRUSASLICER (HEREINAFTER REFERRED TO AS PS)

Open PS and then open the configuration folder.
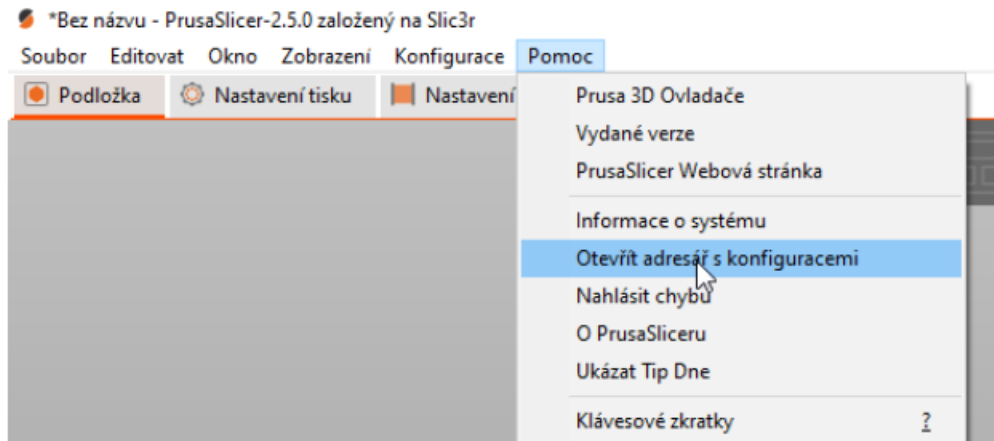
4. If you run the

Configuration for the first time, copy the ZIP file to the configuration folder

a. Downloaded printer profile to the PS directory

b. Downloaded print profiles

c. and filament profiles

For new filament or print profiles, copy configurations from a ZIP file to the configuration folder only:

a. print profiles

b. Filament profiles
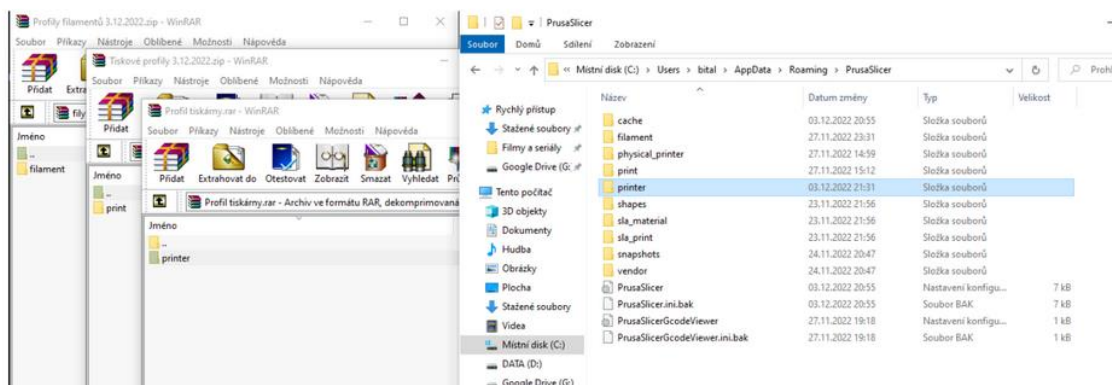
Then turn the PS off and on.

You cancontrol the printer to PS to allow remote recording from the slicer directly to the printer
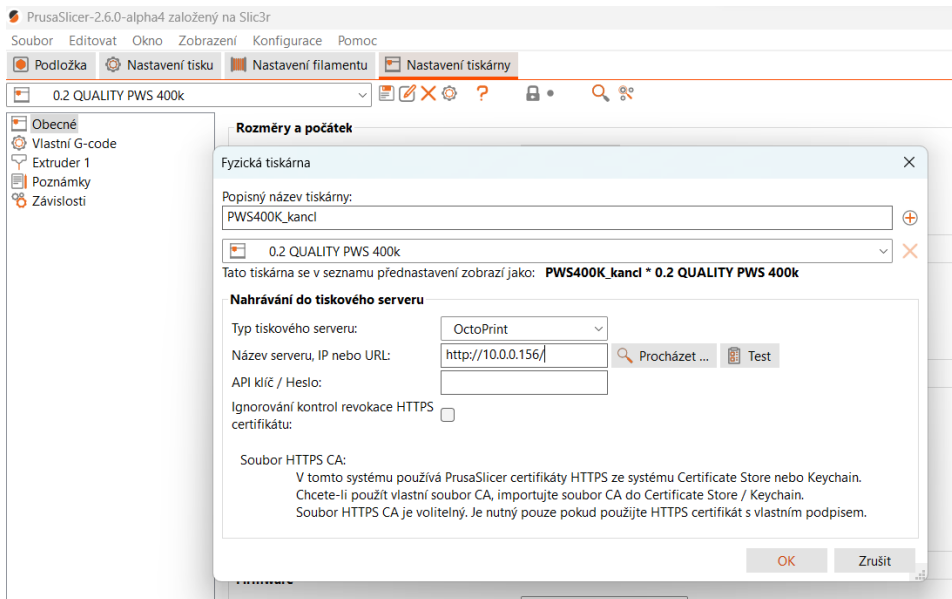
We recommend that you try the test, and in case of a positive result, confirm everything.
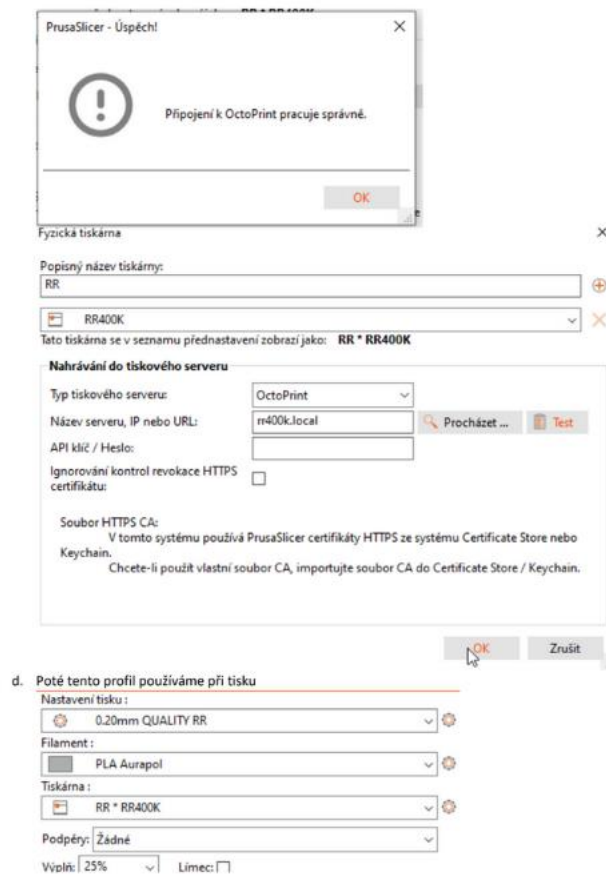
In this way, the g-code can be directly loaded into the printer and, if required, even start printing.
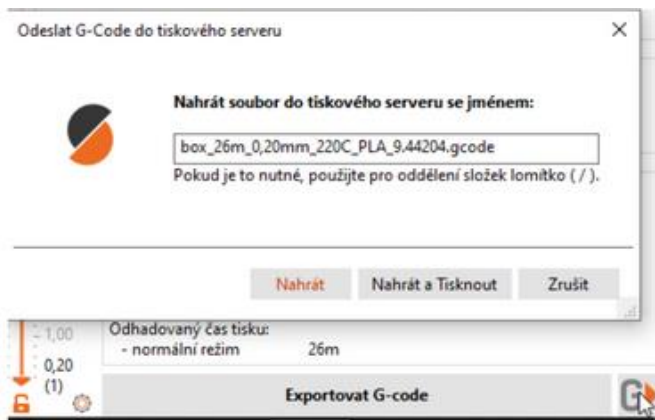
9. INSTRUCTIONS FOR WORKING WITH NOTIFICATION LED STRIPS IN THE PWS400K PRINTER

The PWS400k printer is equipped with notification LED strips with the Spectoda control system. The first part of the LED strip (hereinafter referred to as the notification strip) is located in the lower part of the printer, the second part (hereinafter referred to as the portal) is part of the printer frame.

8.1 Control options

a.) Right bumper

By pressing the right button on the front of the printer, the portal lights up with white for illumination. The same function can be launched from the Mainsail user interface in the "Dashboard" section, the "LED" panel by pressing the "Lighting on" or "Lighting off" button.

It is possible to illuminate the printer desktop in any active state of the printer, including an error.

b) Left bumper

When the printer is turned off by the left button in the front, the notification LED strip and the portal are switched off.

c) Animation

The notification LED strip and portal display animations based on the current status of the printer. These animations are intended to make it easier for the user to orientate in the printing process, or to warn him of possible error conditions.

8.2 Enumerate animations in relation to individual printer states:

Ongoing printing: The portal breathes in a color mask chosen by the user, the notification LED strip displays the loading bar based on the stage of printing (if the print is in 50%, half of the notification LED strip is lit, etc.)

Calibration: Notification LED strip shows white loading animation

Heating: The notification LED strip shows a red-orange heating animation

Idle (no printing): The portal displays an animation in a colored mask chosen by the user

Pause in printing: The notification LED strip shows the loading bar according to the print status, the portal displays the animation as in the idle state

Printing complete: Notification LED strip glows white, portal glows white at the top

Error: Notification LED strip flashes red, portal flashes red at the top

Loading the printer after switching on: A loading animation is in progress, after which an animation is triggered to show loading the Orange Pi in the printer. After starting the Orange Pi, the animation switches to a standstill.

8.3 Lighting control from Mainsail

Lighting behavior settings can be modified directly from the Mainsail web interface. In the "LED" panel, the following buttons are prepared for this:

"Lighting on": Triggers the white working light of the portal, similar to the right button on the printer

"Lighting off": Turns off the working light, the printer displays animations according to its current state

"RGB": By entering the hex code of a specific color, it is possible to change the color mask of notification animations

"Brightness": After entering a number from 0 to 100, it is possible to adjust the brightness of the portal. After entering "0", the lights on the portal are completely switched off.

An alternative approach to setting the lights can be found at the link:
http://pws400k.local:8888/assets/control/

8.4 System Update

If a new version of the system is released, it can be updated in the "Machine" section of the Mainsail web interface.

Packages tied to lights are outlined in red in the image below.
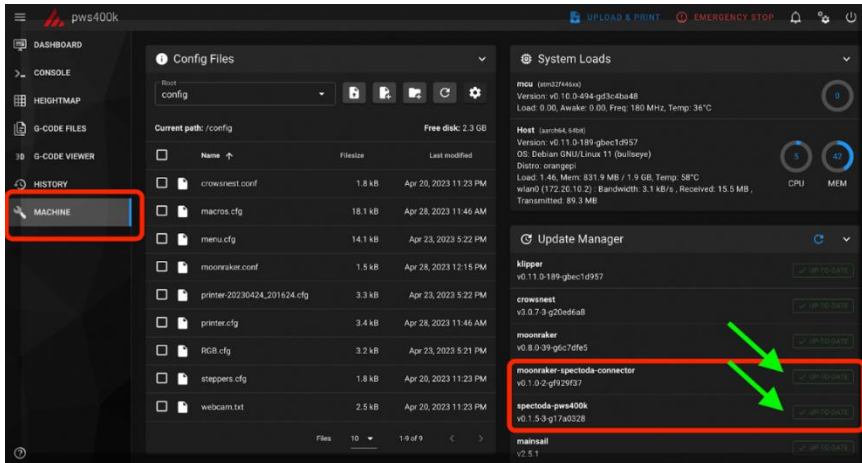
Sample prints, PS profile for PWS400K in 3mf format is on the www.pws3Dprinter.cz pages in the support section.

1.   SAFETY AND MAINTENANCE

Keep the nozzle clean. In the case of dirt in the form of cold filament at the end of the nozzle, there is a risk of collision, damage to the foil or even the printer itself during calibration. We recommend hot cleaning of the nozzle with the included copper brush, and hot replacement. Instructions for replacing the nozzle – see. video support.

Trapezoidal nuts and trapezoidal rods **must NOT BE LUBRICATED!!** It is necessary to keep them clean and clean them from the rest of the filaments.

Hardened bars and linear guides on the Y-axis are recommended to be treated with a clean cloth moistened with preservative oil (e.g. VD40) in case of contamination. Sliding surfaces and rods are only rubbed in this way.

The space p ofthe printer table at the linear guide should be kept clean of printing impurities. We recommend removing filaments from the filament flats with a soft brush or brush.

Magnetic foil u keep clean. BEWARE of material residues under the pad on the magnetic base. We recommend cleaning the magnetic base with isopropyl alcohol and using 3DLAC before printing. Always apply 3DLAC to the pad outside the printer.

In case of problems, defects or ambiguities, please contact our support.

Print with us, print with a smile

C€ Osvědčení o shodě
Konformitätsaussage
Statement of conformity
Číslo/Nr./No.:01022023/P

Potvrzuji tímto, že uvedený výrobek vyhovuje podmínkám níže uvedených předpisů a norem.

Hiermit wird bestätigt, dass das weiter angeführte Erzeugnis mit den unten angeführten Prüfunterlagen übereinstimmt.

I hereby certify that the product below mentioned meets the below mentioned requirements and standards.

Výrobce: **Hersteller** **Manufacturer**	PRINT WITH SMILE, SE, Vrážská 1562/24a, 153 00 Praha 5 – Radotín, ČR
Výrobek: **Erzeugnis** **Product description**	3D tiskárna
Typ/Model: **Typ/Modell** **Type/Model**	PWS400K /PWS400K LITE, PWS400M, PWS400M LITE, PWS 1, PWS 1 LITE
Ověřeno dle: **Geprüft nach** **Tested according to**	NV č. 118/2016 Sb., které je ekvivalentní SR č. 2014/35/EU, NV č. 117/2016 Sb., které je ekvivalentní SR č. 2014/30/EU, NV č. 176/2008 Sb. ve znění NV č. 170/2011 Sb. a 229/2012 Sb., které je ekvivalentní SR č. 2006/42/ES ve znění SR č. 2009/127/ES a 2012/32/EU, ČSN EN ISO 12100, ČSN EN 61010-1 ed. 2, ČSN EN 61000-6-3 ed. 2, ČSN EN 55014-1 ed. 4, ČSN EN ISO 13849-1

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Conformity consulting s.r.o.
poradenství a technická pomoc
při posuzování shody výrobků
IČ: 27275612, DIČ: CZ27275612
tel.+481 380 722, mobil:+23 670 917
e-mail: conformity@prohlasenioshode.cz
www.prohlasenioshode.cz