wallPen
GET VERTICAL

wallPen E2
USER MANUAL

Version 2.1.5

wallPen E2 User Manual

wallPen GmbH, Germany

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Preface

1 Preface

Congratulations on purchasing your wallPen E2 printer. The wallPen E2 is a professional device for direct and durable printing of images, logos, graphics, or text onto vertical surfaces in brilliant colors.

The device is so compact and lightweight that it can be transported and operated by just one person. The wallPen E2 printer is operated after installation on site, ideally via tablet, alternatively via laptop or smartphone.

This manual is intended for certified wallPen operating personnel and serves as a reference guide for installation, assembly, disassembly, commissioning, transport, storage, and maintenance.

If you have any questions, suggestions, or concerns, please contact your wallPen partner or wallPen GmbH in Germany directly. For technical questions of any kind, please use our Service Desk at service.wallpen.com. Here you can also check our knowledge base to see if your question has already been answered. You can also exchange questions and experiences with wallPen employees, other customers, partners, distributors, and operators.

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This manual is intended solely as a reference guide and does not replace intensive personal training on the device. If you have any questions or concerns regarding the information provided here, please contact your wallPen partner or wallPen directly.

Scope of Delivery

2 Scope of Delivery

- ☑ wallPen E2 printer with 240 cm vertical axis height
- ☑ Safety Shield Extension
- ☑ Cross Profile Extension
- ☑ An 8-inch Android tablet
- ☑ wallPen Pro Software license for 12 months
- ☑ Six transport bags for the individual components
- ☑ wallPen Toolbox including:
  - ☑ Allen Key with handle 6 mm
  - ☑ Magnifying glass
  - ☑ Grease nipple
  - ☑ Two dust masks (class FFP2 / FFP3)
  - ☑ Two pairs of UV protective goggles
  - ☑ One hundred Latex gloves
  - ☑ Two spare stainless steel cylinder head screws
  - ☑ Folding Ruler
  - ☑ Roller lifter
  - ☑ Grease nipple adapter
  - ☑ Spacer M3x6 steel with internal and external thread
  - ☑ Grease gun filled
  - ☑ Unit Transport lock
  - ☑ Moist cleaning wipes
  - ☑ Two box foam inlays
  - ☑ One metric Allen key set
  - ☑ Swifel chair castors
  - ☑ Five spare inkbags
  - ☑ USB thumb drive 64 GB
  - ☑ Ten Luer Lock male plugs
  - ☑ Ten Luer Lock plugs female
  - ☑ Two spare printhead FFC cables

- ☑ Four 200 ml bottle ink set (CMYK)
- ☑ 500 ml flushing liquid with syringe and hose connection
- ☑ Glass magic 50 ml
- ☑ Six hundred Dust-Free Wipes (disposable cleaning wipes)
- ☑ Magnetic stainless steel light shield
- ☑ Four print nozzle transport locks

The scope of delivery may be more extensive with optional equipment.

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Safety & Hazards

3 Safety & Hazards

3.1 Mechanical Hazards

When operating the wallPen, there is a risk that unprotected parts may move in a controlled, uncontrolled, predictable, or unpredictable manner. Therefore, the wallPen E2 must always be protected against unauthorized access and monitored at all times during operation.

The emergency stop switch must be freely accessible at all times!

The wallPen must be secured and monitored at all times during operation. The utmost care and consideration must be exercised at all times! There is a very high risk that unprotected machine parts will move “up and down” and “back and forth” at high speed in a controlled manner. A transparent plastic protective shield reduces the risk of limbs becoming trapped or crushed, but does not eliminate it.

Never operate the printer without the safety strut with transparent plastic protective shield in place! It prevents the risk of injury, does not interfere with operation, and is very easy to transport and install. Despite the protective shield, the device is dangerous! Always have the utmost respect for the dangers of the machine and remain alert and cautious at all times! Prevent access to the printer by maintaining a safety distance of at least three meters.

- Effectively cordon off the printing area with barriers!
- Be prepared to stop the printer at any time using the emergency stop switch!
- Be alert! Never leave the printer unattended!
- Always wear UV protective goggles within 5 meters of the device!

Moving parts are dangerous! Always be careful!

ALWAYS PROTECT YOURSELF AND OTHERS!

Interrupt or pause the printing process as soon as you, as a trained operator, leave the work area. Even when the device is paused or stopped, always have it monitored by a competent, adult, and reliable person, even during short interruptions.

As the operator, always stay outside the danger zone of the printer when it is in operation. Always stop the printer if you need to check the print quality, and proceed with caution and foresight. Careless handling can result in serious injury from crushing or shearing of limbs

Effectively prevent bystanders, visitors, children, or even animals from coming into contact with the moving parts of the device and possibly injuring themselves. If in doubt, securely cordon off the entire print area or provide effective visual and access protection around the device.

3.2 Safety Information

UV ink / Health risks

UV inks and cleaners are hazardous to the environment and health. Please read the safety data sheets (MSDS) for the inks and cleaning fluids. The latest versions of these documents are available for download at service.wallpen.com.

It is essential to observe the hazard warnings, transport and storage conditions, warnings, and specifications for UV inks and cleaning fluids specified in these hazard sheets!

Supported inks

Printheads are very sensitive components. Do not use any ink other than the original wallPen ink. The use of other ink will compromise the proper functioning of the printer and void any warranty.

- Only use wallPen UV ink
- Other inks are likely to damage the wallPen printer
- Proper functioning can no longer be guaranteed and the warranty will be void

Printheads and ink

Since UV inks react relatively quickly to (UV) light, you should never expose printheads and ink to direct sunlight and protect them from daylight as much as possible. Otherwise, the printheads may be permanently damaged, as the ink hardens on the tiny print nozzles, rendering them unusable.

It is therefore essential to protect the printheads and ink from direct sunlight! Never expose printheads and ink to direct light for longer than two minutes, even indoors, as normal indoor lighting can also contain critical UV rays.

Always protect the printheads immediately with the magnetic stainless steel cover when the wallPen is not in use.

Damage caused by hardened ink on the printhead nozzles is usually irreparable.

Ink is corrosive

- Danger! UV ink is corrosive!
- UV ink poses a risk of skin burns.
- Wear safety goggles and protective gloves when working with UV ink or when you may come into contact with it, e.g., when changing the printhead, refilling, or cleaning
- If it comes into contact with the skin or eyes, wash or rinse the affected areas immediately with plenty of water (or saline solution for the eyes, eye wash) and seek medical attention! Take the safety data sheet for the UV ink with you
- Do not underestimate the danger! Uncured UV ink is dangerous!

UV ink and UV ink cleaners are hazardous to health

- During printing, there is a risk that uncured ink particles may be released into the air.
- There is a risk of poisoning.
- Avoid inhaling UV ink particles at all times.
- Always wear a dust mask (class FFP2 or FFP3) when working with UV ink or when in the immediate vicinity of the printer while it is in operation.
- Dispose of masks after six hours of use at the latest and use a new one
- Always ensure adequate ventilation when operating the printer

- If you feel dizzy, unwell, have a headache, eye irritation or itching, switch off the printer and go into the fresh air immediately
- Always wear protective gloves and safety goggles when handling UV ink
- It is important to seek medical attention as soon as possible, even if the symptoms subside after a few minutes
- Always wash all affected body parts immediately under warm running water with plenty of soap after skin contact with UV ink

3.3 UV Ink Expiration

Please note the expiration date on the packaging. wallPen UV ink is usually usable between 8 and 12 months after shipment. UV ink is subject to chemical processes and changes its consistency over time.

Do not use ink after the expiration date. This may result in a faulty print image, insufficient curing, color deviations, or irreparable damage to the printheads.

3.4 UV Light Hazards

Danger from UV radiation

- Danger - UV radiation!!!
- Risk of severe skin burns
- Always wear suitable UV protective goggles within 10 meters of the machine
- In case of contact with eyes, seek medical advice immediately
- Ensure that no one is near the device during operation
- Warning signs and barriers must be used to ensure that no one without suitable UV protective goggles can look directly or indirectly into the UV light of the printer from a distance of less than 10 meters.

When operating the wallPen, always bear in mind that it attracts children, adults, and animals like magic, who are unable to assess the potential risk of injury posed by the device, particularly the UV radiation! Shield the work area over a large area and, if in doubt, ensure effective visual protection!

The wallPen has two extremely powerful LED UV emitters with a wavelength of 395 nanometers. Never look into the UV emitters during operation and never look at the UV light reflections on the wall without UV safety goggles. This can cause irreparable damage to the retina! Always wear special UV safety goggles that effectively filter a wavelength of 395 nanometers when operating the printer. Two pairs of such UV safety goggles are supplied with each printer. If in doubt, consult a doctor as soon as possible. Talk to your wallPen partner or wallPen directly to find out which safety goggles are recommended from specialist retailers.

The UV radiation used is dangerous! Always wear suitable protective goggles! Never look into the UV light without effective protection, even if it is reflected via the subtract. This can result in irreparable damage to the retina!

ALWAYS PROTECT YOURSELF AND OTHERS!!!

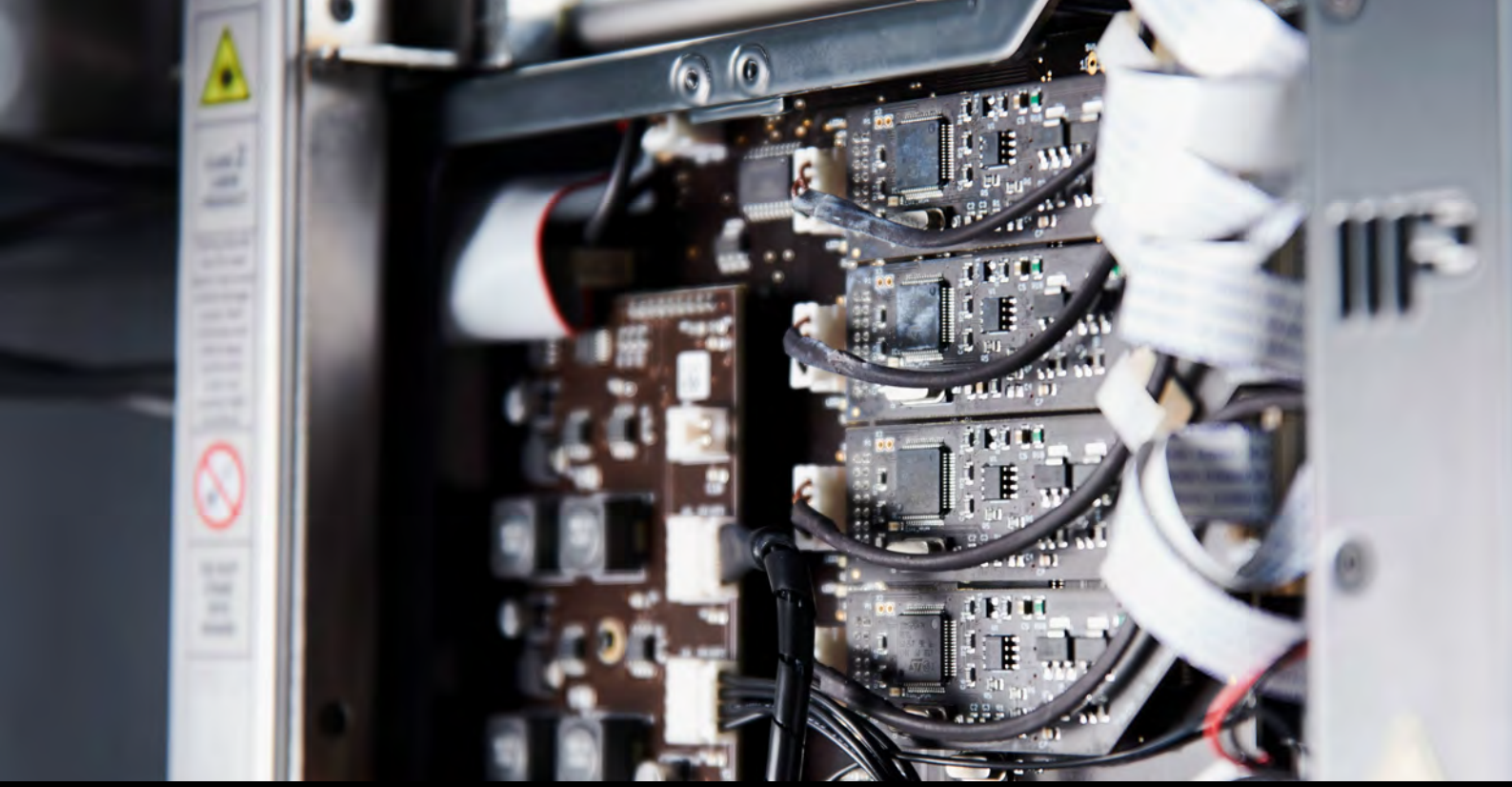
Take effective measures to prevent other people such as onlookers, visitors, children, or even animals from looking into the UV lamp without protection and suffering injury. If in doubt, cordon off the entire printing area generously and ensure that there is effective visual protection around the device.

Consider possible liability risks!

3.5 Disposal

- UV ink and its packaging are hazardous waste
- Never dispose of in household waste as this can cause environmental damage
- Only dispose of in hazardous waste

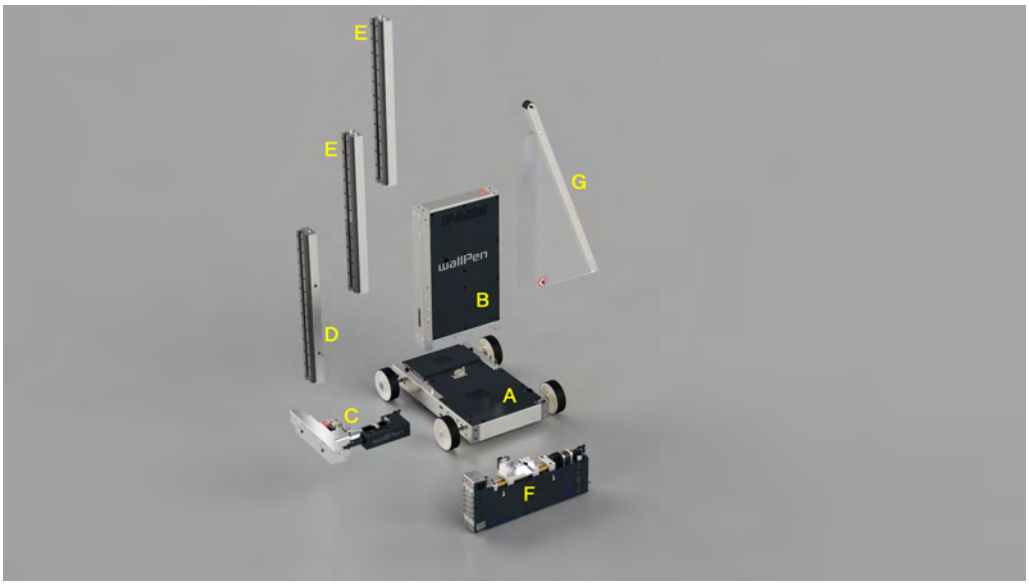
Liquid UV ink is a hazardous substance. Please do not dispose of UV ink in household waste, as these residues can harm the environment. UV ink must be disposed of as hazardous waste. Please contact your local waste disposal company for information on the regulations and disposal options.



Hardware

4 Hardware

4.1 Components



The wallPen E2 consists of the following components:

1. **Platform (A)**
   Base frame with two drive wheels at the rear and two steered wheels at the front

2. **Control cabinet (B)**
   Aluminum frame system with power supply unit. The unit is placed on the platform (A) and secured with two screws

3. **Slide (C)**
   Drive system with cross boom and parking profile for mounting between platform (A) and control cabinet (B)

4. **70 cm base axis (D)**
   Aluminum profile with helical rack and linear guide. The base axle is fastened to the side of the control cabinet (B) on the parking profile (C)

5. **70 cm axis extensions “A” / “B” (E)**
   Two aluminum profiles with helical rack and linear guide for extending the base axis (D), each of which is attached to the base axis (D) with a centric screw

6. **Printhead unit (F)**
   Compact unit for mounting on the cross profile or the cross profile extension of the slide (C)

7. **Safety Shield (G)**
   Reinforcing strut for stabilizing the vertical axis (D / E) and for protection against injury due to jamming or shearing by a safety washer

8. **6 mm Allen key with handle - not shown here**
   Allen key for tightening the screw connections

4.1.1 Black Box

The extensive accessories of the wallPen E2 are mainly housed in a sturdy, stackable, high-quality box:

The box consists of two levels. The upper level contains the following items:

A - Various accessories, such as moist cleaning cloths, Dustfree Wipes, UV protective goggles, magnifying glass and much more

B - 8" Android tablet

C - USB thumb drive 64 GB

D - folding rule

E - 6 mm allen key with handle

F - Syringe

G - 500 ml Flushing liquid

H - On hundred Latex Gloves

The lower level contains the following items:

I - UV ink bottles

J - Various accessories, including 4 castors for easy movement of the wallPen within a building

K - Replacement FCC flat cables for connecting the printheads

L - Replacement ink bags

M - 20 ml wallPen Glass Magic

N - Pre-filled grease Gun for the Linear ball bearing slide unit

O - Spray attachment for the Glass Magic bottle

4.2 Assembly

4.2.1 wallPen Assembly

Before starting each print job, work through the following checklist before beginning setup:

✓ Is there generally enough space to carry out the planned printing process?

✓ Are there any obstacles in the printing area? Pipes? Cables? Sockets? Steps?

✓ Is the ceiling height above the entire printing area clear and accessible?

✓ Are the walls, ceiling, and floor free of steps, beams, nails, or other obstacles?

✓ Is the floor stable and not springy?

✓ Is the printing area itself even, level, free of grease, clean, and dry?

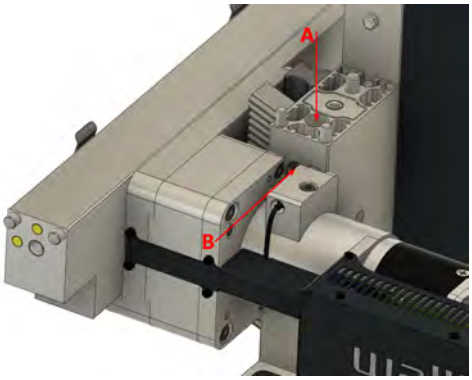
Position the platform (A) so that the steering points to the right and the frame profile of the platform is approx. 30 cm parallel to the wall to be printed, as shown on the left.

Hold the switch cabinet (B) vertically over the mounting bolts so that the switches point towards the steering.

Slowly insert the switch cabinet (B) into the mounting bolts, slowly lower it and lightly tighten the two screws.

Hold the slide system (C) - as shown in the illustration - approx. 3 cm above the platform (A) on the side profile of the control cabinet (B). The slide profile is guided here by two dowel pins.

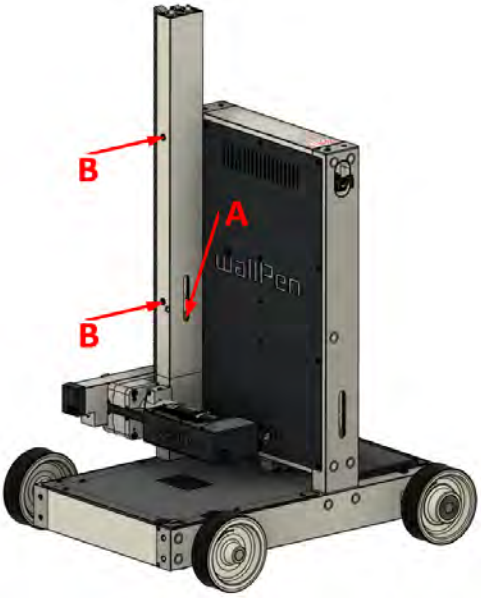
Now carefully lower the slide system (C) onto the platform (A).



Tighten screw "A" very lightly at first.

Then tighten screw "B" hand-tight and do the same with screw "A".

Hold the basic axis (D) - as shown in the illustration - approx. 3 cm above the slide profile on the switch cabinet profile. The axle (D) is guided by two fixing pins.



Carefully lower the base axle (D) onto the carriage profile and lightly tighten the screw "A" and then the two screws "B".

Hold one of the two extension axles (E) approx. 3 cm above the base axle (D), as shown in the illustration ...

... and carefully lower it onto the base axle (D).

Tighten the screw slightly, as shown in the illustration on the left.

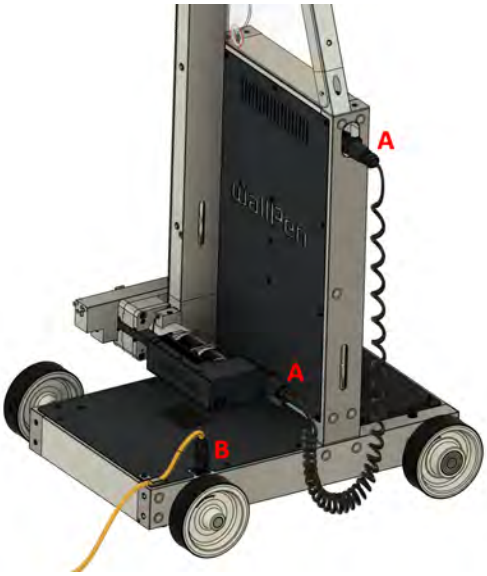
Place the strut (G) in position and tighten the two screws lightly.

Hold the second extension axle (E) approx. 3 cm above the first extension axle (E), as shown in the illustration ...

... and carefully lower it onto the base axle (D).

Tighten the screw slightly, as shown on the left.

Check that the EMERGENCY STOP switch "A" is **unlocked** and the main switch "B" is switched off.



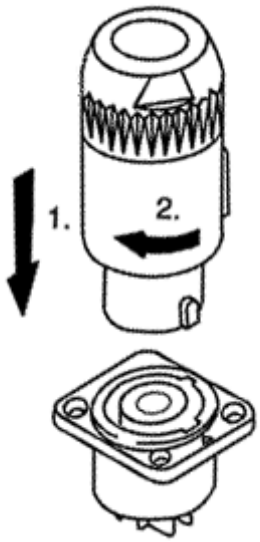
Connecting the spiral cable

Connect the control cabinet (B) and the slide (C) with the spiral cable "A".

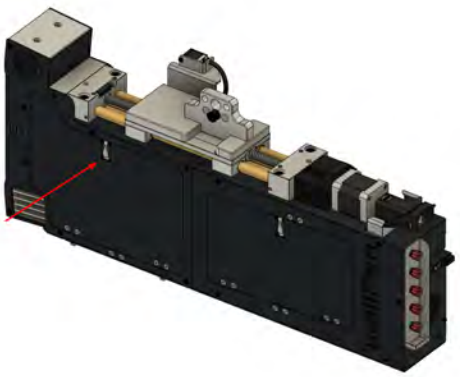
To do this, lift the black locking clips on the sockets, insert the plugs and lock them with the locking clip by pressing it down until it clicks into place.

Connecting the mains cable

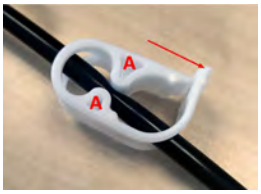
Connect the power cable to a standard power socket and plug it into the socket at the back right of the platform (A).



Insert the plug into the socket (1) and lock it by turning it approx. 45 degrees to the right (2) until it clicks into place.

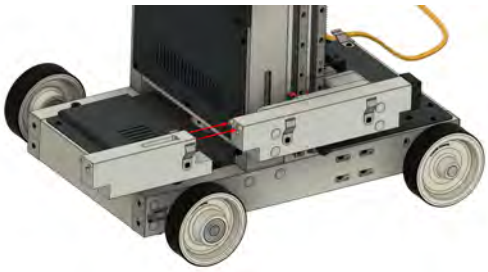


- Remove the magnetic metal cover in front of the printheads (F).
- Open the left front flap and release all four/five white plastic tube clamps and hold them firmly "A" and press the latch in the direction of the arrow



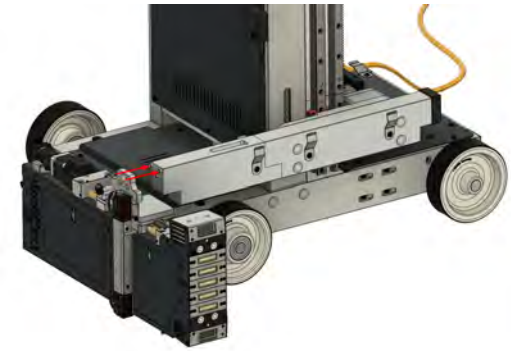
- Remove one or both of the two rear flaps of the ink tray.
- Fold a dust-free wipe and hold it with one hand directly under the nozzle rows of one of the printheads.
- Spread the fingers of the other hand, place them on the bag in the corresponding storage compartment and press it down evenly to remove any residual air from the printhead.
- If in doubt, it is better to squeeze out too much ink than too little.
- Use common sense and find a sensible middle ground! If you apply too little pressure to the bag, not all the air that may be present will be removed and your print result may be ruined later. If you apply too much pressure, there is a risk of damaging the printhead or the bag.
- Carry out the above steps for the colors as well.

4.2.2 Print Head Front (Cross Bar)



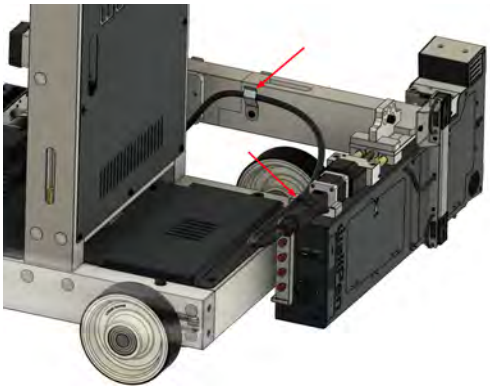
Attach the cross profile extension to the cross profile of the slide system (C).

Lightly tighten the two screws integrated into the top and bottom of the extension to secure it to the cross profile.



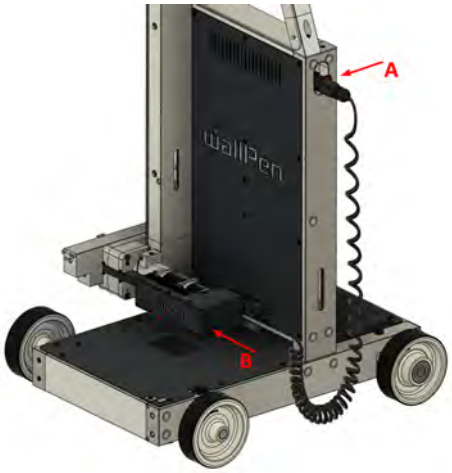
Place the printhead unit (F) on the two locating pins of the cross profile extension as shown

Tighten the screw slightly to secure the printhead unit (F).



Lay the cable from the carriage unit (C) to the printhead unit (F) as shown in the illustration, plug it into the back of the printhead and lock it.

4.2.3 Print Head Front



Turn the mains switch (not shown here) to "ON" (A)

Prepare to release the brake by holding the carriage (C) with your left hand (see red marking) so that it does not drop down when the brake is released.

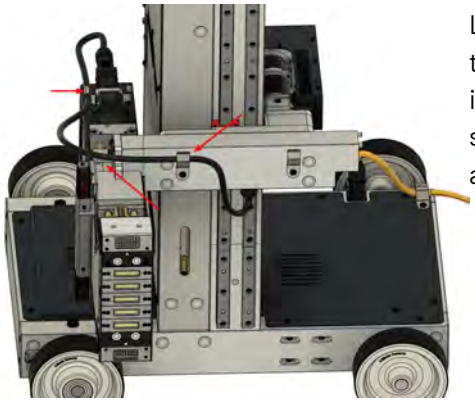
Now press the "B" "Release brake" button on the carriage (C) with your right hand...

... and hold it down while pulling the carriage upwards by about 25 cm, as shown on the left.

Turn the power switch OFF!

Place the printhead unit (F) at the front end of the carriage (C) and slide it sideways onto the two guide pins.

Tighten the screw slightly as shown in the illustration.



Lay the supply cable from the carriage (C) to the printhead unit (F) as shown in the illustration, then insert the plug into the socket at the back of the printhead housing and lock it with the black latch.

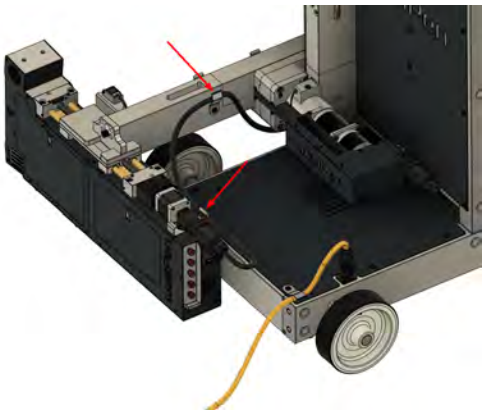
4.2.4 Print Head Rear (Cross Bar)

Attach the cross profile extension to the cross profile of the carriage (C) as shown.

Lightly tighten the two screws integrated into the top and bottom of the extension to secure it to the cross profile.

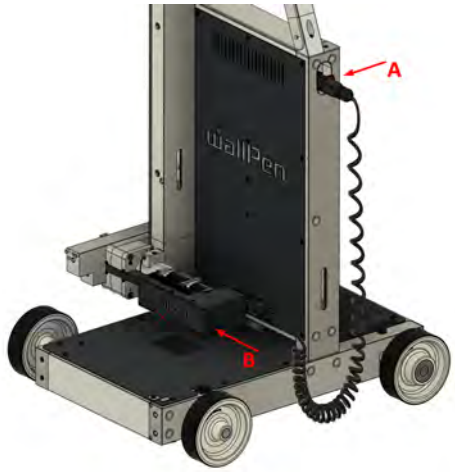
Slide the printhead unit (F) onto the two locating pins of the cross profile extension of the carriage (C) as shown

Tighten the screw slightly to fix the printhead unit (F) in place.



Lay the cable from the carriage unit (C) to the printhead unit (F) as shown in the illustration, insert it into the socket on the back of the printhead housing (F) and lock it.

4.2.5 Print Head Rear

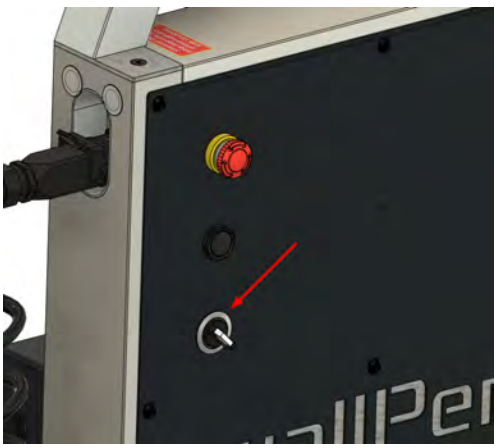


Set the mains switch (not shown here) to "ON" (A)

Prepare to release the brake by holding the carriage (C) with your left hand (red marking) so that it does not slide downwards when the brake is released in the next step

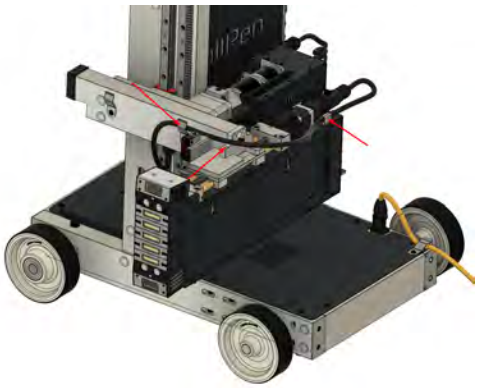
Now press the "Release brake" button on the carriage (C) with your right hand ...

... and hold it down while pulling the carriage (C) about 25 cm upwards (see illustration on the left).



Turn the power switch OFF.

Carefully tighten the screw on the printhead (F) as shown in the illustration.



Lay the connection cable from the carriage (C) to the printhead (F) as shown in the illustration, then insert the plug into the socket on the back of the printhead housing (F) and lock it with the black latch.

4.2.6 Vertical Extension Setup

The maximum print height of the wallPen E2 is **4 meters**. This height can only be achieved by using the optional axis extension.

In addition to the basic axis (70 cm), two additional extensions - so-called axis A (70 cm) and axis B (70 cm) - are included in the scope of delivery of the basic wallPen E2. This results in a standard print height of up to 2.1 meters.

An optional extension set is available for higher walls, which includes additional segments in various lengths:

- Two 80 cm extension axis
- One 70 cm extension axis
- One 50 cm extension axis
- One 30 cm extension axis
- One 20 cm extension axis
- One 10 cm extension axis

Note: The **10 cm** and **20 cm** extension elements are designed as **end pieces**. No further segment can be mounted on these.

All axis can be assembled quickly and securely in the following order using the enclosed 6 mm Allen key:

This setup enables flexible adaptation to the respective room height so that the maximum possible print height can always be optimally utilized on site. A 25 cm extension axis is also optionally available for extra flexibility offering vertical increments of just 5 centimeters.

This modular combination of extension axis allows individual height configurations to be realized in 5 cm / 10 cm increments - both for very high rooms and for environments with limited ceiling height.

Additional stabilizing strut

If the printer is set up with one or more 80 cm extensions from the extension set, the stabilizing brace supplied must be fitted for additional protection.

This brace consists of three segments and is also attached to the existing safety brace. It ensures greater stability of the vertical axis, especially with very high build-ups, and reduces vibrations or oscillations during operation.

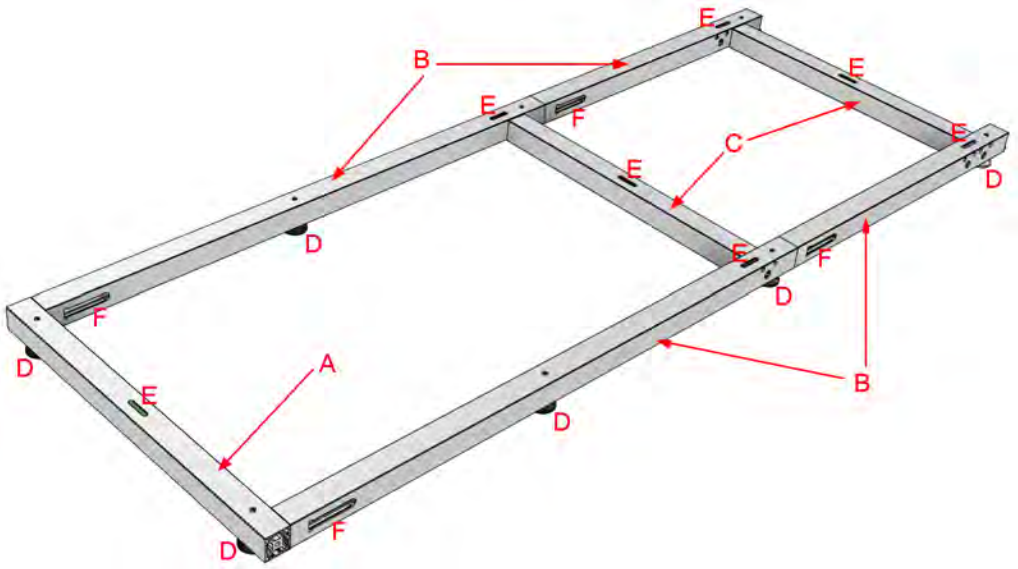
4.2.7 Rail System Assembly

The wallPen Rail System

For constant and precise horizontal movement and consistently high print quality, we recommend using the appropriate rail system when operating the wallPen E2. This modular system ensures particularly stable and precise guidance during the printing process. Unevenness in the floor area is often difficult to detect, can hardly be compensated for, and - if detected - ruins a print without any possibility of reacting.

Yes, the wallPen also works perfectly without a rail system, but the floor area must then be dry, clean, and perfectly level, otherwise the printing result may be poor. In case of doubt, it is always better to use the wallPen rail system.

The rail system consists of a basic package with a length of 260 cm and - on request - one or more extension sets with a length of 400 cm each. Rail elements with a length of 20 cm are also available for more flexible use.



The rail system consists of a basic profile (A), two longitudinal profiles (B) and a connecting cross strut (C). The height is adjusted via rail feet (D) from above using the enclosed Allen key. The elements are leveled lengthwise and crosswise with the aid of integrated spirit levels (E). The panels are screwed in place through the side cut-outs (F) using the Allen key.

Preparation

- Ensure that the surface for assembly is level, clean and as dust-free as possible

- Remove dust and dirt and anything from the floor that could interfere with the precise positioning of the rail system
- Ensure that there is sufficient space at the installation site to set up the entire length of the rail system
- Clean all rail elements - especially the upper running surface - of dirt, paint residue and damage

Assembly and alignment

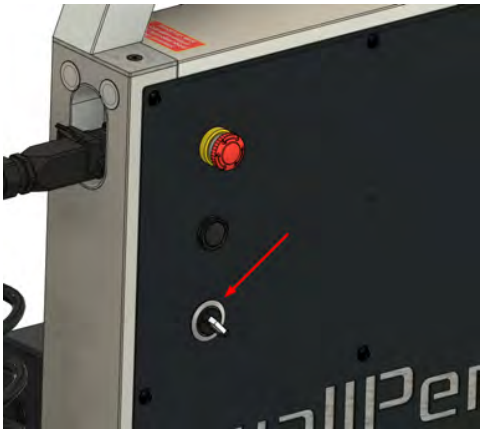
- Always assemble in the direction of print, i.e. from left to right. Prepare the base profile (A) on the left for assembly
- Now screw two longitudinal profiles (B) to the side of the cross strut (C) using the Allen key provided. Only tighten the screws hand-tight!
- Now screw this assembled element to the base profile (A) via the cut-outs (F), as shown in the illustration
- The height of each foot (D) can be adjusted to compensate for uneven floors. Align the entire rail segment carefully using the integrated spirit levels (E). If necessary, a separate long spirit level can also be used for this purpose
- Once the first segment is aligned, screw the next rail segment, again consisting of two longitudinal profiles (B) and a cross strut (C), through the cut-outs (F) and align it with the previous segment
- Repeat this process until the desired overall length is reached

Important notes

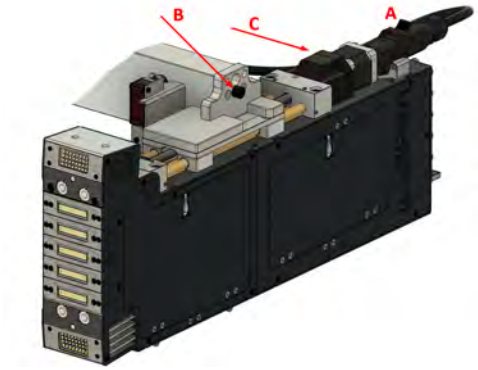
- The exact alignment of the entire rail system has a decisive influence on the print quality. Even small deviations in height or alignment can lead to errors in the printed image
- Use all integrated spirit levels consistently for checking. In addition, a long spirit level or a digital measuring system can be useful for fine adjustment
- The rail feet only stand on the floor - they are not screwed down tightly, but are only adjusted to the respective floor level by adjusting their height
- The entire rail must be parallel to the wall. Avoid deviations in the angle to ensure a clean horizontal printer movement
- When referencing, be sure to activate the "rail" mode as soon as the device is operated on the rail system

4.3 Disassembly

4.3.1 Printhead Disassembly



Switch off the device at the main switch of the control cabinet (B).



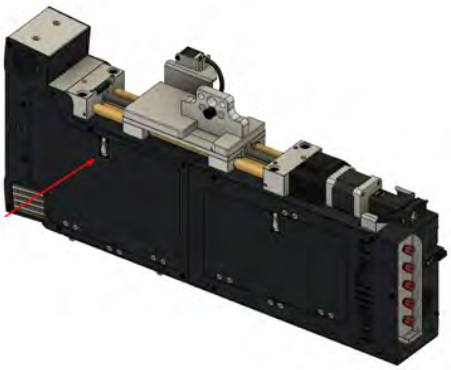
Regardless of which of the four possible positions the printhead unit (F) is mounted in, proceed according to this principle when dismantling:

Unlock connector "A" by lifting the plastic bracket upwards, pull it off to the rear and put the cable to one side so that it cannot be damaged during further disassembly.

Remove the screw "B" and make sure that the printhead unit (F) does not slip off the two pins if it is no longer secured. To be on the safe side, hold it in position with one hand.

Hold the printhead unit (F) firmly with both hands, carefully pull it sideways from the locating pins, hold it horizontally "C" and carefully stow it in the transport bag.

WARNING: Always handle the printhead unit (F) with the utmost care! It should always be held, transported and stored in a horizontal position. Do not tilt the printhead and do not drop it.



Place the printhead unit (F) on a clean and level surface.

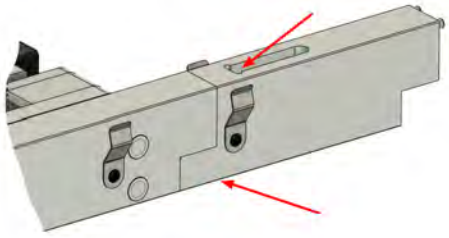
Open the left front flap to close the hose clamps to prevent ink leaks during transportation.

Carefully press all the clamps together as shown until you hear exactly **4 clicks**...

(You can occasionally move them a few millimeters on the tube so that the tube is not always squeezed in exactly the same place).

Close the left front flap and carefully clean the front around the printheads with a soft cleaning cloth.

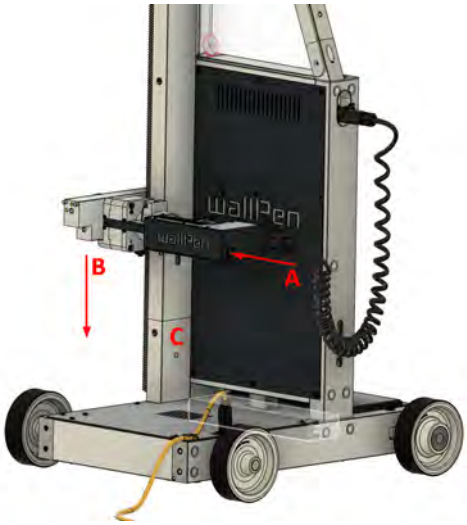
Use the magnetic front cover to protect the printheads from damage and light.



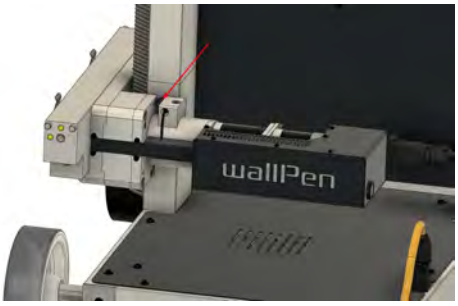
Only if the cross profile extension is fitted and irrespective of which of the two possible positions the cross profile extension is fitted in, proceed according to this principle when dismantling:

- Loosen the two screws as shown in the illustration on the left.
- Carefully pull the extension sideways out of the bolts and stow it in its transportation bag.

Switch the device back on at the control cabinet (B).



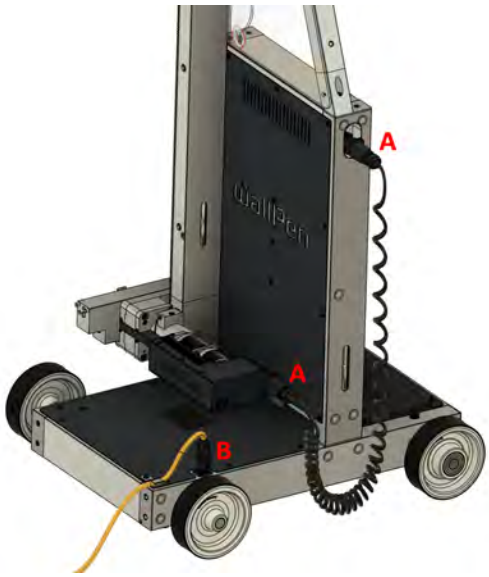
Hold the carriage unit (C) with your left hand, press the "Release brake" button (A) and allow the unit to slide slowly down onto the parking profile (C).



Allow the carriage (C) to slide down at least far enough so that you can safely reach the hole on the side (see arrow) for disassembly in order to be able to loosen the screw there later.

4.3.2 Basic Disassembly

Switch off the main switch on the control cabinet (B).



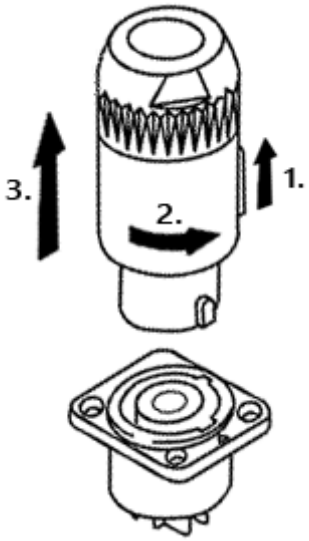
Removing the spiral cable

Disconnect the spiral cable from the control cabinet (B) and carriage (C) at the positions "A" shown.

To do this, lift the black locking clip on each socket, pull off the plug and place the cable in its transportation bag.

Removing the power cable

Pull the mains cable "B" out of the mains socket and out of the rear left-hand socket on the platform.

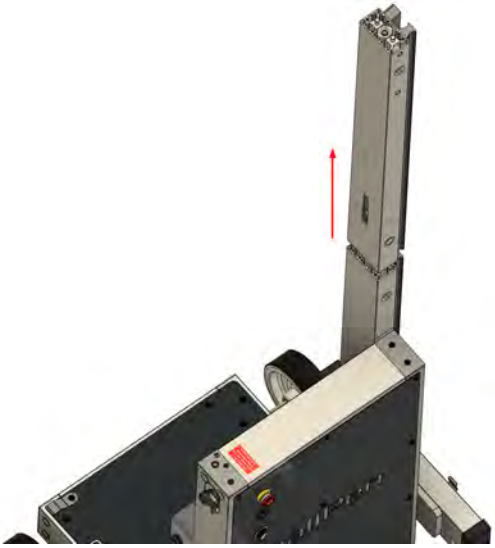


To remove the power cable, pull the small locking lever (1) upwards, turn the plug

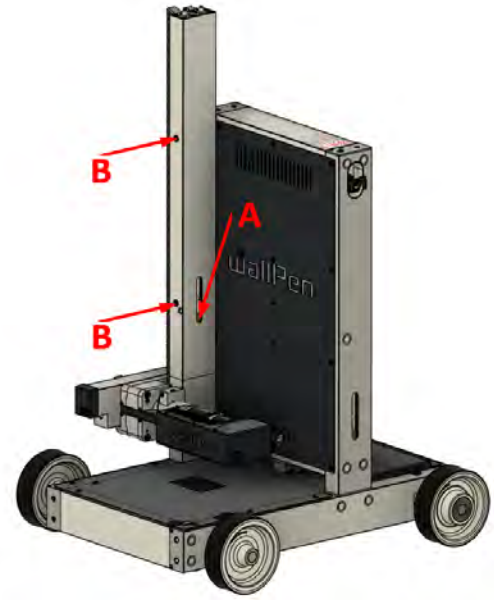
housing 45 degrees anticlockwise (2) and pull the plug with the cable upwards out of the socket (3).

Loosen the two screws of the strut (G), carefully lift it upwards and stow it in its transportation bag.

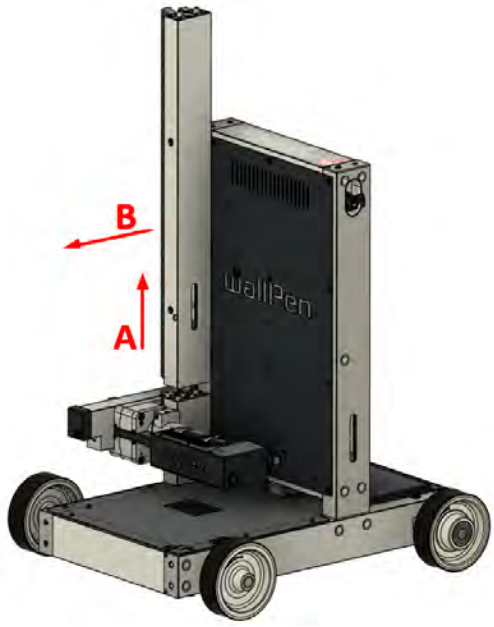
Loosen the screw of the upper extension (E).



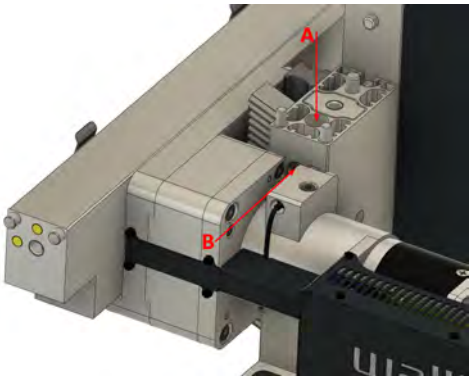
Carefully lift the extension (E) upwards and store it in its transport bag.



Loosen the screw "A" and the two screws "B" of the base axle (D).



Carefully lift the base axle (D) by approx. 3 centimeters in direction "A", then move it in direction "B" away from the control cabinet (B) and stow it in its transport bag.



Loosen the screws "A" and "B" on the slide (C).

Carefully lift the slide (C) by approx. 3 centimetres ...

... sideways away from the control cabinet (B) and stow it in the transport bag.

Loosen the two screws that connect the control cabinet (B) to the platform (A).

Lift the control cabinet (B) carefully and parallel upwards without tilting it and stow it in its transport bag.

Lift the platform (A) and stow it in the corresponding transport bag.

Transportation & Care

5 Transportation & Care

5.1 Transportation

Transporting the wallPen

The wallPen is secured during transportation by sturdy, rigid transport bags. This bag system is ideal for transporting the printer in your own vehicle, but also for storing the system - protected from damage or environmental influences - over a longer period of time.

Always stow all components in the pockets provided after use.

Even if all bags are well padded and sturdy, always take great care when transporting, loading and stowing them. Do not stack the bags on top of each other. Always secure your load adequately. The precise components of the wallPen can be damaged very quickly by slipping, knocks or tipping over.

Always store the bag with the print head unit upright, do not tip it over, do not drop it, and handle with extreme care.

The built-in Ricoh piezo printheads are highly sensitive components that can easily be irreparably damaged by knocks and vibrations. Therefore, always store the bag in the vehicle very well padded on a foam or similar soft surface.

5.2 Care

Take good care! :-)

Take good care of your wallPen! The device is a sensitive technical device and can quickly become damaged if it is handled roughly or with too little care.

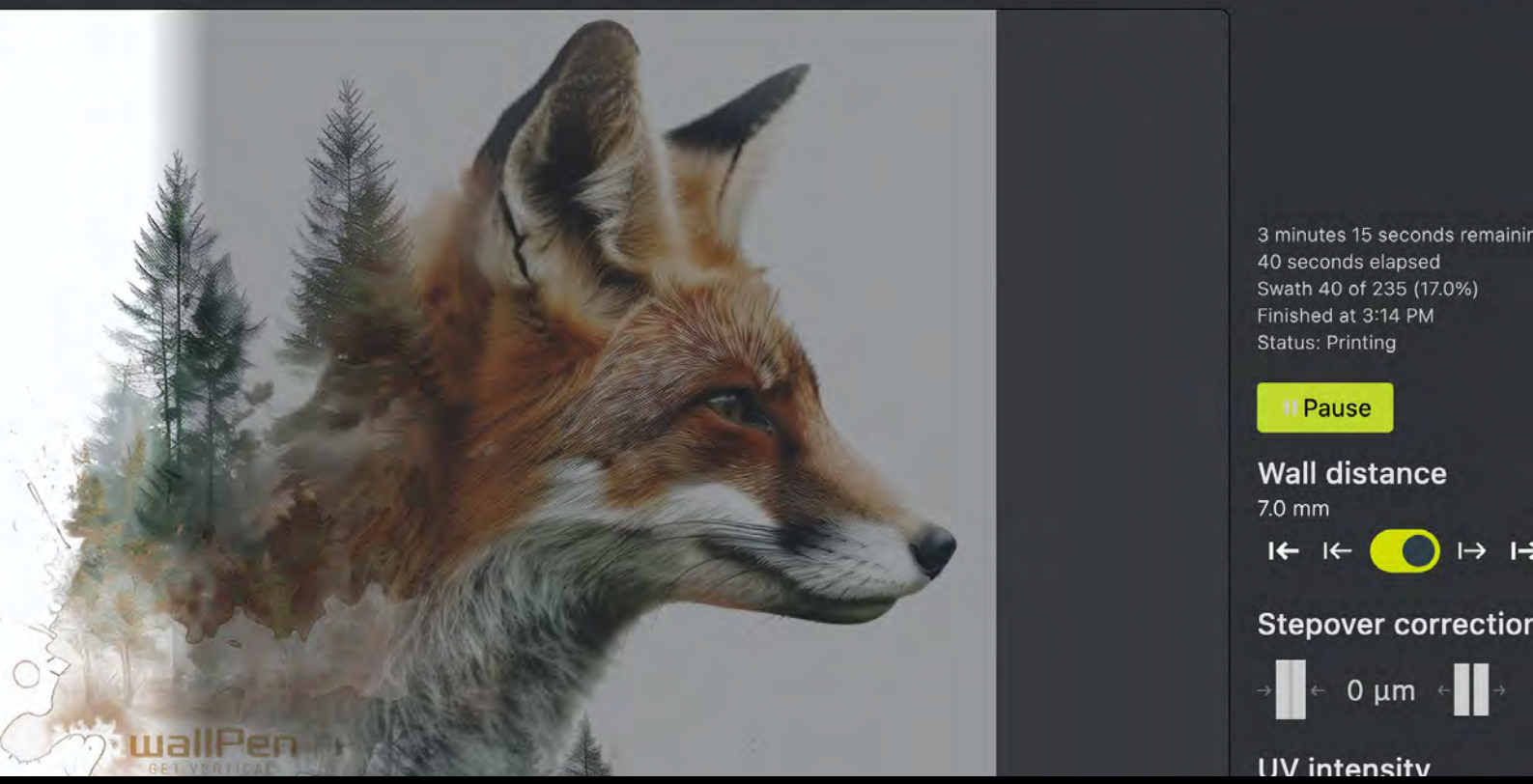
- Clean all components thoroughly after use
- Keep the device in a clean and good condition
- Treat it with the necessary respect and handle it with care

Only a well-kept and well-maintained device will give you pleasure for a long time and print excellent images that will inspire and fascinate your customers!

We use wet cleaning cloths similar to the one shown here to clean the housing and general surfaces. UV ink can also be removed relatively easily as long as it has not hardened.

Do not use these wipes to clean the print nozzles!

Try to find a similar product in your region or buy such wipes directly from wallPen or your wallPen partner.


wallPen
3 minutes 15 seconds remainir
40 seconds elapsed
Swath 40 of 235 (17.0%)
Finished at 3:14 PM
Status: Printing
Pause
Wall distance
7.0 mm
Stepover correctior
0 µm
UV intensity

Software

6 Software

6.1 Software Infrastructure

The wallPen Software Infrastructure

Under the hood, the wallPen consists of two very different program components that appear uniform to the user and which are both developed by wallPen Germany. However, it should be clear what the differences are and why they are important for the operator:

The wallPen App

The wallPen app is the software that runs on the operating device and through which the user interacts with the printer. The app is available for various operating systems and is simply installed and started on almost any Android, iPad, iPhone, Windows, or Mac device. Images are also loaded, calculated, displayed, and managed within the App. The wallPen App is therefore a piece of software that works largely independently, but is required to control and monitor the wallPen once a Wi-Fi connection has been established.

New updates to the app are available via the respective app stores or at app.wallpen.com.

The wallPen OS

The wallPen E2 itself runs a Unix-based operating system (wallPen OS), which is developed almost entirely at wallPen in Germany. This operating system controls all components of the machine, it controls the drives, the printheads, the licensing, the limit switches, the laser sensors and much more. Whenever you power on the machine, its wallPen OS boots up, performs self-tests, and waits for a connection to the wallPen App to receive commands.

Since both software programs interact very closely with each other, it is extremely important to make sure to use the latest version of both. New updates to the OS will be displayed in the app as soon as they become available and should be installed promptly. The installation process is self-explanatory and can be completed from within the app in just a few minutes. Connect the app to the internet regularly to ensure you don't miss any update and bug fix.

Remark: At the time of publication of this manual the wallPen App is identified by version number "**V1**.x.x", while the wallPen OS is identified by "**V3**.x.x."

6.2 The wallPen App

The wallPen App is a complete solution for preparing motifs, controlling and setting up the printer, and operating the machine. It is solely developed by wallPen in Germany and available for various operating systems, both mobile and stationary. Currently the App is available for the following operating systems:

- Android
- iOS
- macOS
- Windows 10/11

A link to the the latest releases (stable & beta) is available at app.wallpen.com

Generally, all images to be printed with the wallPen must first be prepared using the "wallPen App". It is not just a software that controlls the printer, but also a comprehensive and very capable "Raster Image Processor" ("RIP"), that evaluates bitmap files, converts them into the required "CMYK(W)" color channels, divides them up and screens these channels in such a way that the ink drops on the substrate later accumulate to form an image that is as true to the original as possible. Please keep in mind, that the available colors of a CMYK printer (cyan, magenta, yellow, black, (white)) may represent only a limited color space in comparism to the original image. In this respect, any "ripping" of an image is always only a compromise for technical reasons. Please read the important chapter "Color Management" in this manual for further technical background and details.

In order to rip a graphic file with the wallPen APP, certain requirements must be met by the image file. In general, we recommend a current version of the "Adobe® Photoshop" software for image processing and preparation for rasterizing.

The latest versions of the wallPen app can be downloaded for iOS® from the Apple® App Store and for Android® from the Google® Play Store. All the latest installation files, including for Windows® and macOS®, can be found at app.wallpen.com. All devices always have access to the latest functions and updates here. If you have any difficulties downloading the app or have any questions about the app, please contact your wallPen partner or wallPen Service directly.

Important Notes

- Avoid special characters for paths, file names or designations
- Do not use paths or Windows user directories if they contain spaces or special characters
- Only use high-quality USB thumb drives from brand manufacturers to transfer files to your printer
- Format USB data carriers in exFAT format
- For the wallPen app on Windows® or macOS®, we recommend modern computer systems with the latest Intel® or Apple® processors and a current 64-bit operating system
- Use a minimum resolution of 150 DPI for your images, but still 300 DPI is mostly recommended

File requirements

Images to be converted into .wallpen-file format must be provided in one of the following formats:

TIF format

- File extension: .tif, .tiff
- Color space: RGB, CMYK, RGB(A) or CMYK(A)
- Remarks: 4 GB file size limitation

BIGtiff format

- File extension: .tif, .tiff
- Color space: RGB, CMYK, RGB(A) or CMYK(A)
- Remarks: not supported by most image editing programs
  no 4GB file size limit

Photoshop format*

- File extension: .psd, .psb
- Color space: RGB, CMYK, RGB(A) or CMYK(A)
- Remarks: Use .pdb format for files > 4 GB and/or > 30k pixels

PNG format

- File extension: .png
- Color space: RGB or RGB(A)
- Remarks: Color space limitation (RGB only)
  The use of PNG is not recommended

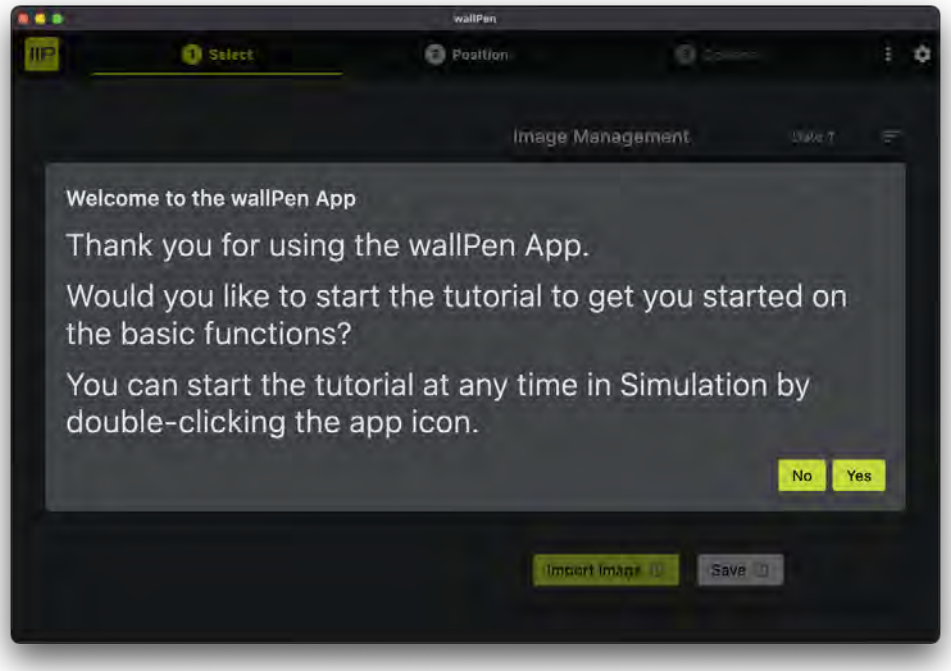
JPG format

- File extension: .jpg, .jpeg
- Color space: RGB
- Remarks: Color space limitation (RGB only)
  Artifacts likely due to compression algorithm
  4 GB file size limitation
  The use of JPG / JPEG is not recommended

*wallPen Pro required

The Start Screen

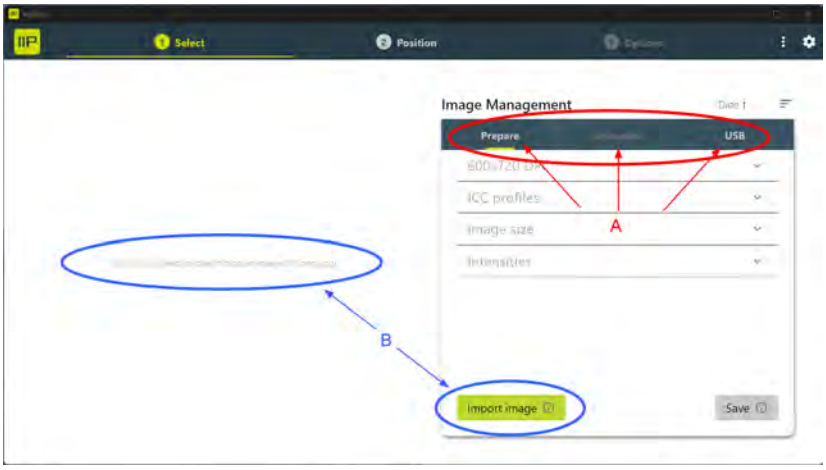
When you start the wallPen App, a welcome screen appears with an integrated tutorial. We recommend watching this tutorial in full to familiarize yourself with the basic functions and the operating procedure.



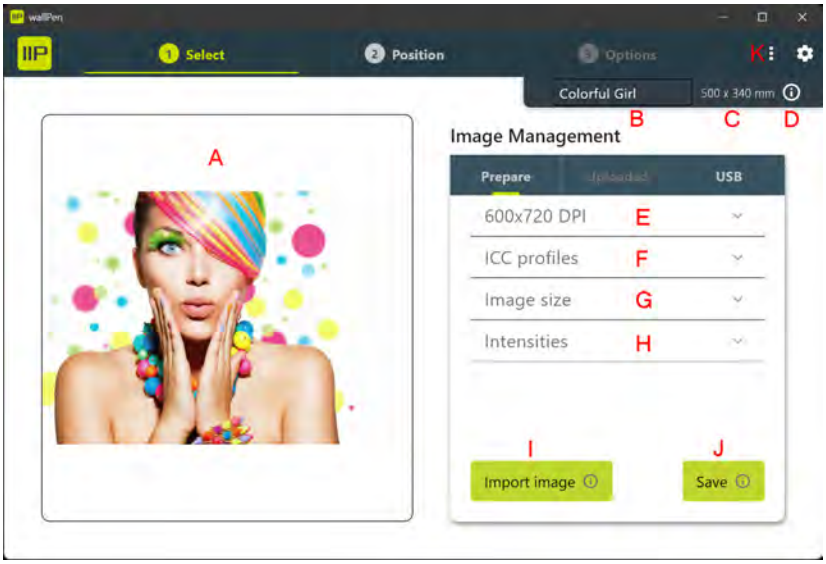
The "Select" menu

In order to be printed, graphic files in certain formats (.tif, .png, .jpg, .psd, .psb) must first be imported into the wallPen app and converted into an internal data format (.wallpen-file). It is therefore important to distinguish between "graphic files" and ".wallpen files". This difference is quite easy to recognize in the wallPen App. External graphic files are imported via the "Prepare" menu item. Already converted .wallpen files can be found under the "Uploaded" and "USB" tabs.

So after starting the app, a dialog for selecting a motif to be printed appears. In the image management selection bar (A) you can either select the tab "Prepare" to import a new graphic file or "Uploaded" / "USB" to show all calculated .wallPen files. To import a new graphic file, drag the desired file into the empty area on the left or click on "Import image" at the bottom (B):



After a file has been imported, a preview image (A) is displayed, which can also be zoomed in and out. The parameters for conversion to a .wallpen file are defined under "Image Management":



A - Image Preview This screen area displays a preview of the currently selected image. You can also import another image here using Drag & Drop.

B - File Name The file name of the .wallpen-file to be created can be changed here for easier later administration.

C - Dimensions Displays the current print format. The size can be adjusted in the Image Size (G) menu.

D - Info Displays basic information about the current image.

E - Resolution Selection of the desired resolution for the motif to be printed in vertical and horizontal direction.

In the horizontal direction, you can choose between 300, 600 and 1200 DPI. A resolution of 600 DPI is recommended for the vast majority of prints.

In the vertical direction, you can choose between 300, 600, 720, 800, 1000, 1200 and 2000 DPI. A resolution of 600, 720 or 800 DPI is recommended for the vast majority of prints.

F - ICC Profiles Deactivation, activation and selection of ICC profiles for the conversion of the graphic into the .wallpen file. ICC profiles have a significant influence on a consistent print result and their use is strongly recommended in the vast majority of cases. Background information on the use and purpose of ICC profiles can be found in the corresponding chapter in this manual.

G - Image Size The size of the motif can be adjusted in height and width under this tab. We recommend - if at all - only making small changes here, as the calculation algorithms in programs such as Gigapixel or Photoshop are much better.

H - Intensities The intensity of the individual colors can be adjusted here from 0% to 200% for special printing projects. The default value of 100% should be retained if

possible and adjustments should rather be made in programs such as Photoshop before importing.

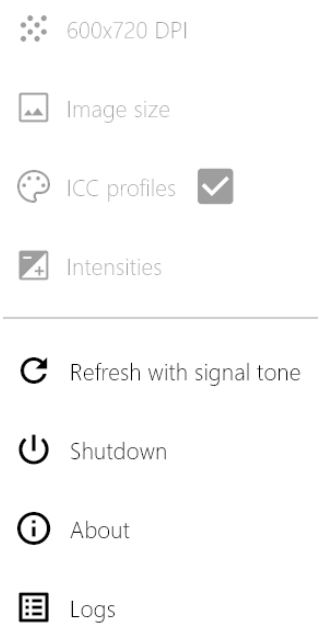
I - Import Select a motif using the file selection mask of the respective operating system.

J - Save Upload or save the current motif. By clicking on Info on the right side of the switch, the following selection can be made in a new dialog window:

- **Save**: Save the file locally
- **Auto***: Upload the file, if connected to the wallPen, otherwise save it locally.
- **Upload***: Upload the file to the wallPen, otherwise an error message occurs.
- **Save & Upload***: Save the file locally and upload it to the wallPen, if connected.

* Requires wallPen Pro

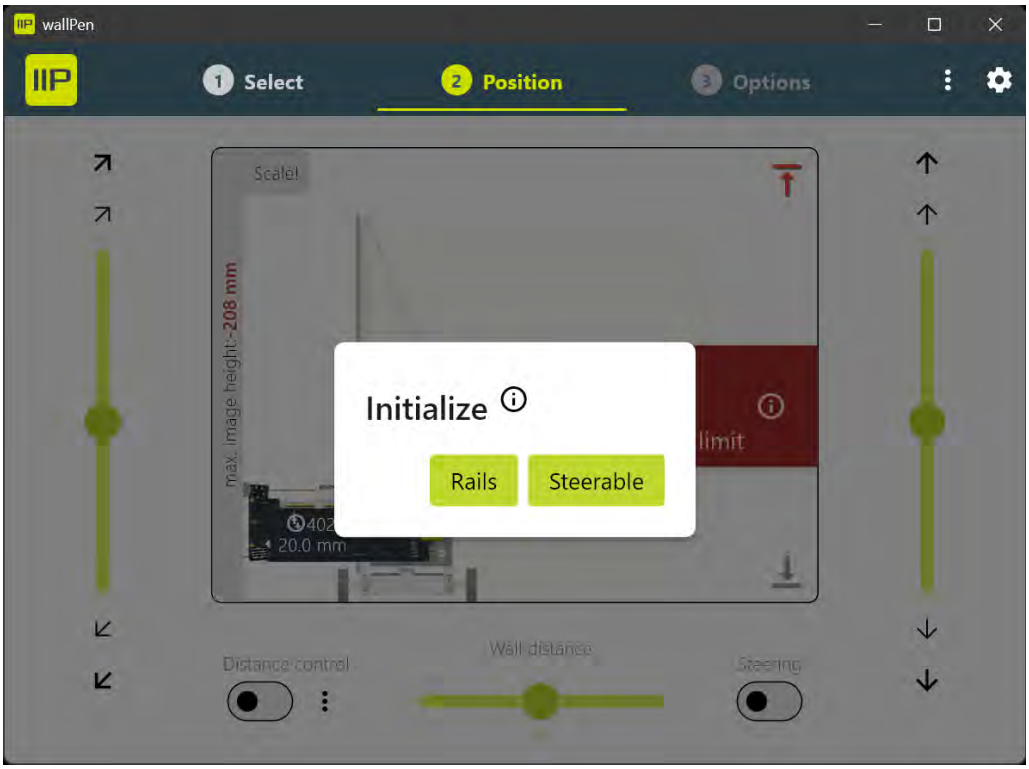
K - "Select" / "Three Dots" menu



DPI	Set the desired DPI resolution of the motif to be printed
Image size	Change the size of the motif before printing
ICC profile	Select, activate or deactivate ICC profile
Intensities	Change the intensity of the individual color channels
Update with signal tone	Updates the print status with a short sound signal
Shutdown	Shuts down the operating system
About	Display information about the installed software and hardware (serial number, etc)
Logs	Display and download log files for wallPen support

The "Position" menu

Initialize

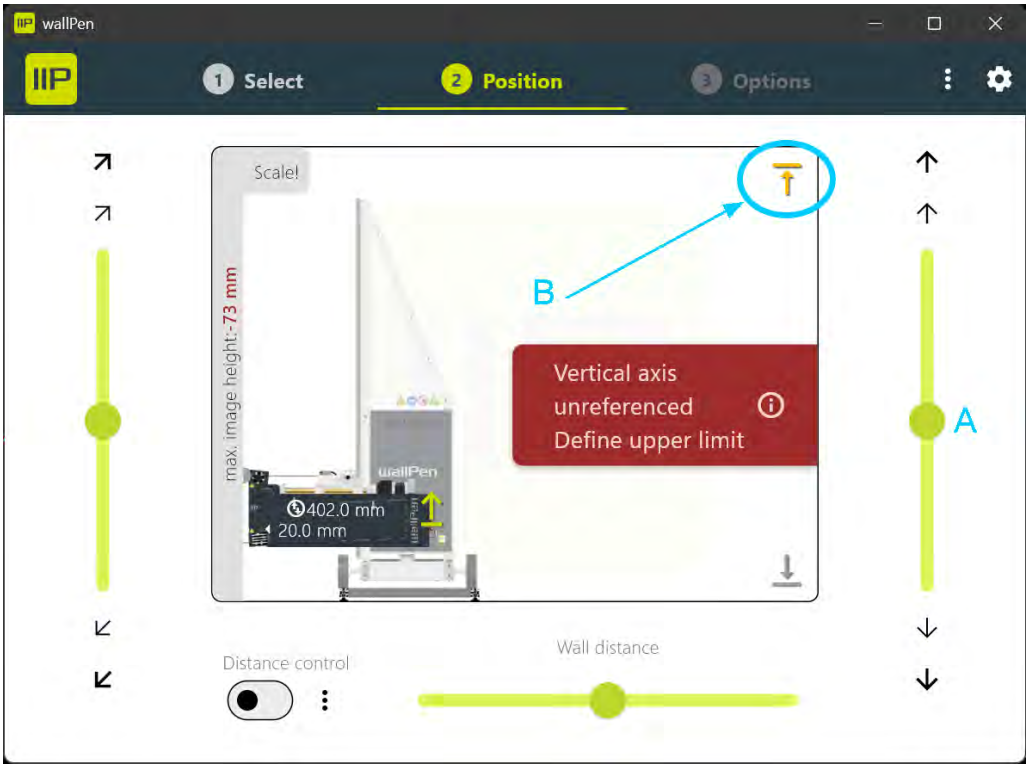


Select whether the printer is mounted on rails or on the floor (= steerable).

Caution: Remember that the machine can move and reference itself once you have made your selection.

Caution: Do not select "Steerable" if the wallPen has been placed on rails.

Define Upper Limit



By dragging the slider (A) on the right hand side of the screen upwards moves the vertical axis of the printer upwards as well. Once the desired upper position has been reached, press the icon (B) to set the upper limit. The red warning message will disappear and the wallPen is ready for operation. If the limit is not set before the upper physical end of the axis, the machine moves beyond the end of the axis and sets a sensor-controlled “hard limit”. Since a "hart limit" is purely a safety measure and is always accompanied by a noticeable mechanical jolt of the entire machine and should be avoided. The usual procedure should therefore be to set the upper limit as a “soft limit” by pressing the icon (B).

After setting the upper limit, move the printhead down to the desired print start point by pulling the slider (A) down.

A - X-Axis (Horizontal movement) Moves the entire device horizontally along the substrate. Moving the slider up moves the whole wallPen to the right, moving it down moves it to the left. Releasing the slider stops the movement immediately. The further the slider is moved up or down, the faster the device moves. Tapping the 45 degree tilted arrows on the top and bottom moves the device in increments. The outer arrows, which are slightly thicker, cause larger increments, while the inner arrows, which are thinner, move the wallPen in smaller increments.

B - Y-Axis (Vertical movement) Moves the slide with the printhead unit vertically up and down along the substrate. Moving the slider up moves the unit upwards, moving it down moves it downwards. Releasing the slider stops the movement immediately. The further the slider is moved up or down, the faster the device moves. Tapping the arrows on the top and bottom moves the printhead unit in increments. The outer arrows, which are slightly thicker, cause larger increments, while the inner arrows, which are slightly thinner, move the unit in smaller increments.

C - Z-Axis (Distance to substrate) Moves the printhead unit towards or away from the substrate. Moving the slider to the right moves the printhead unit towards the substrate, moving it to the left moves it away from the substrate. Releasing the slider stops the movement immediately. The further the slider is moved left or right, the faster the head moves. Tapping the arrows on the left and right moves the printhead unit in increments. The outer arrows, which are slightly thicker, cause

larger increments, while the inner arrows, which are slightly thinner, move the unit in smaller increments.

D - Substrate Distance Control Activates both laser sensors for automatic distance control. After activation, the distance set in the "Three-point menu" is maintained. A distance of 6 to 8 mm is recommended for most applications.

E - Lower Soft Limit Sets a lower soft limit at the current position of the printhead. This function is useful as a safety measure if, for example, printing is taking place above a radiator and you want to prevent the printhead from accidentally colliding with this obstacle.

A lower soft limit is removed by selecting the icon again.

F - Distance to Upper Limit Shows the travel distance still available up to the upper limit.

G - Axis Height Shows the total vertical travel available with the currently set upper limit.

H - Max. Image Height Maximum possible image height to be printed measured from the current position of the printhead.

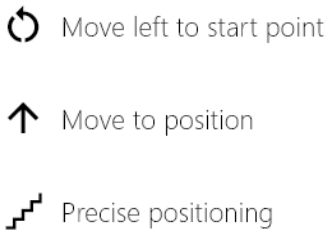
I - Floor Distance Abstand vom Boden, bzw. von der Oberkante des Schienensystems bis zur Unterkante des Druckkopfes.

J - Substrate Distance Distance from the floor (or the top edge of the rail system) to the bottom edge of the printhead.

K - Start Direction Tap the icon to specify whether printing should start from the current position upwards (Arrow pointing up) or downwards (Arrow pointing down).

Remark: When upwards (standard setting) is selected, the upper laser dot is used as start point reference. When downwards is selected, the lower laser dot is used as start point reference.

L - "Position" / "Three dots menu"



A - Move left to start position After printing, the wallPen returns to the left to the starting point of the print. The movement is stopped as soon as the relevant axis is moved minimally and then released again. However, this manual

movement by software also deletes the reference value to be reached.

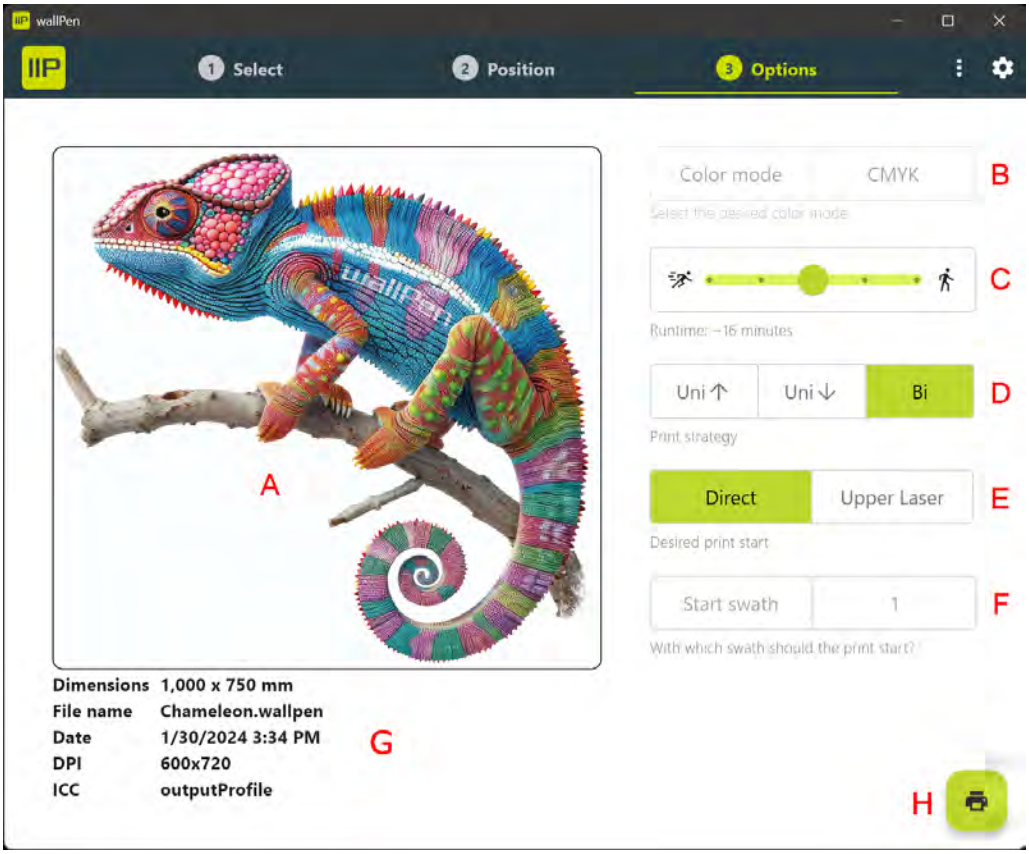
Warning: The device may move independently over a longer distance. Ensure that no collision occurs and that the travel path is free of obstacles. Pay particular attention to the alignment of the steering when operating on rails.

B - Move to position Position the wallPen vertically or horizontally in relative or absolute values

C - Precise positioning* Precisely position any axes of the wallPen in very small increments.

* wallPen Pro required

"Options" menu



A - Image Preview Display of the selected print motif. Depending on the device, this image can be zoomed in, zoomed out, and dragged using a pinch gesture or the mouse wheel.

B - Color mode Depending on the image, you can select a color mode (CMYK, CMYKW, W-CMYK or "White only"). For this option, a fifth printhead must be installed (optional) and the graphic file must have an “alpha channel.” For more

information about these modes, refer to the "White printing" section of this manual.

C - Passes Select whether the design is to be printed in one, two, four, eight or sixteen pass mode. This setting has a significant effect on the quality and speed of the print. The fewer passes, the faster, but also "coarser" the print result. The more passes, the slower and more "homogeneous" the print result will be. Often motifs are printed in 8-pass, but also 4-pass or even 2-pass is ofter sufficient.

Often texts and graphics printed with less passes look sharper and cleaner than with many passes. Gradients, images and larger color areas often require more passes to achieve a more "homogeneous" look.

Test the effect of this setting on different motifs over time. This will give you a very good feeling of which motifs have the best effect with which setting.

Much more detailed information on Multi Pass Printing can be found in the chapter "Miscellaneous / Multi Pass Printing" in this manual.

D - Print pass mode These parameters determine whether this motif should be printed purely upwards, purely downwards, or in both directions.

- **Uni ↑** Printing only takes place during the upward movement. Downwards is not printed and a higher speed can be set for this empty travel in the options if required.
- **Uni ↓** Printing only takes place during the downward movement. Upwards printing does not take place and a higher speed can be set for this empty path in the options if required.
- **Bi** The printer prints bi-directionally both upwards and downwards.

The "Uni" options are usually used when particularly small texts or fine details need to be printed as precisely as possible. All the "empty moves" mean that printing takes significantly longer then bi-directional printing, but is more precise as the colors do not have to be aligned and calibrated upwards and downwards against each other. The risk of edge blurring and color shifts is therefore minimized, but this can be neglected for most motifs.

E - Print start position Direct - With the default setting "Start direction up," printing begins directly in the lower left corner of the selected motif.

With the setting "Start direction down," printing begins directly in the upper left corner of the selected motif.

F - Start with swath With the help of this setting, a print file can be started or continued at almost any point. For this reason, the current swath can be saved in the app in the event of a manual print abort.

Some technical background: While printing, the wallPen divides the data within the .wallpen-file into vertical print paths (swaths). These swaths are internally numbered in ascending order starting with "one". Conversely, this means that a print should normally always start with the swatch number "one", which is also the usual default setting here.

If a print is canceled with swath number 500, for example, the print can be continued with a little practice using this function (in our example with swath 501). To do this, first carefully mark both laser points on the substrate with a pencil, ideally on small pieces of masking tape so as not to draw the wall. If both laser points are later aligned exactly with the two markings, the print can be continued here by pressing "Start at Swath 501". But do not forget to remove the masking tape before continuing.... ;-)

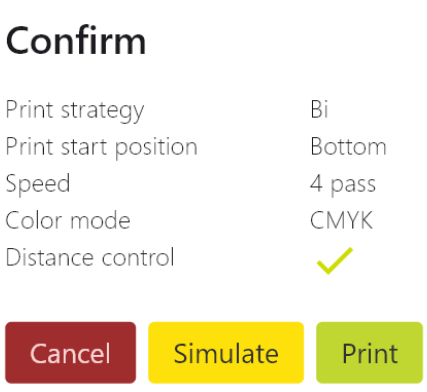
Before printing starts or restarts, two conditions are checked:

- Ink temperature: If the temperature deviates by more than 3K, a warning is displayed.
- Distance control: If this is deactivated, a warning is displayed.

Such continuing of a print requires practice, patience and, above all, very precise alignment of the printer in both the horizontal and vertical directions.

G - Print file details General information about the actual motif

H - Start printing Starts printing, but first displays the following dialog box to allow you to check the settings again before final printing:



Check the settings carefully.

Cancel Click "Cancel" to cancel the process and return to the previous screen to make changes to the settings.

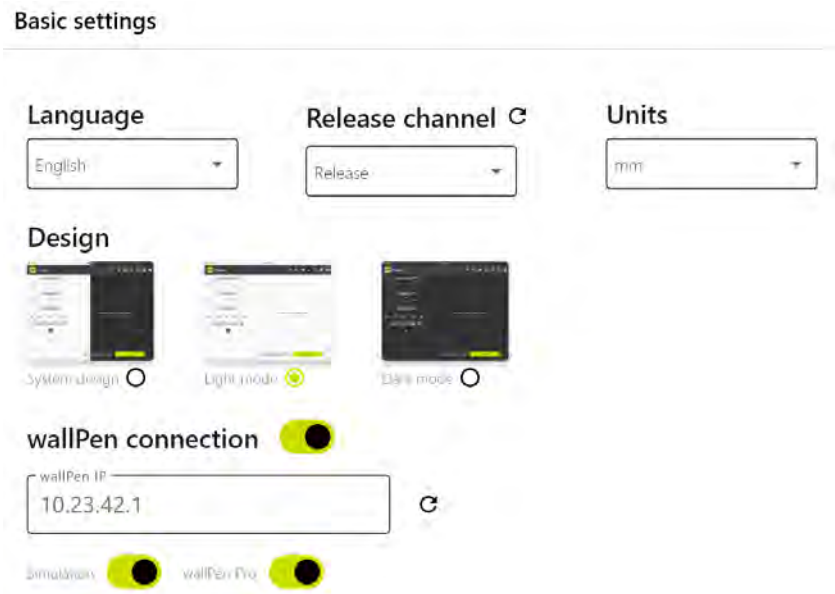
Simulate The "Simulate" button starts the printing process and the wallPen moves as expected, but without firing ink and without UV. This allows movement sequences and travel heights to be checked, for example.

Print If all settings are correct, select "Print" and the printing process will start.

6.3 Basic Settings

Basic Settings

The following section describes the wallPen App settings in more detail.



Language Selecting the language of the wallPen APP

Release channel Selection of the release level with the option to switch to the beta version of the software in order to test the latest functions. Click on the refresh icon to the right of the heading to check for updates manually. This requires the device to be connected to the Internet.

Units* Definition of the unit of measurement within the app:

- mm - Display: 73 mm
- cm - Display 7,3 cm
- Inches (fractional) - Display: 1'9 1/8"
- Inches (decimal) - Display: 2.9 inch

Design* Select the app display in light mode, dark mode, or following the actual system settings

wallPen connection The IP address under which the wallPen can be found in the WLAN network. The default value of 10.23.42.1 should only be changed if the wallPen is connected to a local network or if several wallPen E2 devices are located nearby at the same time.

Simulation Enables virtual control of a simulated wallPen printer via app.

In this mode, .wallPen files can also be calculated from graphic files and printed virtually. The simulation is also a great way to test the range of functions and operation of the app or to prepare print data on external devices without a connected wallPen.

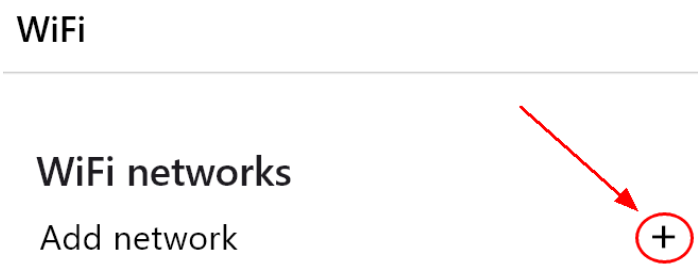
wallPen Pro Activation or deactivation of the optional "wallPen Pro" features while in simulation mode

* wallPen Pro required

WiFi

The wallPen can either act as a router to interact with the control device or it can be connected to an existing local WiFi network. A connection to a local WiFi network is usually more stable, allows even more direct control of the printer, also license management and wallPen software updates are easier to obtain thanks to a parallel Internet connection.

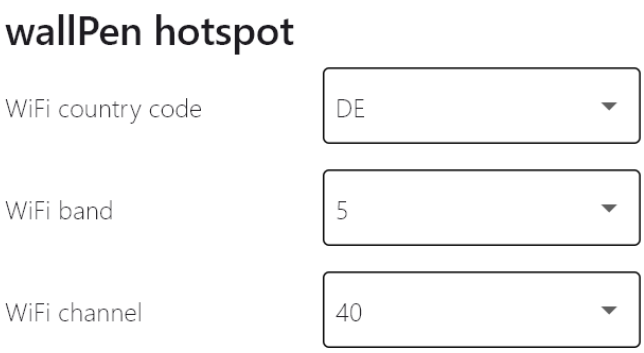
To connect the device to a local WiFi network, click on the plus symbol to open a new dialog window.



In this dialog box, enter the name (SSID) and password of the desired local network and confirm with OK:

Once a connection has been established, the network and the associated IP address are displayed.

The wallPen can then be accessed in the local network via the wallPen app using the IP address displayed. However, the IP address displayed must be entered in the app's settings screen to enable control.



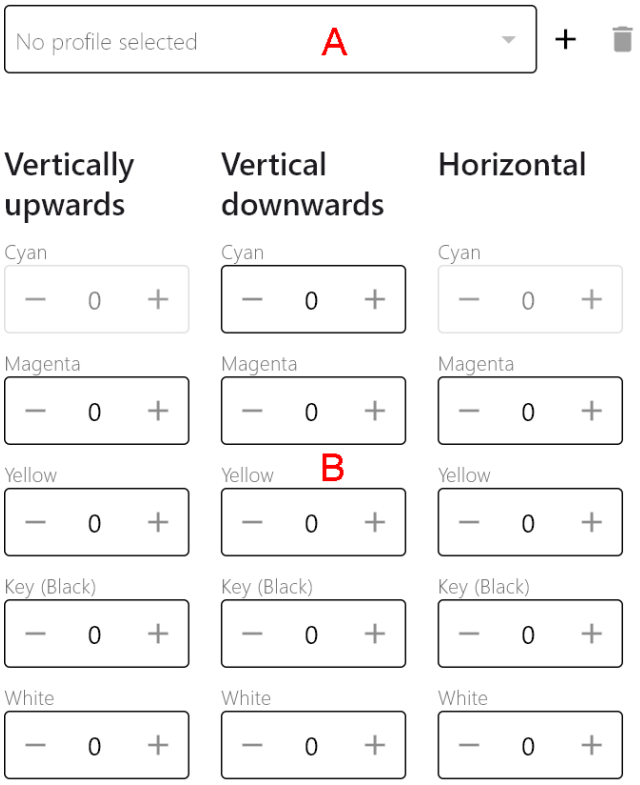
The wallPen supports both the 2.4 GHz and the 5 GHz band for WiFi transmission; for legal reasons, 2.4 GHz is the default setting. We strongly recommend that you select 5 GHz here, as this transmission technology is usually much faster and more stable than 2.4 GHz.

To do so it is legally required to first select the correct country code that applies to you in order to display and select only the radio channels permitted in your country or region.

Caution - Before selecting "5 GHz", make absolutely sure that a "TP-Link Archer T3U Nano" is used as the Wifi device in the printer. If you switch to 5 GHz without a proper 5 GHz USB adapter, in the worst case scenario you will no longer be able to access the wallPen. In the best case scenario, the system will continue to operate at 2.4 GHz, which will significantly impair the user experience due to its slow speed.

Calibration

Calibration



This menu allows all colors to be aligned pixel by pixel in the horizontal and vertical directions for perfect printing results.

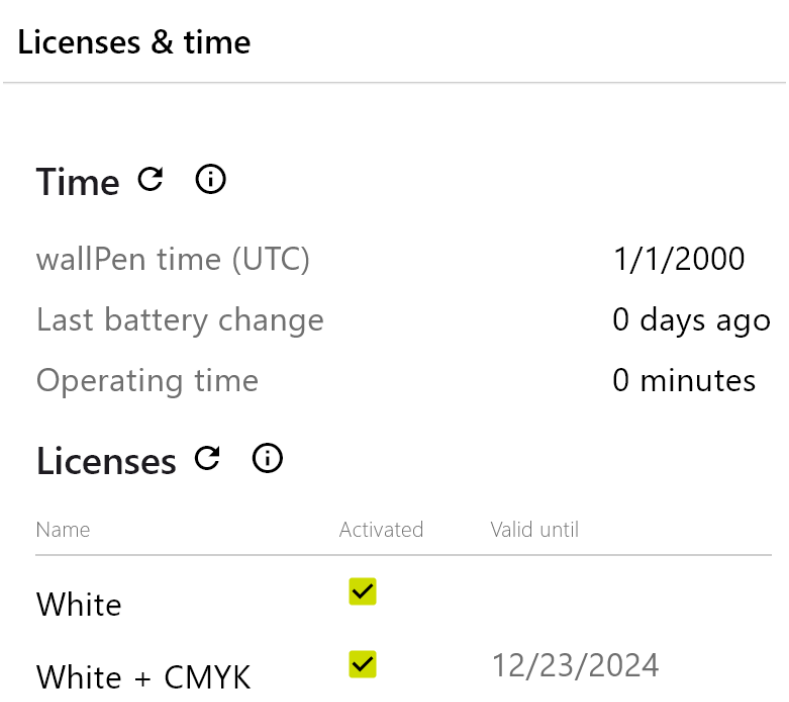
A* - Various profiles can be saved here for calibration. For optimum printing results, it may be advisable to perform and save a separate calibration for each possible mounting position of the printhead (front, half front, half rear, rear).

B - Calibration values **-** Details on the use of these values and the calibration procedure are documented in detail in the "Service / Calibration" chapter of this manual.

These values are already optimally preset at the factory. It is therefore strongly recommended that you **make a note or screenshot of these factory settings** before making any changes so that you can refer back to them if necessary.

* wallPen Pro required

Licences & time



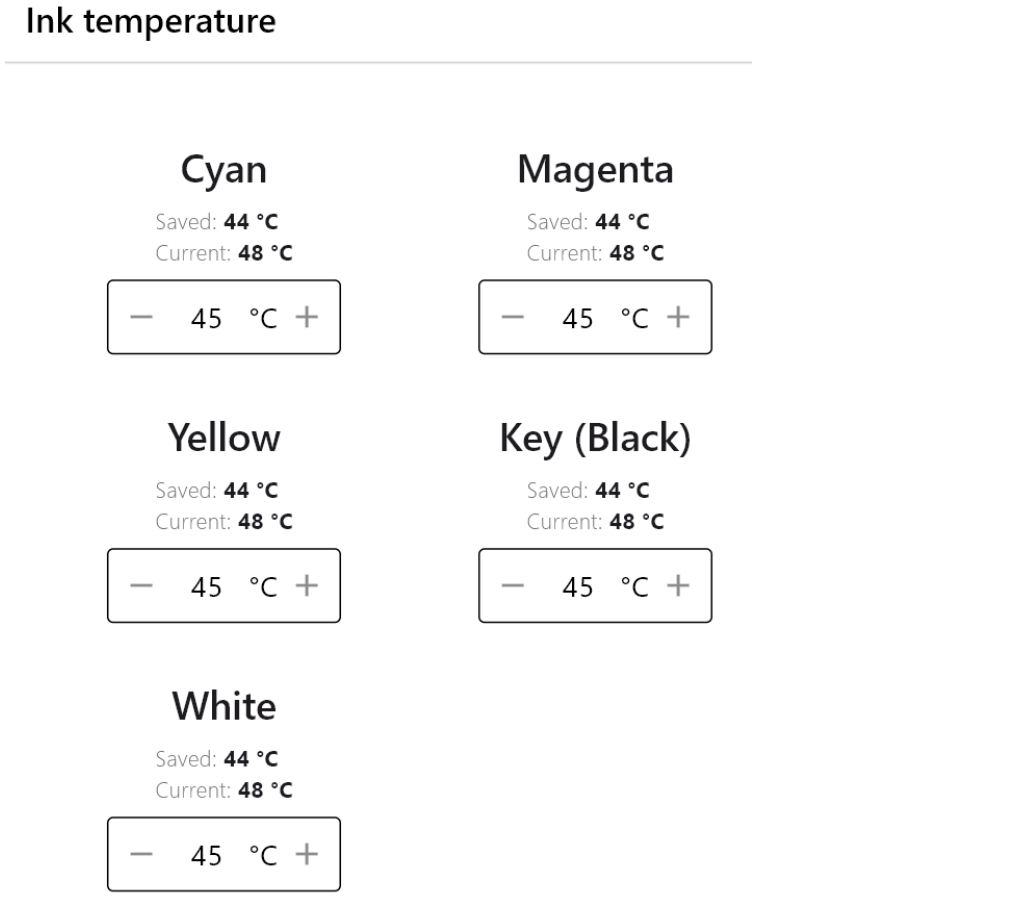
The wallPen is equipped with a real-time clock (RTC), which logs the operating hours of the wallPen and saves the current time in UTC (Coordinated Universal Time). The RTC also ensures that licenses can be stored on the wallPen and used for a limited time.

If an error occurs during license management, the wallPen must be connected to the Internet to validate the licenses and renew them on the device:

Option 1 Connect the Ethernet interface of the wallPen printhead unit to the Internet using a LAN cable.

Option 2 Connect the wallPen to a Wi-Fi network that is connected to the Internet, as shown in the "Wi-Fi" section of this manual.

Ink temperature

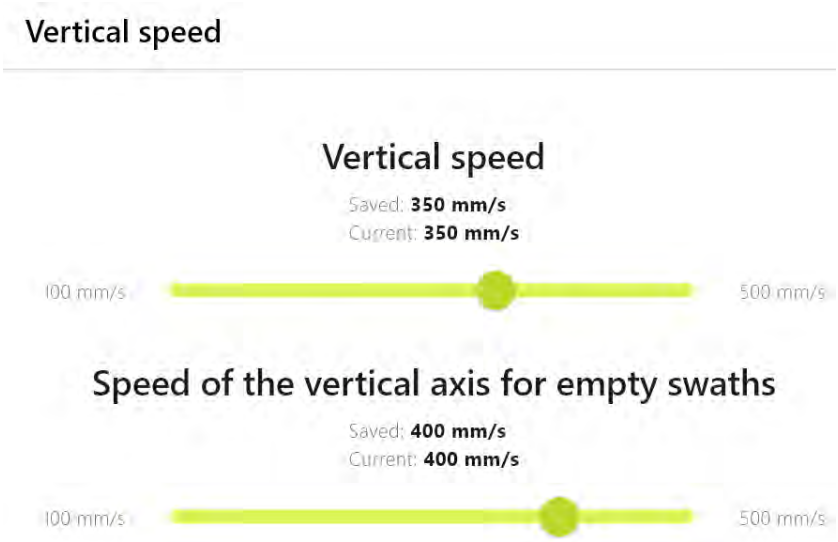


The ink temperature is set to a standard value of 45°C. Do not change this general temperature without consulting the wallPen support team, as too low or too high temperatures may very likely damage the print nozzles or lead to poor to very poor printing results.

- Ink that is too warm is very thin and difficult to print without significant problems with print quality. The higher temperature also damages the printheads.
- Ink that is too cold is thick and viscous, difficult to print without significant problems with print quality, and its thick consistency damages the ink system, tubing, and printheads.

Always wait until the desired ink temperature has been reached before working with the device.

Vertical speed

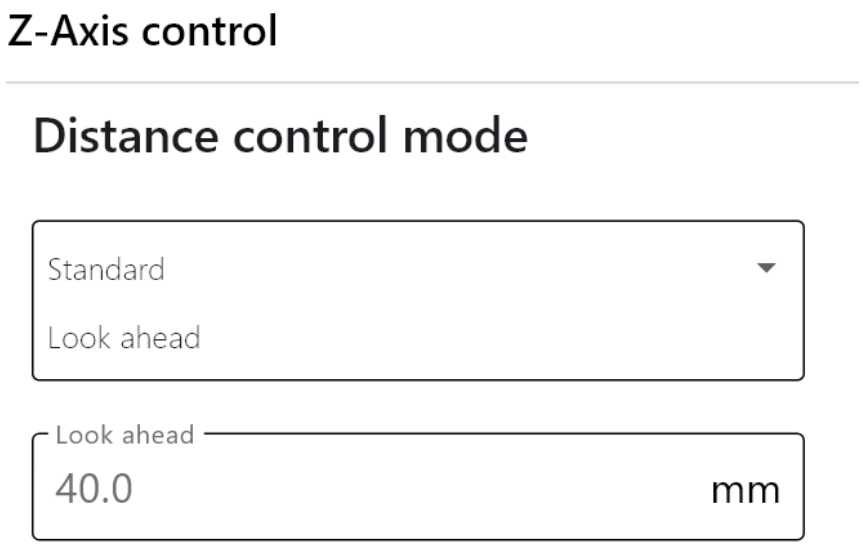


Setting the vertical axis speed during printing and during empty swaths in unidirectional printing.

A printing speed of 40 cm per second should only be exceeded in exceptional cases.

Z-Axis control

This setting determines the method used to control and monitor the printhead via laser in relation to the substrate.



Standard The distance control is performed by the laser sensors in real time. This setting is sufficient for most printing jobs.

Look ahead*	Distance control and movement control are performed intelligently and predictively according to the specified value. A distance of 35 to 50 mm has proven effective here. This method analyzes measuring points in advance and, based on these findings, the printhead moves more smoothly and compensates better for uneven surfaces. Please note that significant contour changes, edges, or obstacles cannot be detected by this predictive function. So this look-ahead function does not prevent collisions.

* wallPen Pro required

6.4 Advanced Settings

Dwell time

The dwell time is the time the wallPen waits after a movement before it starts printing. This is useful tall prints to "calm down" vibrations from previous movements.

- “max. dwell time” is the time in seconds that is waited at a height of the axis setup of four meters.
- “No dwell time below” is the height above which dwell time is taken into account.

These two settings may look illogical at first glance, but they offer a great deal of flexibility once you have internalized the principle behind them.

The "max. dwell time" setting **always refers to an installation height of the vertical axis of four meters**, even if the device may not be installed that high for the planned print job. The setting therefore specifies that the dwell time of the printhead is - in this example - four seconds if the printhead would be at a height of four meters.

The second value is much easier to internalize. It simply states that a dwell time should only be used from the set height.

The dwell time actually applied at a certain height is now calculated linearly using the two given parameters. In this example, this would mean the following:

At a print heigh of ...	**... is the dwell time**
4 meters	4 seconds
3,75 meters	3,5 seconds
3,5 meters	3 seconds
3,25 meters	2,5 seconds
2 meters	2 seconds
2,75 meters	1,5 seconds

2,5 meters	1 second
2,25 meters	0,5 seconds
2 meters	0 seconds

This would therefore mean that if the setup height for a particular print job is 3.5 meters, the dwell time at this height taken into account by the software would then be three seconds.

UV intensity

Setting the power of the UV lamps from 0 to 100% for curing the ink.

This setting can also be changed live on the user interface during printing. The system automatically returns to the default value defined here in the settings after each print.

A value should be set that is not too intense in order to protect the environment and the printheads from short-wave UV rays as much as possible, but also not too weak to cure the ink reliably.

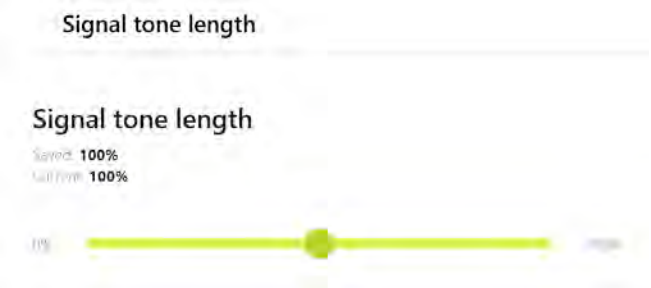
In practice, values between 50% and 70% have proven to be effective.

The intensity of the UV light can also affect the gloss of the ink on various surfaces. Often, very intensely cured ink appears somewhat dull, while less exposed ink appears somewhat glossier.

The thread pitch of the vertical axis plays a role in curing. The slower the axis moves vertically, the less power the UV lamps require to cure the ink.

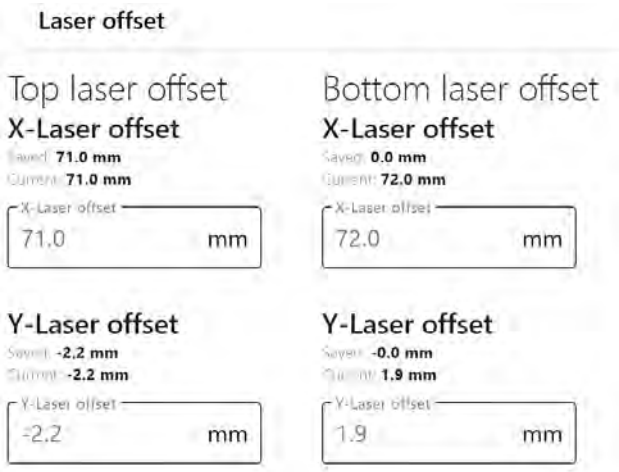
It must be avoided as far as possible that the UV rays are reflected on the substrate when the UV lamps are too powerful and the ink hardens at the tiny nozzle openings on the printheads. This will damage them irreparably. Particular caution is advised when printing on highly reflective substrates. Examples include bright white paper, glass, mirrors, shiny metal, and many more.

Beep length



Setting the length of the signal tone for the wallPen. The signal tone is used to indicate the end of a print job or other events.

Laser offset *



The wallPen offers the option of using the laser dots as the print start point.

- If the print start direction is "Bottom to top" (default setting), the upper laser dot is used as the reference point and the lower left corner of the image to be printed will be exactly there.
- If the print start direction is "Top to bottom", the lower laser dot is used as the reference point and the upper left corner of the image to be printed is positioned exactly there.

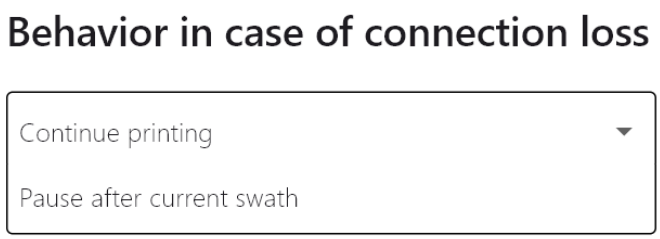
If the print start point does not match the laser point, this deviation can be corrected here. Both laser offsets are specified in X and Y direction:

- Top laser offset - The laser offset for the upper laser
- Bottom laser offset - The laser offset for the lower laser
- X-Laser offset - The laser offset in horizontal direction
- Y-Laser offset - The laser offset in vertical direction

The four laser offset values are already optimally preset at the factory. It is therefore strongly recommended that you **make a note of these factory settings** before making any changes so that you can refer back to them if necessary.

* wallPen Pro required

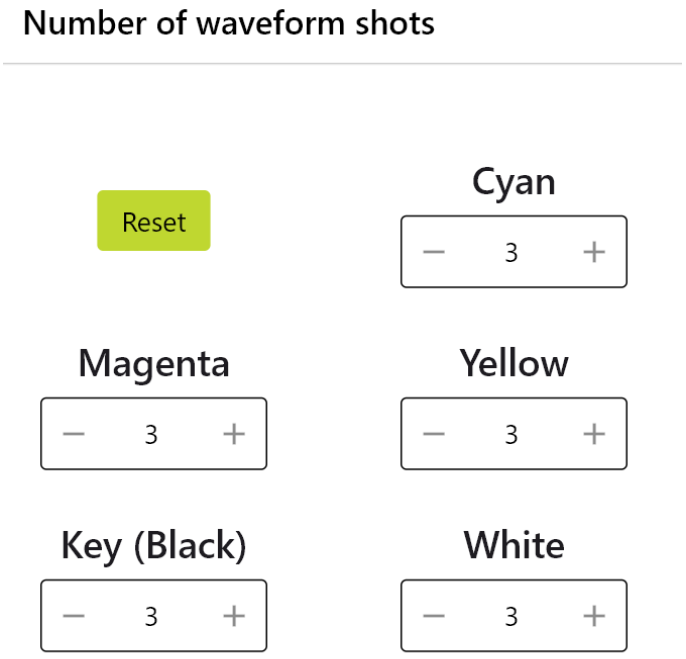
Behavior if the connection is lost



Pause after current print path If the WLAN connection to the control unit is interrupted, printing is automatically paused after the current print job. Printing can then be resumed or paused again by briefly pressing the Pause/Resume button on the control cabinet.

Resume printing If the WLAN connection to the control unit is interrupted, the current print job is continued. However, the printing process can be paused and resumed manually at any time by briefly pressing the Pause/Resume button on the control cabinet.

Number of waveform shots

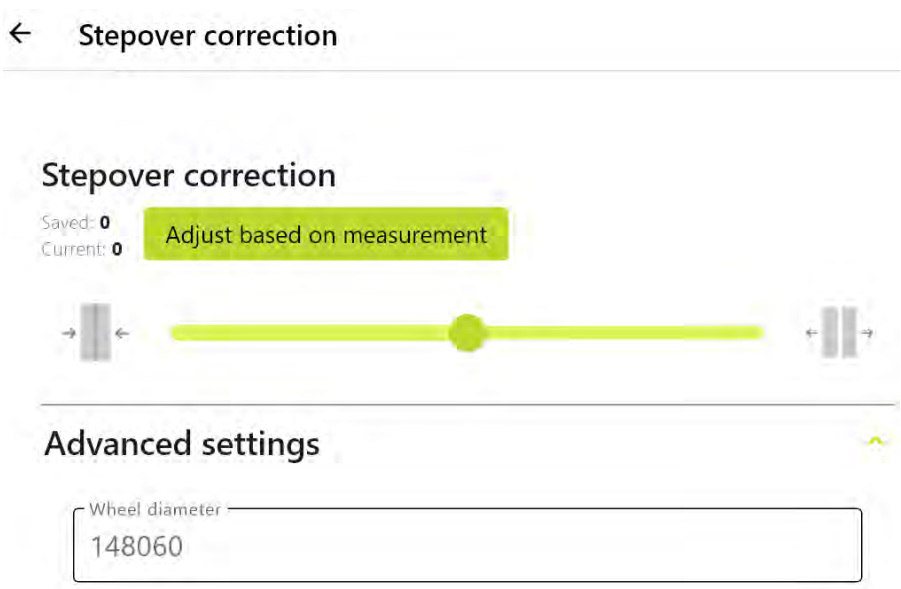


During printing, millions of tiny ink drops are shot, which are generated by electrical impulses (waveforms). Several of these tiny drops merge in flight within milliseconds before they hit the substrate as a single larger drop. This "multidrop process" is quite complex and requires very precise synchronization of the pulses. The wallPen E2 is optimized for three drops as standard and any change to this value should be carefully considered and only ever made for a short time for special cases and tests. There is not only the risk of overheating and damaging the print nozzles, but also of poor printing results with overspray, i.e. an uncontrolled "ink mist" that cannot be cured properly.

The default value "3" is ideal for most applications. This value may be changed to 5, but only on a trial basis and only for a short time, if a substrate is very absorbent.

We strongly advise against changing this value!

Stepover correction



Optimization of the platform travel between the print paths in the horizontal direction. This value ultimately influences the wheel diameter and has a direct impact on the distance between the print paths and thus on the print quality due to possible gaps or overlaps.

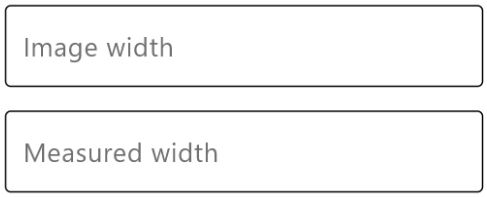
- A larger wheel diameter increases the wheel circumference and the printer travels a longer distance per wheel revolution. The software will compensate for this larger diameter accordingly and travel a shorter distance.
- A smaller wheel diameter reduces the wheel circumference and the printer travels a shorter distance per wheel revolution. The software will compensate for this smaller diameter accordingly and travel a longer distance.

The aim here is to find a value that will ensure that a defined motif with a known width (e.g., 100 cm) is actually printed in this width.

- If the printed motif on the substrate is wider than the original motif in the graphics software, the wheel diameter must be selected slightly larger.
- If the printed motif on the substrate is narrower than the original motif in the graphics software, the wheel diameter must be selected slightly smaller.

The wheel diameter is already calibrated at the factory and should be noted before making any changes so that it can be referred to later.

Adjust based on measurement



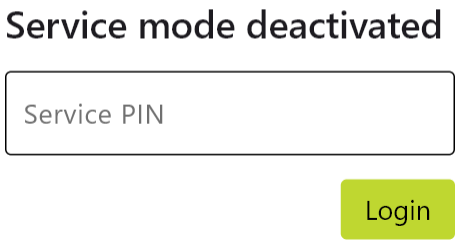
The correct wheel diameter can be determined relatively easily using “Based on measurement”.

- Image width - Width of the image in the graphics software (e.g. 1000 mm)
- Measured width - Measured width of the same image after printing on the substrate (e.g. 990 mm)

By entering the target and actual values, the software now determines the correct wheel diameter.

Service mode

Service mode login



In consultation with wallPen Service or an authorized wallPen service partner, a maintenance mode can be activated using a code. This enables our technicians and developers to analyze and diagnose errors.

6.5 wallPen Pro (optional)

The wallPen Pro functions expand the capabilities of your wallPen with additional intelligent features that have been specially developed for professional applications and special printing requirements. When you purchase a new wallPen, wallPen Pro is included for a period of 12 months. Within this period, you can decide whether you want to purchase the functionality for a further 12, 24 or 36 months.

Activation of wallPen Pro

With a valid license wallPen Pro is activated automatically. Therefore, the wallPen E2 should be connected to the Internet regularly to ensure that all license information and operating system software are up to date.

wallPen Pro can also be activated in "Simulation Mode" within in the wallPen App under “Settings > wallPen Pro” to be able to test at least some of its features, even without a valid license.

A real-time clock (RTC) in the wallPen E2 ensures reliable license management and activation. If you have any questions about licensing or renewing your wallPen Pro license, please contact the wallPen support team or any wallPen sales partner.

Functions at a glance

1. Extended Z-axis control (look-ahead mode)	The Z-axis is not only controlled in real time, but also in look-ahead mode. This significantly improves adaptation to uneven surfaces and leads to more stable printing results. Ideal for textured, rough or curved vertical surfaces.
2. Precise positioning and axis control	The positioning of the printhead can be finer and more precise with wallPen Pro. The X and Y axes can be controlled with a resolution of up to 0.1 mm or..... 0.5 mm, which allows exact positioning of reference points. In addition, the printing process can be started exactly from a previously defined print path or directly at the current laser marking. This is particularly helpful for wall-to-wall or motif-related starting points.
3. Extended license options	With wallPen Pro, time-limited or modular licenses can be managed - ideal for rental models, test phases or special printing projects.
4. Advanced management and editing of .wallPen files	wallPen Pro not only allows you to save and upload .wallPen files directly from the app, but also offers an integrated analysis function for these files.

	This allows size, color information and technical parameters to be checked before a print is started - even in offline mode. This increases planning reliability, especially for complex or recurring print projects
5. Calibration profiles	Users can save, retrieve and compare multiple calibration profiles - e.g. for different substrates or locations. This function allows fine adjustments to be made to the print parameters in a targeted and repeatable manner.
6. Advanced image processing and simulation tools	In Pro mode, additional tools for image editing are available on mobile devices, and editing is also possible in simulation mode (without a connected printer). Such extended tools allow for much more flexible preparation of motifs directly in the app.
7. Format options and units of measurement	With wallPen Pro, you can switch between the "metric" and "inch" units of measurement.
8. Special functions for print data and workflow	For particularly large motifs or advanced printing strategies, advanced functions such as "Skip & Shrink Swath" are available in wallPen Pro mode. "Skip Swath" skips horizontal print areas if no print data is available. "Shrink Swath" ignores vertical areas without color information and skips them. Both settings contribute significantly to saving time on demanding print projects.
7. Start printing at laser dot	With wallPen Pro it is possible to start the print at the laser dot. This allows prints to be positioned more precisely and easily.

The operation of the wallPen is explicitly possible without a valid wallPen Pro license. wallPen Pro has no influence on the print quality, only on handling and efficiency.

The notes "wallPen Pro required" used in this manual are not legally binding and are not necessarily complete or provided everywhere. Errors, additions, and changes are reserved.

6.6 Software Updates

New wallPen OS versions are regularly provided. They can be installed as an OTA (over the air) update via the wallPen app, or via a USB. In both cases, the update is started and monitored through the app.

How to update the wallPen E2

App OTA Update

The wallPen app automatically checks for updates when the app is connected to the internet (connecting to the internet might mean disconnecting from the E2 temporarily).

If an update is available, a dialog will show the available version and what has changed:

Please read the change log to see what has changed in the new version. If an Internet connection is available, you can also check for new versions manually by clicking on the update icon next to the “Release Channel” selection in the app's general settings.

There are three steps to the OTA update:

1. Download the update file to the control device.
2. Transfer the update file to the wallPen E2.
3. Install the update on the wallPen E2.

Between each step, you will be asked to confirm the next step.

The installation will take a few minutes, during which the wallPen E2 may not be turned off! The app will guide you and show the progress of the installation. After the

installation is complete, the wallPen E2 will need to be restarted manually using the power switch.

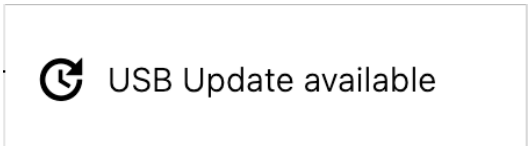
Manual USB Update

If for any reason an OTA update is not available, you can also update the wallPen E2 using a USB stick. To do this, you need a USB stick with the latest ".wpupdate" file on it.

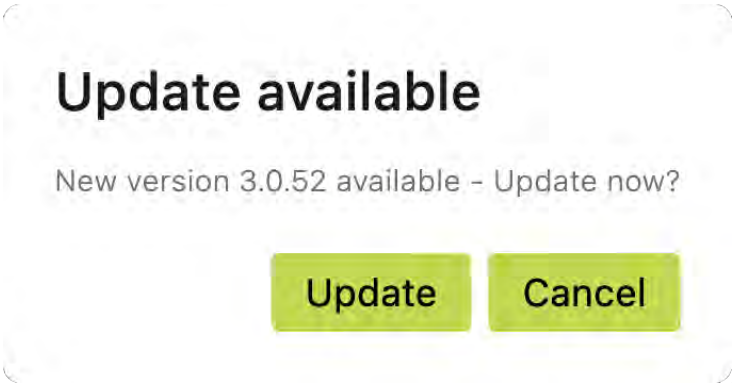
Download the latest wallPen OS 3.x update file from the service.wallpen.com and copy the ".wpupdate"-file to the root directory of the USB thumb drive.

Now insert the prepared thumb drive into the USB port of the wallPen E2 that is ready for operation. After a few seconds, an "update available"-symbol will appear in the top right corner at the three dot menu within the app:

Open the three dot menu and select "USB Update available" :



A simple dialog box will appear asking you to confirm the update. Click "Update" to start the update process:



Operation

7 Operation

7.1 Proven Procedures

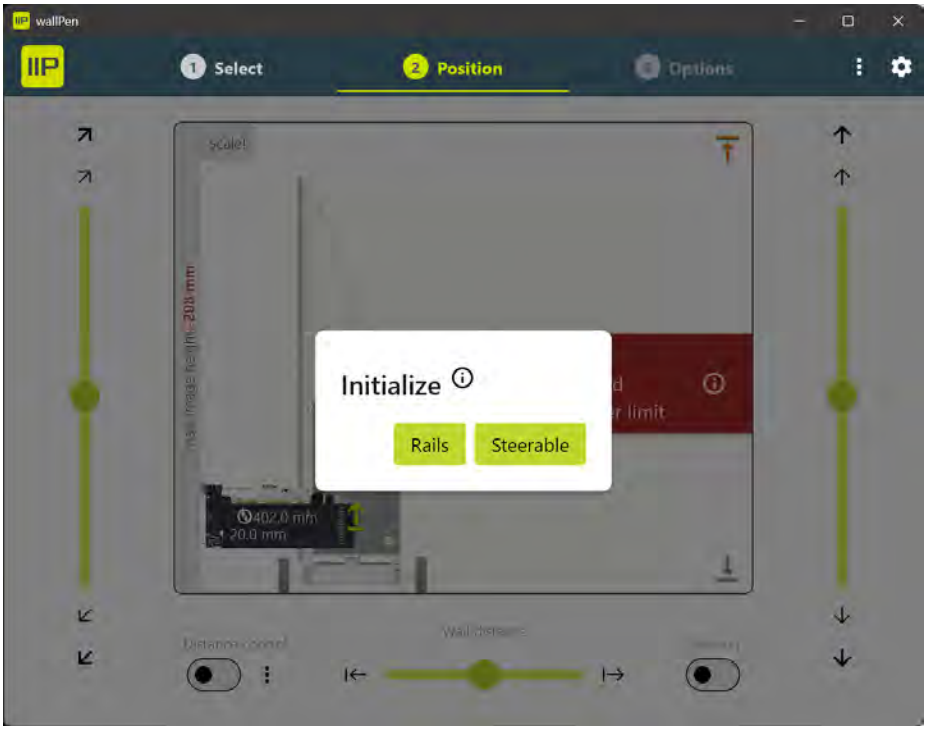
7.1.1 Basic Procedure

From an image to the substrate

This section describes the complete process for printing an sample image after the wallPen was set up. These instructions are not a substitute for thorough training and are only intended as a quick refresher for operators who have already received comprehensive training.

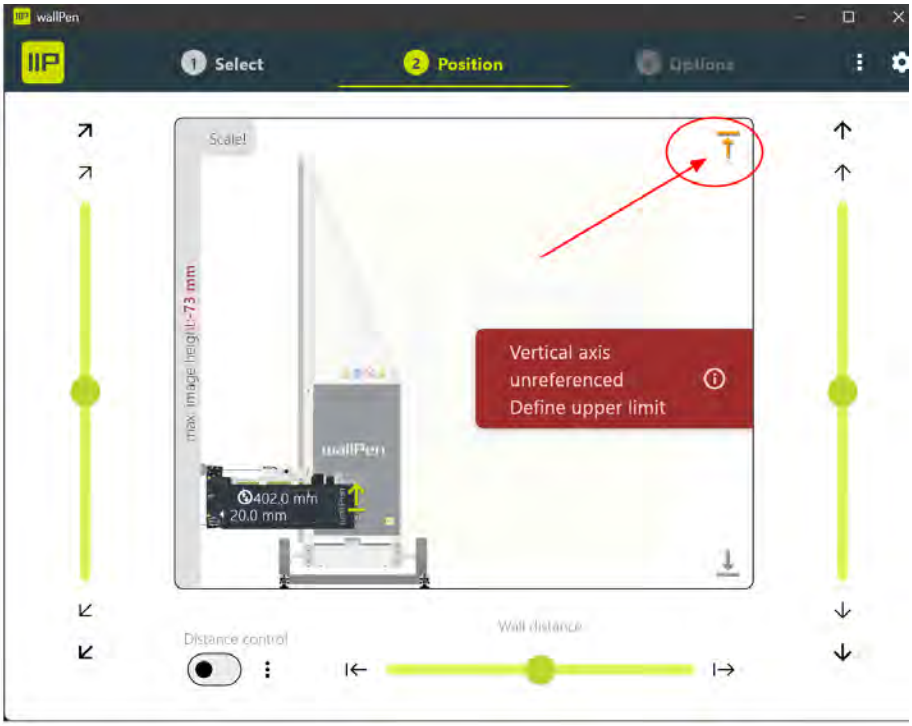
First step is to reference the wallPen by selecting the initialization method in the corresponding window.

Make sure that the vertical profile protrudes at least 25 cm above the actual slide position before referencing, as the printhead first moves approx. 25 cm upwards for referencing before the downward movement begins, which determines the reference point.



After referencing, the wallPen is in “safety mode.” In this state, which is still unreferenced, at least in the vertical axis range, the slide system can only be moved upward at reduced speed to be referenced.

Move the right slider upwards and position the printhead unit at a suitable upper position. Once the desired height has been reached, confirm by clicking on the orange limit arrow to set the upper limit ("soft limit").

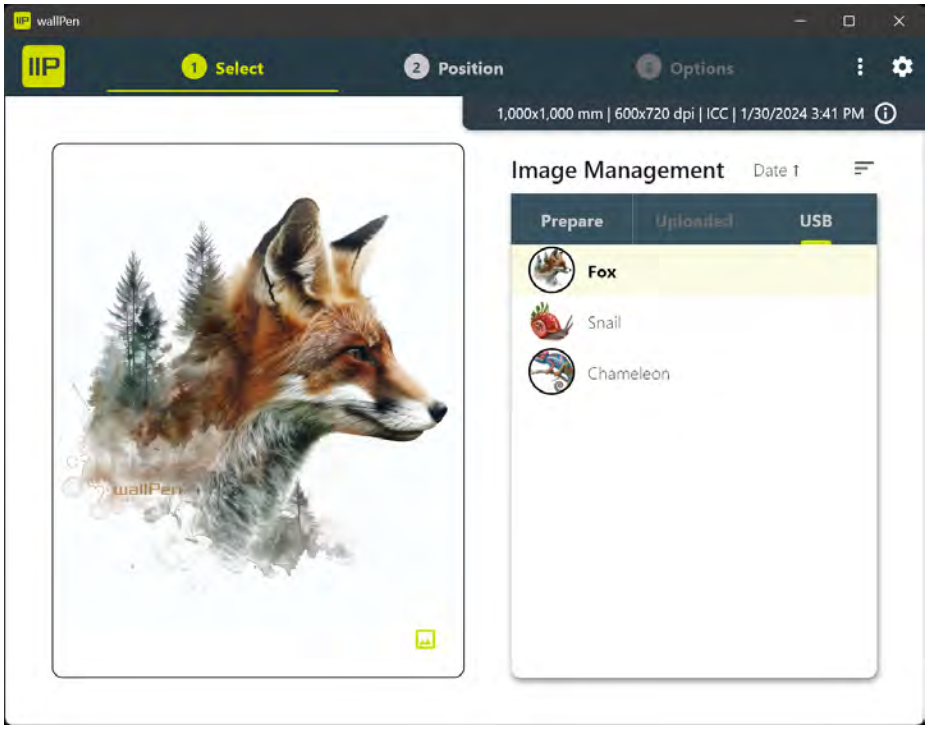


Ideally, **move the slide to just before the upper end of the vertical axis** in order to obtain the greatest possible travel distance for later printing.

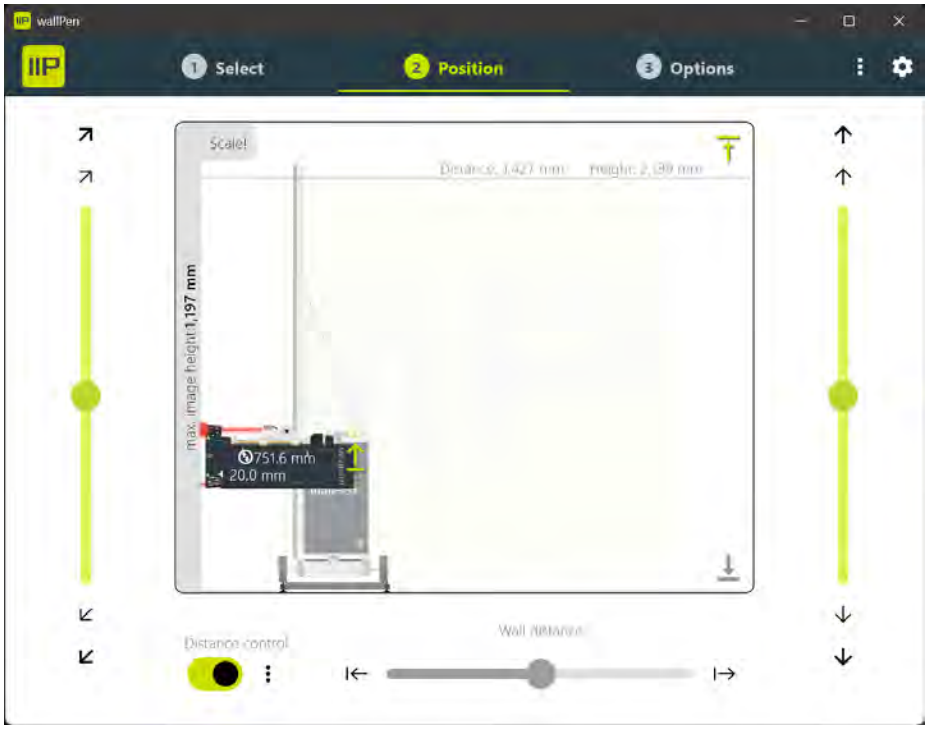
If the slide is deliberately moved to the end of the axis without stopping, a sensor is triggered, stops the movement, and forces an upper limit (hard limit). **Setting a hard limit is not recommended** because it causes the machine to jerk unnecessarily, which may damage the mechanics over time. Protect your machine in the long term and get into the habit of always setting a soft limit.

Once the upper soft limit has been set, the wallPen can be controlled in all directions and can be positioned for printing.

Select the "Prepare" menu and choose the image you want to print.

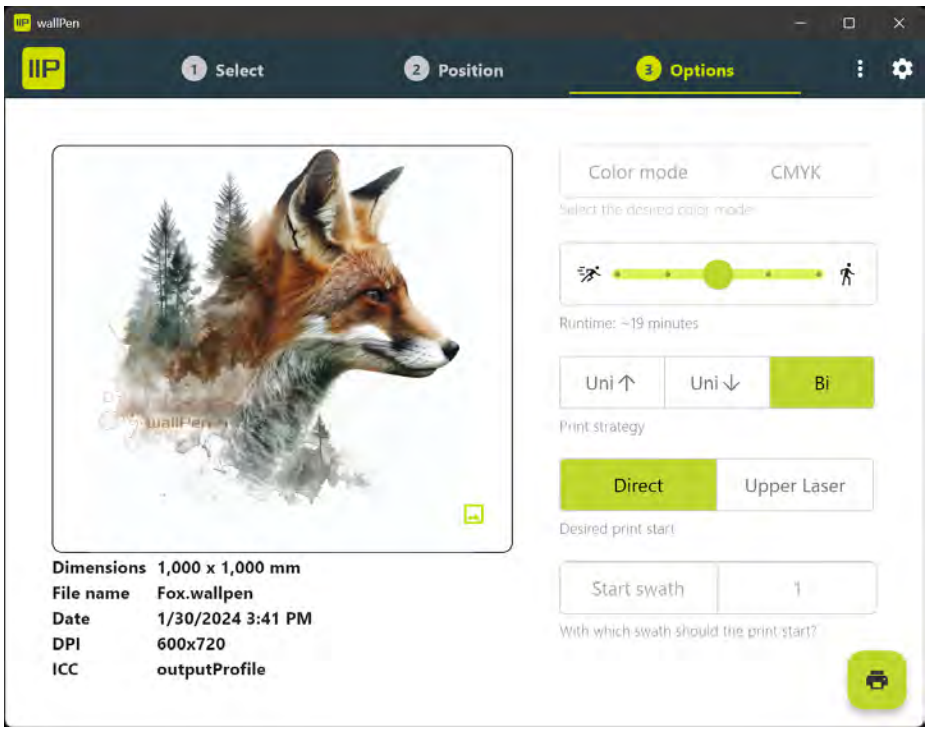


Select the “Positioning” menu and move the wallPen to the desired lower left corner where the image should start printing. Don't forget here now to activate the laser distance control in the lower section of the screen.

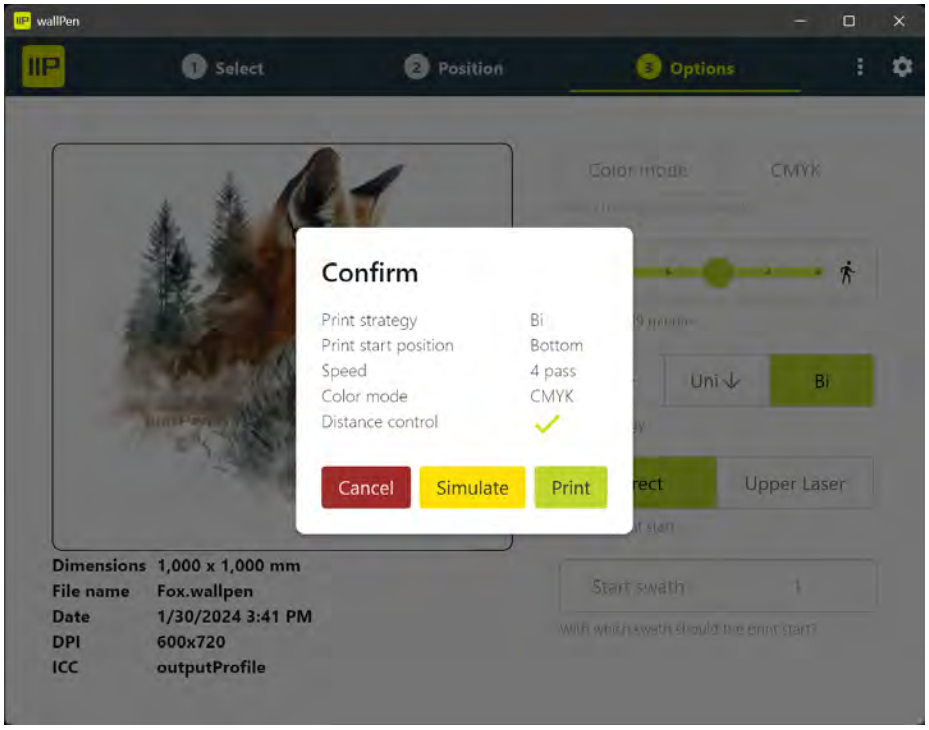


Once the motif has been selected and the wallPen has been aligned, set the desired print options. To do this, switch to the "Options" menu and select the parameters. Once

all settings have been made, printing is started via the printer icon in the bottom right-hand corner of the screen.



Now briefly check the overview and start the printing process by selecting “Print”.



7.1.2 Printing Recommendations

Which settings are generally advisable for printing?

It would be too easy to answer the frequently asked question "Should I print in 1, 2, 4, 8 or 16 passes?" by choosing between speed and quality. A 1-pass print will generally not produce a satisfactory result and irregularities will be visible in the printed image.

Therefore, 1-pass printing is better suited for nozzle tests. In rare cases, however, the quality is also sufficient to print at high speed, for example at the top of a high wall outdoors.

With the latest generation of software, good results are achieved for CMYK in 4-pass with 600 DPI horizontal and 720 DPI vertical resolution. In many cases it is a good compromise between quality and time.

7.1.3 Results not Satisfactory

What if the results are not satisfactory?

Unsatisfactory print results, streaking or other problems can have many causes and reasons. If you are having problems with the print quality, you should first go through these questions to possibly find a solution:

- Does the printhead test as described in the chapter "Service | Calibration" show that - in the best case - all printhead nozzles are working properly?
- Are all heads optimally calibrated as described in the "Service | Calibration" chapter?
- Is the floor level and free of defects?
- Is the surface to be printed on suitable for UV printing? Is it free of dirt, grease, fingerprints or handprints? Are there any primer residues? Has the same ink been used for the entire surface?
- Are the running surfaces of the wheels clean, in good condition and without scoring, ink residue or damage?
- Is the printer really aligned parallel to the wall? Is this parallel alignment checked regularly during printing and corrected by steering corrections?
- Is the distance between the printhead unit and the wall as small as possible without causing a collision? Is the distance to the wall checked regularly during printing and corrected with the corresponding software function as described in the chapter "wallPen Control | Settings"?
- Have you tried printing your image in a different vertical resolution? With more or fewer passes?
- Are there any overlaps in the vertical print paths? If so, correct these by increasing the step-over value.
- Are there gaps in the vertical print paths? If so, correct these by reducing the step-over value.
- Is the image itself of high DPI quality? Poor input usually leads to poor output!
- Have you tried to calculate the same image with different settings in the wallPen APP? More/less intensity? ICC profiles on/off?
- Is the ink heating set correctly? Are all heaters working? Is the ink supply ensured? Are the tubes bent or leaking? Is there too much or too little ink in the bags? Are all hose clamps open?
- Does the ink still have a shelf life? Has it been stored too cold or too warm for too long?

If all of the above suggestions are unsuccessful, please write a ticket at service.wallpen.com and include as much detailed information as possible about the problem and what you have done so far to solve it.

If you would like to send print data or motifs that are too large to be sent by ticket or e-mail, please use a free data transfer service such as https://wetransfer.com or https://www.filemail.com for the transfer.

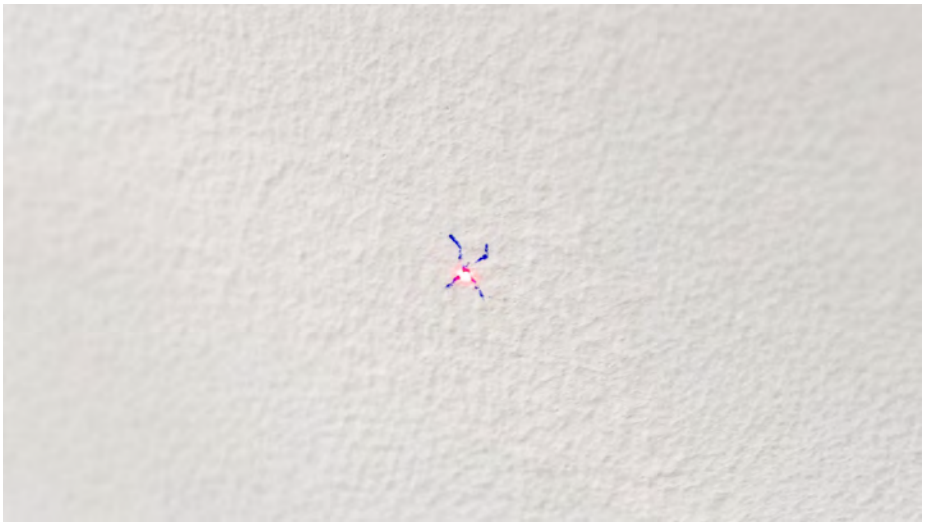
7.1.4 Working with Reference

The two red laser dots to the right of the printhead are not only used to automatically measure the distance to the wall (Distance Control), but also as reference points for the starting position of your prints.

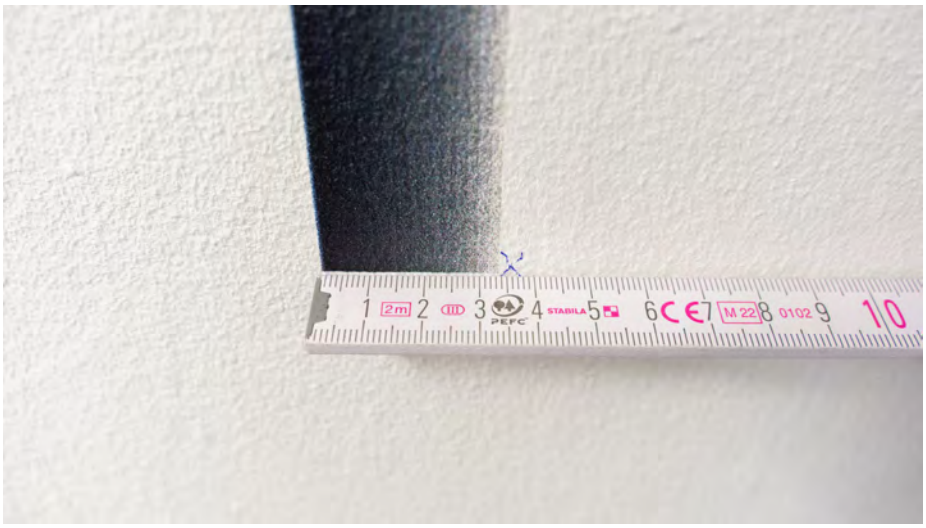
Determine the distance values

In order to use these points as a useful reference, the exact distance from the top laser dot to the bottom left corner of your print must first be determined for each print configuration (1/2/4/8/16-pass). To do this, please proceed as follows:

1. Use a smooth and clean vertical surface for printing, e.g. a white plastic plate or paper.
2. Clean the wheels and make sure that the floor is flat and clean and has no steps or obstacles.
3. Make sure that the printhead unit can move freely upwards about 20 centimeters while the distance to the substrate remains within a few millimeters **without** laser distance control.
4. Mark the exact position of the top laser dot on the wall with a pen before starting the printing process.



5. Make sure "Automatic Distance Control" is turned off.
6. Print any image with a "defined" (measurable) lower left corner and cancel the print after a few swaths. The image should not be higher than approximately 5 to 10 centimeters to prevent the print head from touching the wall while the distance control is deactivated.



7. Measure the horizontal and vertical distance from the bottom left corner of the image to the pen mark. This example shows an offset of 36 millimeters to the left and about 2 millimeters down.
8. Make a note of the values you have determined for your reference. You can also enter them in this table:

Date	Pass Modi (1/2/4/8/16)	Horizontal distance	Vertical distance

Positioning an image

The lower left corner of an image is relevant for the exact positioning of a picture on the wall. So if you want to position a picture exactly, determine the desired bottom left corner point of the picture from the width and height of the picture.

Proceed as follows after you have determined the corresponding offset values as described in the previous section.

1. Mark the bottom left-hand corner of the desired picture with a small pencil point on the wall. It is a good habit to use masking tape on the spot so that you do not have to mark the point directly on the wall
2. From the desired lower left starting point of the image, measure the previously measured offset to the right and up or down and mark this new point with a tiny pencil mark here
3. Now move the printer and place its upper laser dot exactly on the second mark
4. Remove the masking tape (if used)
5. Print your image

7.1.5 Wall-to-wall Printing

In order to print as completely as possible on the front of a wall - from the left to the right corner - wall-to-wall printing is recommended in many cases. Precise alignment of the printing system is crucial in order to achieve a clean and professional result

1. Make sure that the floor is level, especially in the area of the overlay. If it is uneven, the print will not be clean and the transition will be visible
2. Mount the printhead on the left (= rear) side of the wallPen
3. Align the wallPen precisely and parallel to the wall
4. Use a spirit level and adjust the alignment of the rail system until the vertical axis is as precisely vertical as possible across the entire print width. This precision is important, especially in the area where the image will later be divided
5. Select a good spot where to divide the image later. In particular, "busy", multicolored, and somewhat “chaotic” image areas are better suited, while single-color areas are less so. Due to tolerances, printing height and other factors, a transition between wall-to-wall prints will rarely be "absolutely perfect", which is why choosing the right area is all the more important. It requires a little practice, experience and also a "skilled hand"
6. Load and print the desired motif as usual
7. Once the desired position for separation within the print job is reached, pause the machine so that the printhead remains at the bottom
8. Cancel the print, select "Save progress" and still make a handwritten note of the current swath
9. Deactivate "Distance Control"
10. Stick two small pieces of masking tape to the wall each one covering one of the laser points
11. Carefully mark both laser points on the masking tape using a precise, fine pencil
12. Switch off the wallPen
13. Carefully and slowly push the wallPen to the left
14. Remove the printhead from the left side and mount it to the right side of the machine
15. Start up, reference and set the upper limit of the wallPen as usual
16. Move the Z-axis printhead to the previous wall distance
17. Make sure that the device is exactly parallel to the wall again and the vertical axis is vertical. Use a spirit level to double check
18. Use the software to position the wallPen as precisely as possible with both laser points on both pencil marks
19. Activate "Distance Control"

20. Select the same image in the motif selection
21. Remove the both masking tapes
22. Double check your notes and start printing at the swath where the job was previously interrupted

Note: If a motif other than the current one is selected after switching on the wallPen, the display of the current print path is reset to "1"

7.2 White Print (optional)

What is white printing?

White printing is a printing process in which white ink is used to

A. create an opaque white background for other colors (= underprinting / W-CMYK)

B. print another color (spot color or white) together with CMYK, e.g. to achieve special effects (= 5th color / CMYKW)

C. pre-print CMYK on transparent material (e.g. glass) and then overprint with white (= overpriniting / CMYK-W)*.

D. pre-print CMYK on transparent material (e.g. glass), back-print white and overprint CMYK (= sandwich printing / W-CMYK-W)*.

White printing is particularly useful on transparent or dark backgrounds, or where a white background makes the overlying colors brighter and stronger.

* wallPen Pro required

What is the difference between "white print" and "5th color"?

Standard color printing is done in four colors (CMYK). The wallPen offers the option of installing a fifth printhead and activating it via software. In most cases, the ink system of this fifth printhead is filled with white wallPen ink and the head is used for white printing as described here in this chapter.

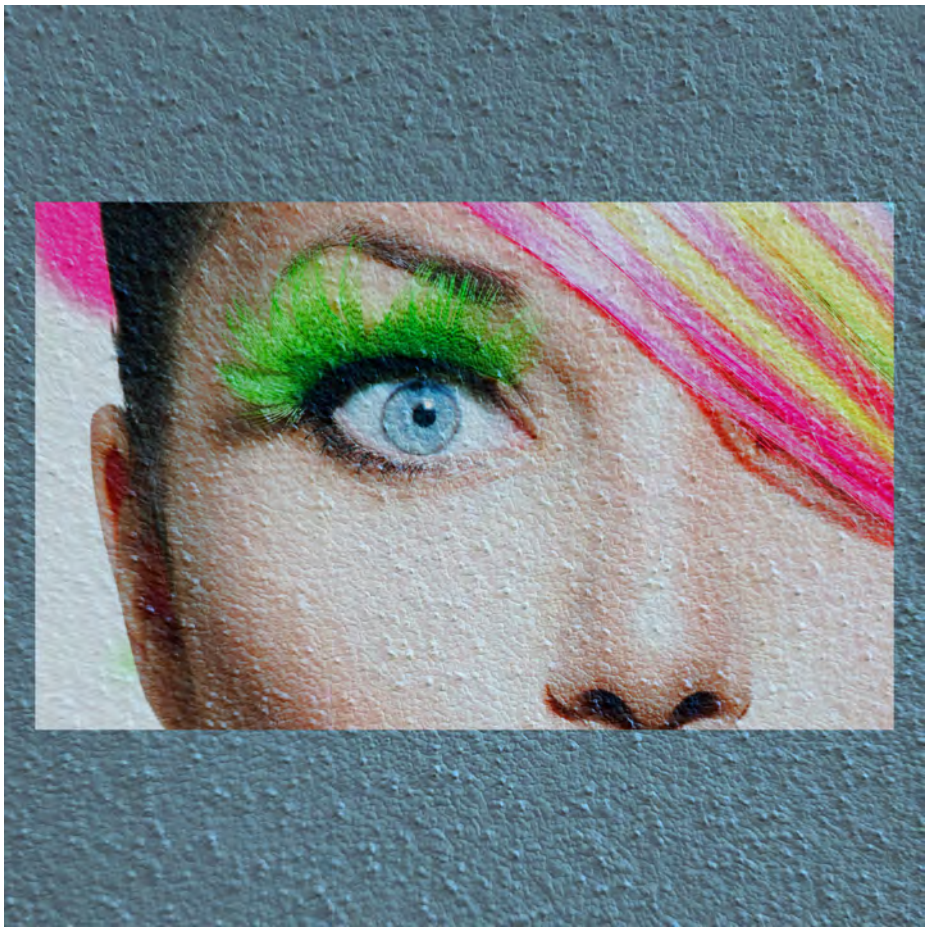
In rare special cases, a fifth color (e.g., gold, neon, black light ink, etc.) might used for the fifth printhead instead of white wallPen ink. Here we strongly recommend consulting with us and testing such ink extensively before using any other than the standard white wallPen ink. No warranty is expressly assumed. It is also essential to note that the entire ink system, i.e., the tubing, ink bag, and printhead, must be completely (!) replaced each time the ink type is changed. Do not mix UV inks without consulting our support team. The use of non-white wallPen ink is always at your own risk and excludes any warranty.

In this chapter, we will always refer to "white printing", as white is by far the most commonly used fifth color, even though a different color could also be used in the pure process described here.

Basic Principles

Here are some examples of common applications for white printing.

A rectangular print on a colored surface:



An isolated image (ideal for printing special shapes, logos, text, etc.):

Printing on black or dark backgrounds:

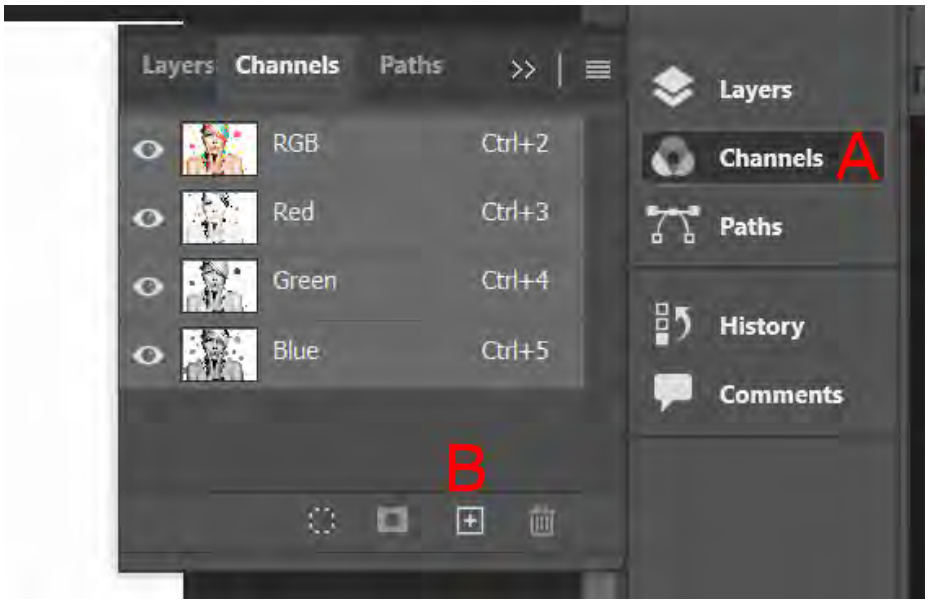
Preparing images for printing white

The desired motif is first prepared in Adobe Photoshop or similar software. As explained in detail in this manual, the color space is set to CMYK and the resolution for the desired motif size is set to 300 DPI. The basic preparation of a motif using the usual procedure is therefore identical up to this point.

There are various ways to carry out the printing and prepare the motif. This procedure depends, for example, on the expected result, the motif itself, its shape, and the color of the background. The basic prerequisite for white printing is the creation of a so-called "Alpha Channel", which describes the white areas to be printed. Whatever is in this Alpha Channel is printed in white; anything shown in black here is not printed. However, gradations are possible since areas shown in gray within the Alpha Channel mean less white ink is applied to the background.

Print CMYK on an all white layer of ink

Click on “Channels” (A) in Photoshop then click on the small “+” symbol (B) at the bottom to add the new Alpha Channel. This new channel will appear in black as it is the default setting:



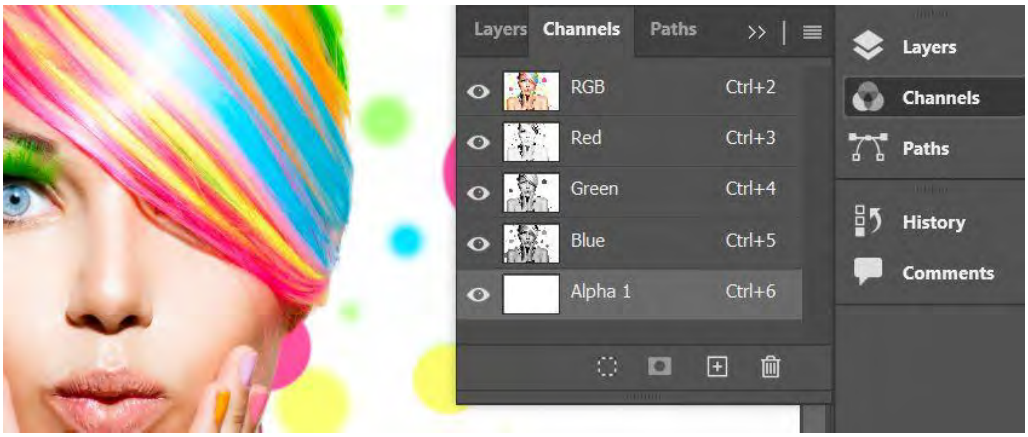
Since in this example the entire image is to be printed in white, select the Alpha Channel just created in the list and press Ctrl + I (invert). This will invert the channel and display it in white.

Whether you work with an inverted Alpha Layer or not is purely a matter of your personal taste.

- Inverted means that all areas that will later expected to be printed in white are displayed in full color and the areas that will later not be backprinted in white are displayed in a light shade of red.
- Not inverted means that all areas printed later in white are displayed in a light red tone and the area not printed later in white is displayed in color.

This manual uses the "inverted method".

Make sure your Alpha Channel is visible. To do so, click on the small areas to the left of the preview images under "Channels" until all “eye icons” appear:



With these simple steps, it is already possible to save, process and print full color images with a white background by using the wallPen app. But remember to export these images in TIFF or Photoshop* format so that they can be calculated with the wallPen app, as all other supported formats (.JPEG, .PNG) do not support alpha channels.

*wallPen Pro required

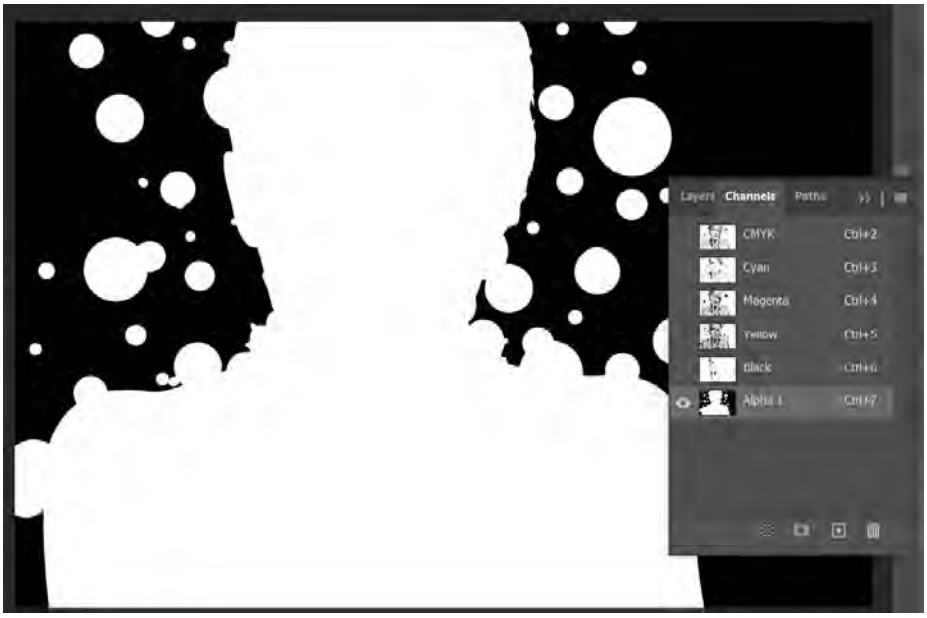
Edit the white channel

To crop the white background, a few more steps are required in Photoshop. There are many ways to achieve the same result, so the purpose of this description is to provide a general understanding of the function and purpose of the process. The basic idea is to edit the Alpha Channel so that the areas that are to be printed in white are retained and the areas that are to be omitted, i.e. not printed in white, are removed. As always, when working with the wallPen: A thorough knowledge of Photoshop is essential for high-quality results, which is why we here only provide a rough overview of the general principles in order to explain how the basic concept works.

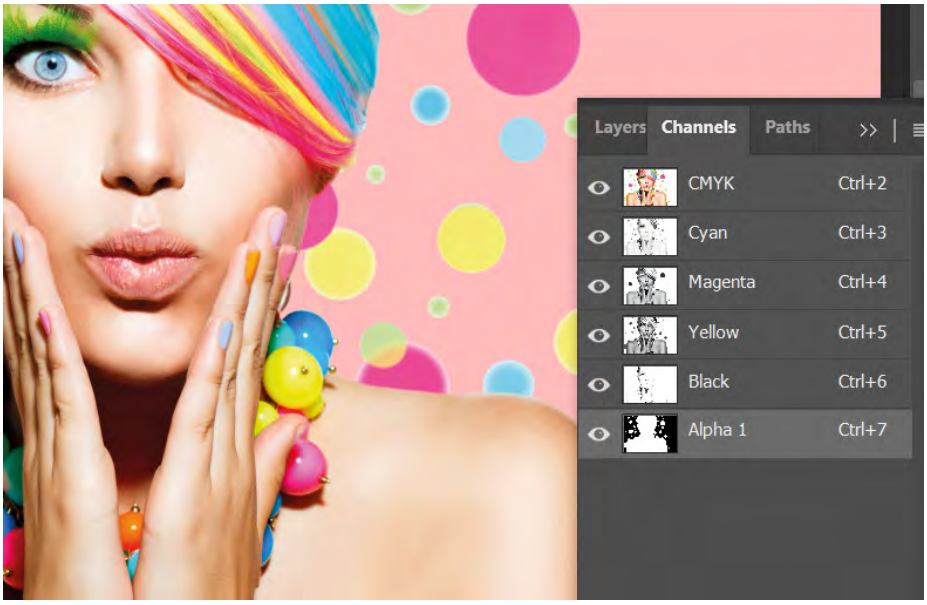
To get started for this example, hide the Alpha Channel and press "M" on the keyboard to enter "Marquee Mode". Now you may use all available Photoshop tools to define the areas that are supposed to be printed white afterwards (kept) or to be spared out (omitted).

In this example, the three background areas (B) were selected using the “Magic Wand tool” (A) while holding down the Shift key, the Alpha Layer (C) was marked, and the marked area was removed using the Remove button:

If you now click on the eye icon in the Channel menu to the left of CMYK to hide the color channels, the area with the white background is clearly visible:



Before saving as a TIFF or Photoshop file, don't forget to turn all channels back on:

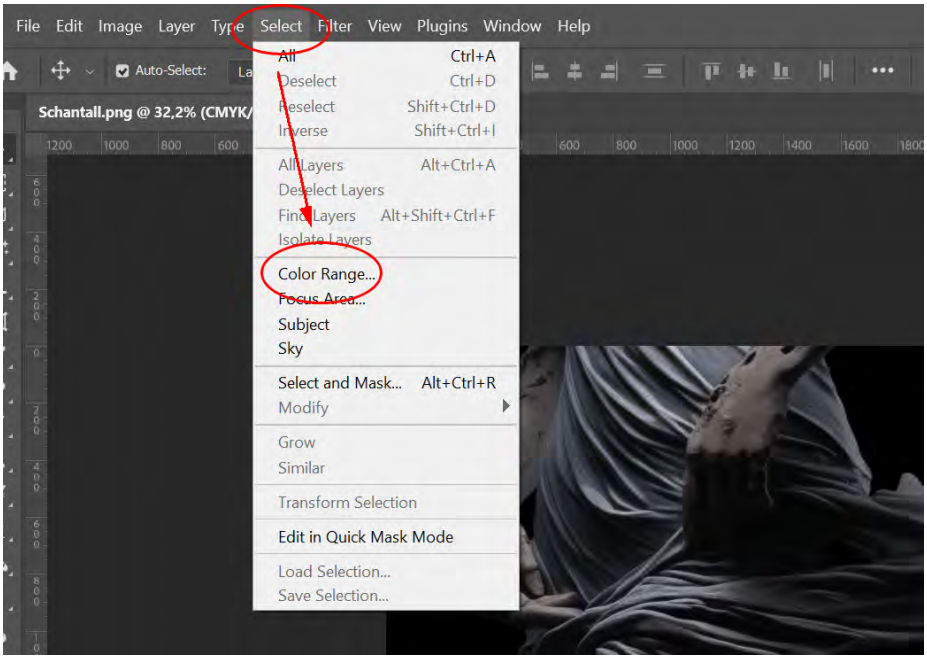


Blend images on black or dark substrates

This method is ideal for printing on very dark or even black surfaces, where dark areas of the motif are replaced by the dark colors of the substrate.

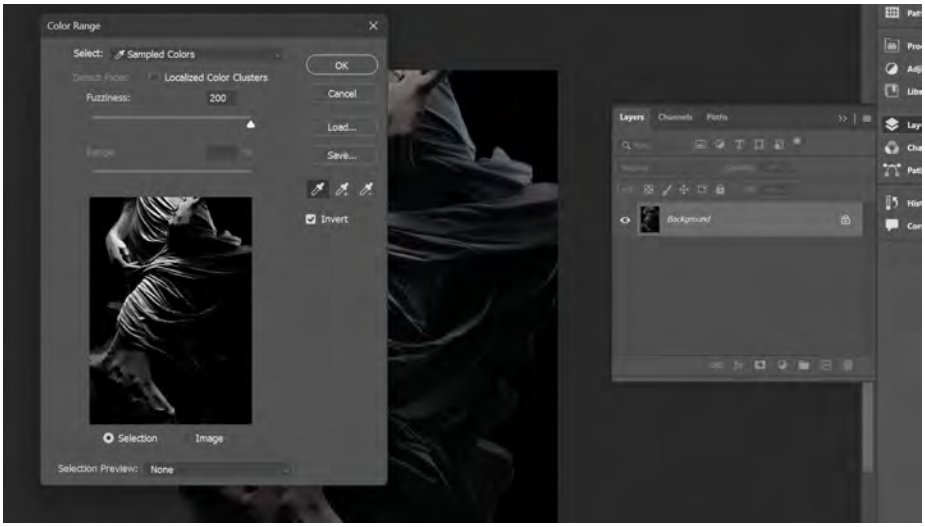
This process is particularly well suited for motifs that blend seamlessly into the wall thanks to their gradations. Similar to CMYK color printing, where the white surface color represents the white tone of the printed image, here the dark surface color replaces the dark colored areas of the motif.

Pick the "Select" menu and select "Color Range...":



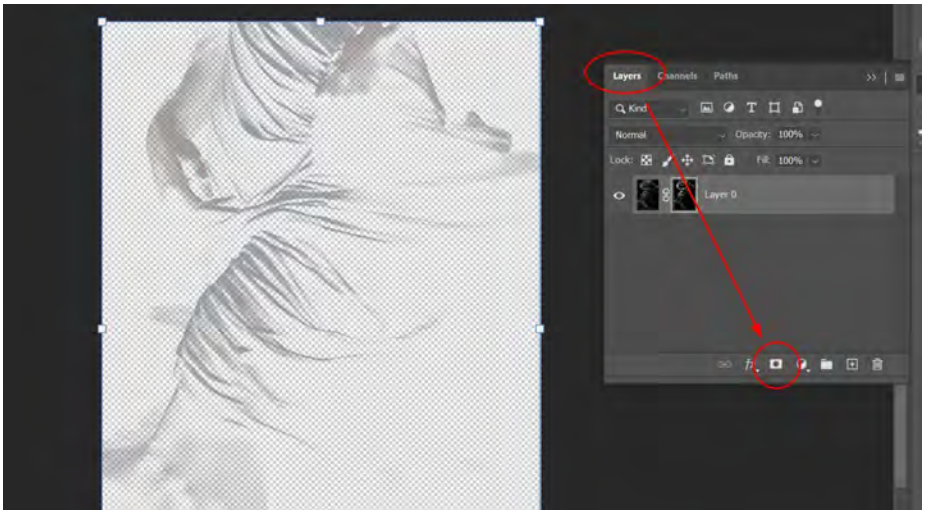
The purpose is now to create a selection that includes all very dark and black colors in the image so that they can then be removed.

To do this, first check the “Invert” box then use the “Pipette” tool to click on the darkest area of the image. The "Fuzziness"slider can be used to fine-tune the proportion of the selected color:

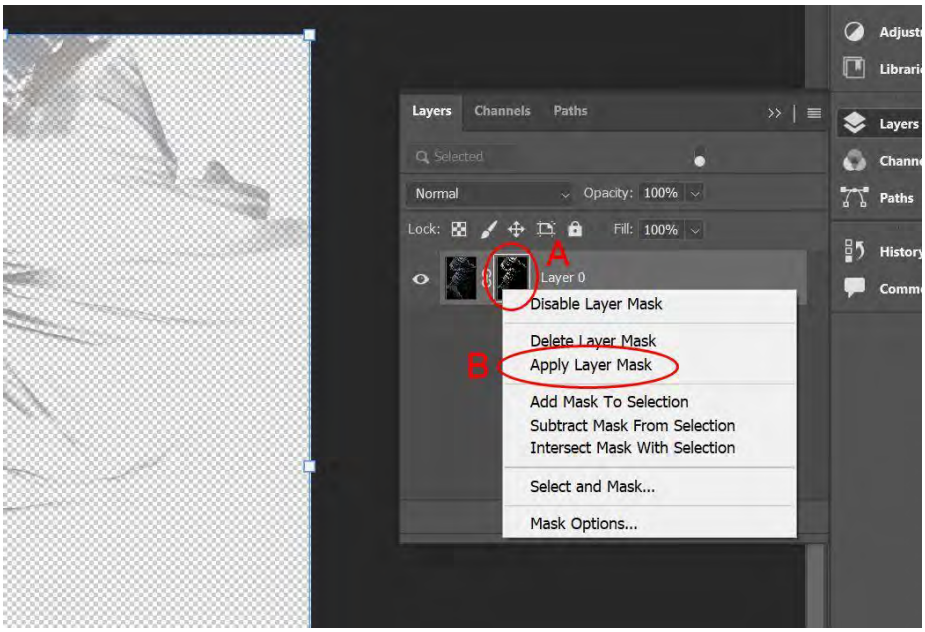


Click “OK” when you are finished.

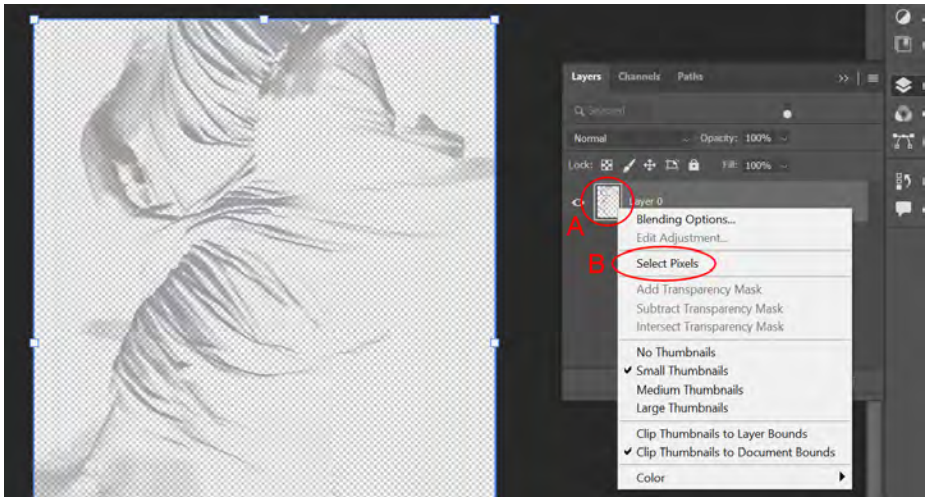
Click on the “Layer Mask” button in the layer menu to create a mask based on the previous selection.



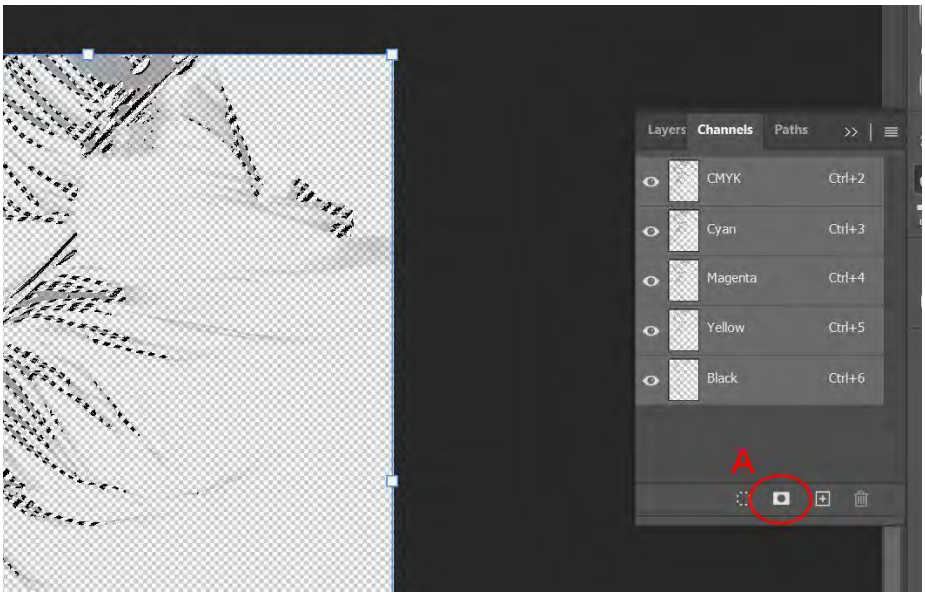
Right-click on the layer mask you just created (A) and select “Apply Layer Mask” (B) from the menu to merge the image and the layer mask into a single layer:



Right-click now on the merged layer (A) and select "Select Pixels" (B) to activate the selection.



Select the "Channels" tab and click on the "Save selection as Channel" icon (A) to create an alpha channel from the currently selected area:



As mentioned above, these are just examples of how to prepare images for white printing. Some methods are better suited to certain motifs than others. It is important to find your own workflow and acquire a sound knowledge of Photoshop.


YELLOW
BLACK
wallPen
MAGENTA
wallPen Arigi UV HD2 Ink
Use before: 11/22 | Charge No: 21/A1
Use with WallPen E1/E1plus | Made in EU
Hazardous! Avoid contact with Eyes or Skin.
Store dark and frost free.
wallPen GmbH
Germany
CYAN
Pen Arigi UV HD2 Ink
Use before:08/22 | Charge No:21/A1
Store dark and frost free.
Germany
5
10
15

Ink System

8 Ink System

8.1 Ink System and Air

The wallPen Ink System has been specially developed to ensure the most reliable ink supply in the tightest of spaces and at the same time to make refilling the ink as easy as possible. In any case, ink supply usually has one main enemy: AIR!

If there are air bubbles in the line system, one or more nozzles are very likely to fail. If a nozzle is blocked by air, it is very unlikely that it will unblock itself. It is therefore extremely important to be very careful when refilling ink and always ensure that the trapped air is removed as completely as possible, with the exception of the ink, which must always remain in the filling tube after refilling.

8.2 Print Head Unit Treatment

Handling the printhead unit after transportation

Hold the print head unit in this position for just 1 second and shake it gently.

Remember that a small amount of air will always (!) remain in the ink system; this air is even desirable in the rear supply lines. For this reason, the bags are positioned at a slight angle in the housing and ensure that the residual air collects at the top end - far away from the ink outlet to the printhead - and can only enter the lines when the ink supply is really running low. Pivoting, tilting or rotating the printhead carries the great risk that the air at the end of the bag will migrate to the outlet and lead to ink loss after some time. It is therefore important to avoid tilting the printhead housing and to always store and transport the printhead in a horizontal position.

To remove air bubbles that have entered the front ink inlet during transportation, hold the printhead at an angle of 40 to 50 degrees to the floor for a maximum of 1(!) second after transportation and before mounting the printhead and shake it carefully.

After placing it on the wallPen, carefully clean the printhead nozzles with a dust-free cloth to remove any ink that may have escaped through the nozzles during this quick process.

Treat the printhead unit before each new print job

If the wallPen is not used for a longer period of time, if the air pressure changes significantly or if the printhead unit is shaken during transportation, even small amounts of air can enter the ink system through the nozzles. In any case, carefully fold and hold a dust-free cloth in front of each printhead and gently press on the corresponding bag in the ink compartment to push out any air that may have been sucked in through the nozzles.

Then carefully clean the nozzle plate by gently wiping the cloth from one direction to the other. Avoid dabbing movements and never rub the cloth back and forth.

8.3 Refill Ink

The printheads and the ink system are the most sensitive components of the wallPen. A general problem with any inkjet system is the handling of air, especially how to keep it away from the printhead nozzles. As soon as air gets into the piezo elements of the printheads, the nozzles block and can no longer fire ink. It is therefore very important to keep air away from the printheads.

The wallPen E2 uses aluminum bags as tanks, which can be refilled cleanly and quickly from bottles on the back of the printhead housing.

Proceed as follows:

1. In a clean environment, lay out all the necessary components:
    a. A bottle with sufficient wallPen UV ink with a short tube and connector.
    b. Some damp cleaning cloths.
2. Remove the black cap on the back of the printhead of the desired color.
3. Open the cap of the bottle with the corresponding ink.
4. Hold the bottom of the bottle with the connector facing upwards
5. Squeeze it lightly (without ink leaking out) and bend, twist and connect the adapter tube on the bottle to the corresponding refill connection.
6. Lift the base of the bottle upwards and do not squeeze the bottle any more. The resulting vacuum will now suck the air - and possibly some ink - out of the bag and into the bottle.)
7. As soon as this air has been removed, slowly squeeze the bottle and now press as much ink into the bag as desired.
8. Keep the bottle plugged in while you gently wiggle the bag with your other hand and slowly stop squeezing the bottle.
9. Continue this process until you can no longer hear any air entering the bottle.
10. Leave the bag untouched, lower the bottom of the bottle again and turn the bottle together with the hose connection from the rear connection of the printhead.
11. You will now hear air entering the bottle to remove the vacuum inside. Be prepared for a few drops of ink to escape from the two openings.
12. If you want to add more ink than you have managed in this one pass, repeat the above steps from No. 4 until the bag is filled to your satisfaction.
13. Close the ink outlet opening on the printhead housing and the bottle opening with the two caps.

NOTE 1

If too much ink has been filled, use the same "vacuum technique" as described above to remove excess ink from a bag by connecting a squeezed bottle to suck excess ink from a bag back into the bottle.

NOTE 2

Always make sure that you have enough ink in the bag, refill it in good time and do not overfill it.

NOTE 3

When refilling, make absolutely sure not to mix up colors! A wrong color in the wrong bag means that the bag and the entire tube from the rear connection to the printhead must be replaced and the wrong ink must be completely removed from the printhead by intensive rinsing.

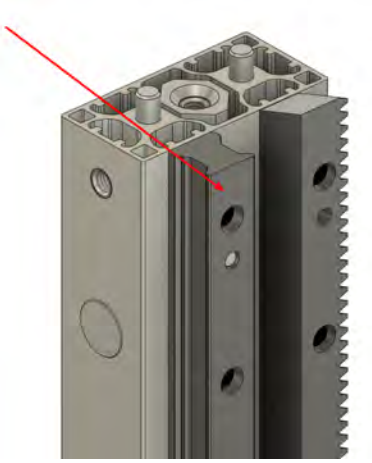
Service

9 Service

9.1 Maintenance

9.1.1 Vertical Axis Maintenance

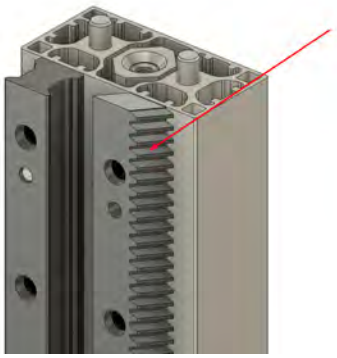
The entire length of the linear profile of the vertical axis should be briefly wiped with a cloth moistened with commercially available machine oil after each use of the printer so that a thin film of oil remains on the metal. This effectively prevents dirt or rust from accumulating on the rail or carriage over time. Alternatively, a high-quality silicone spray can also be used for maintenance.



9.1.2 Gear Rack Maintenance

The gear rack should never be greased, as the grease presses into the rear flanks of the teeth and can have a very negative effect on the clean running of the gearwheel.

Instead, clean the gear rack from time to time - especially in the area of the rear flanks - with a thin wooden stick or cloth and apply a thin layer of oil to the gear rack using a cloth soaked in standard machine oil to prevent rust. Alternatively, a high-quality silicone spray can also be used for maintenance.

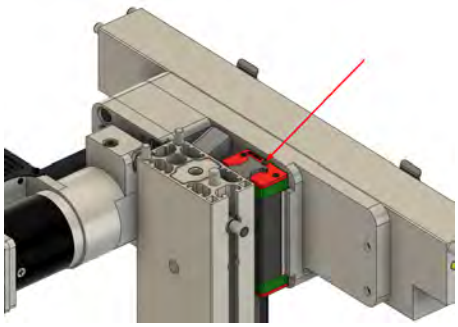


9.1.3 Linear Slide Maintenance

The linear slide is a high-precision system in which 4 chains made of ground steel balls run to guide the slide on the profile. The system must be lubricated after approx. 2000 km or after 12 months - whichever comes first - to prevent abrasion and friction and to ensure smooth running. Only use the grease supplied by wallPen and the grease gun provided.

It is best to lubricate the system when the printer is dismantled. This is the best way to reach the screw for the grease nipple and to position the grease gun securely.

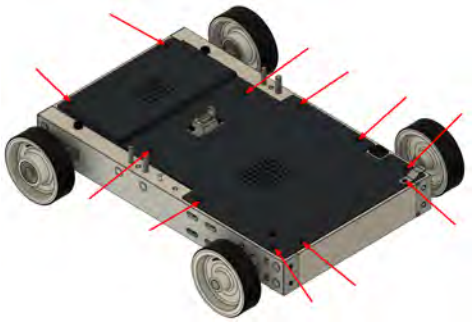
If you look at the linear carriage from above, you will find either a small threaded hole with a small black grub screw (requires a 1.5 mm Allen key) or a visible black Allen screw (requires a 2 mm Allen key).



1. Remove the screw completely and set it aside carefully.
2. Screw in the small silver grease nipple that you received with the machine by hand with a few turns.
3. Place the grease gun that you received when the machine was delivered on the nipple and slowly press grease into the carriage with one or two strokes.
4. Clean the area with a cloth if any grease has escaped.
5. Unscrew the grease nipple again and keep it clean and safe for the next use.
6. Screw the previously removed screw back in using an Allen key.
7. Repeat this process after a mileage of around 2000 km or if you have the impression that the carriage is running dry and rough. Better too often than too seldom!

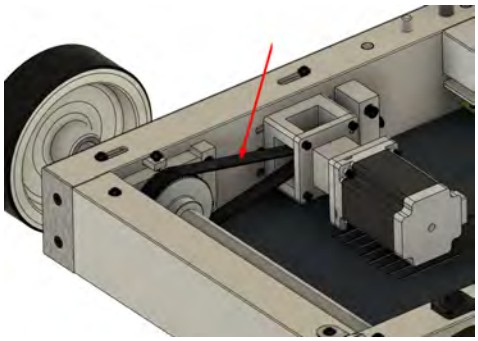
9.1.4 Tooth Belt Maintenance

Every approx. 50 to 60 operating hours, remove the upper rear aluminum cover plate of the platform (11 Allen screws) and check the toothed belt for correct tension.



Ideally, the toothed belt should have a tension frequency between 205 and 215 Hz. We set the tension at the factory using a special frequency measuring device.

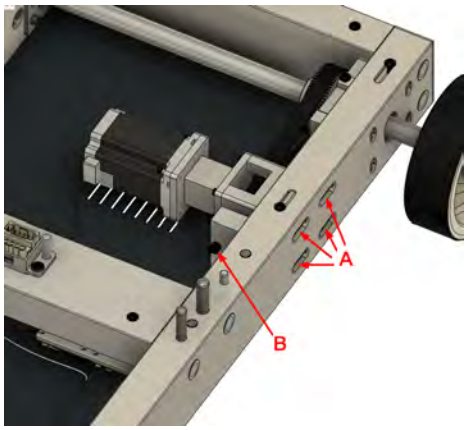
However, it is also possible to set the belt tension quite accurately using an Android or Apple smartphone. Numerous apps that measure and display vibrations in Hz can be found in the app stores under the search term "measure frequency".



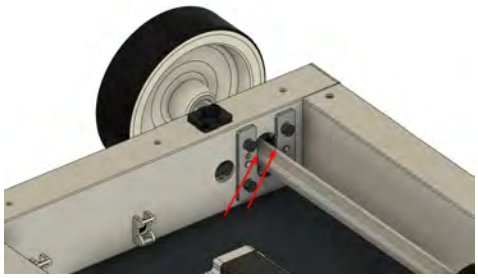
- Make sure that the environment is as quiet as possible.
- Gently grip the toothed belt from the side with one finger, similar to plucking a guitar string. The optimum position is shown by the arrow in the illustration. You should clearly hear the tension sound of the belt, similar to the sound of a string on a stringed instrument.
- Hold your smartphone close to the belt and read the frequency peak in Hz while you pluck a few times.
- If the frequency determined is too low, tighten the strap as described below and repeat the measurement.
- If the determined frequency is too high, relax the strap as described below and repeat the measurement.

The optimum tension is reached when the frequency is around 208 Hz. If the belt is clearly too tight (> 230 Hz), the motor bearing may be damaged over time. If the belt tension is too low (< 190 Hz), the entire platform may have play, which can have a very negative effect on the printing results.

- To tighten or loosen the belt, slightly loosen the four screws on the side of the platform profile (A) that hold the motor mount.
- Turn the screw (B) clockwise to tighten the belt (= increase the frequency). Turn the screw (B) anticlockwise to loosen the belt (= reduce the frequency).
- Adjust the tension by turning the screw (B) until the desired frequency is reached.
- Tighten the screws (A).
- Now repeat the frequency measurement as described in the previous step and adjust it again - if necessary - until the correct belt tension is achieved.



Every 50 to 60 operating hours - if the rear cover is removed anyway to check the belt tension - you should also check whether the rear axle bearing around the U-profile is still sufficiently lubricated. If the guide is running dry, apply some commercially available machine grease around the axle guide.

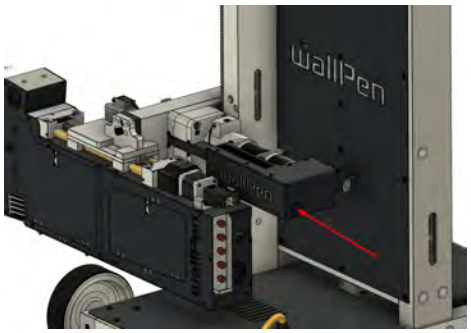


Refit the top cover.

9.1.5 Vertical Axis Brake Release

The wallPen E2 is equipped with a high-quality motor brake on the vertical drive. When the power is off, the brake is closed, i.e. it blocks the motor. This prevents the entire slide unit, including the printhead, from falling down by gravity in the event of a power failure and possibly causing permanent damage or even injury.

In some cases, it may be desirable to move the slide unit manually. This may be necessary, for example, to adjust the clearance of the gearbox to the rack or to move the slide to the park position without having to switch the entire printer back on if this was forgotten when it was switched on.



For this purpose, there is a black push button on the front of the slide housing.

If the device is not switched on

- Disconnect the printhead cable from the printhead unit (if connected)
- Turn on the power switch
- Hold the slide housing firmly with one hand. Be prepared that entire slide unit and its attached printhead unit will immediately pull downwards with a weight of approx. 20 kg without any braking force once the next step is executed
- Push and hold the button with your other hand
- Slowly move the slide unit up or down to the desired target position.
- Release the button. This immediately closes the brake and holds the entire unit in place again
- Turn off the power switch

When the device is switched on

- Hold the slide housing firmly with one hand. Be prepared that entire slide unit and its attached printhead unit will immediately pull downwards with a weight of approx. 20 kg without any

braking force once the next step is executed

- Push and hold the button with your other hand
- Slowly move the slide unit up or down to the desired target position.
- Release the button. This immediately closes the brake and holds the entire unit in place again

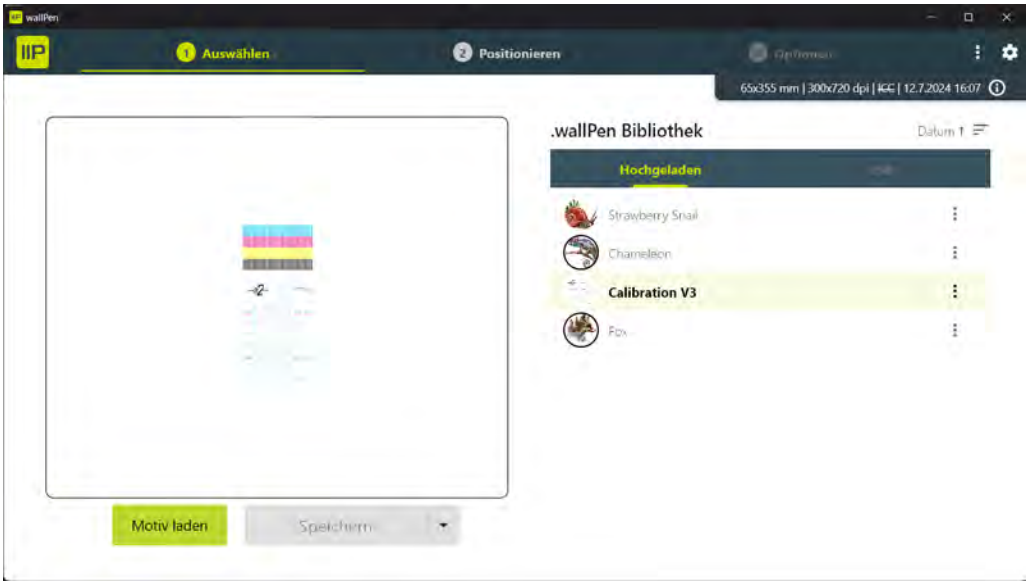
9.2 Calibration

The wallPen E2 uses four (optionally five) individual printheads to print the CMYK (W) colors. As these printheads are mounted separately, they must be calibrated to each other to achieve optimum printing results. Calibration according to these instructions should only be carried out each time a printhead has been dismounted / mounted.

The Ricoh GH2220 printheads used have two offset rows of nozzles, each with a pixel density of 150 DPI. Due to the offset arrangement of the nozzles by half a nozzle distance, 300 DPI is achieved in the print image.

A calibration image is used for easy assessment and alignment of the printheads to each other. To calibrate and evaluate the printheads, a wallPen calibration image is printed showing vertical and horizontal adjustments in all colors. The calibration image is stored on each wallPen from the factory

The file "E2-Calibration_v3.wallpen" can be printed directly on the device.



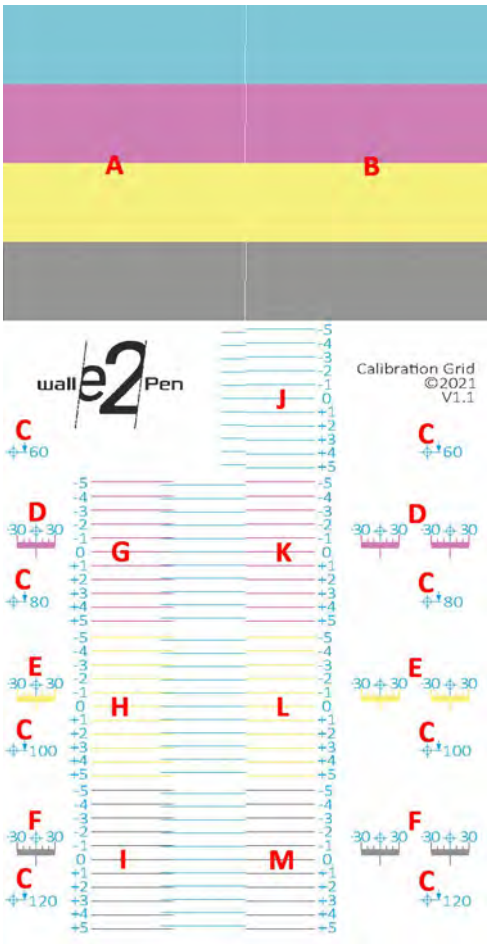
Prepare to print the file on a smooth, white surface, preferably on a blank sheet of paper that is stuck flat on the wall.

If all settings are correct, a print path is printed upwards, the printer moves approx. 3 cm to the right, prints another print path downwards and finishes printing.

(Depending on the values entered, a third print path may be printed)

After printing, check the result in detail with the magnifying glass provided. The aim is to move the colors up and down, right and left relative to each other so that all colors are aligned vertically and horizontally.

The reference for the calibration is the **cyan printed at the top!**



A - Nozzle row 1 - Displays the status of all nozzles in the first nozzle row

B - Nozzle row 2 - Shows the status of all nozzles in the second nozzle row

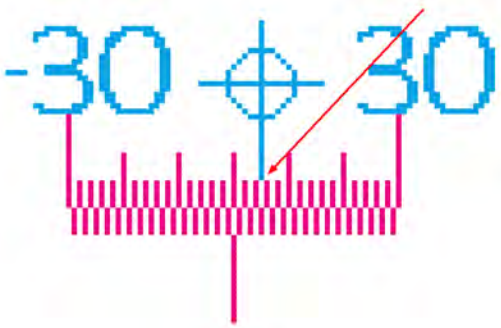
A/B - If failures occur at A and/or B, the printheads should first be vented. If there are still dropouts, it is advisable to completely flush and clean the printheads with the flushing fluid supplied. If the result is still not significantly better, the corresponding printhead must be replaced.

C - 60 / 80 / 100 / 120 millimeters measuring distance from the upper edge of the cyan nozzle rows (A/B) to the respective crosshairs.

D / E / F - Lateral offset in the range of +/- 30 pixels at 300 DPI for magenta (D), yellow (E) and key (F).

The lateral offsets are corrected in the wallPen APP as they are read from the calibration image. Cyan is always set to zero (0) as a reference and only the values in the scale for magenta, yellow and key must be entered there accordingly.

In this example, the correct calibration value for magenta would be +5 :



The determined value for the respective color is entered in the Wallpen APP:

Now also enter the correspondingly read values for yellow and key here and leave cyan at "0"

G / H / I / J / K / L / M - Vertical offset

By defining the vertical offsets, the colors are aligned vertically to each other. It is important to note that the lines printed upwards in cyan, which appear in the middle of the calibration image almost from top to bottom, are the reference for the alignment of the other colors.

For each color, find the horizontal line that most closely matches cyan. Now read off the separated value and offset it against the reference value for cyan (in this case 0)

If, for example, magenta is aligned upwards (G) with cyan at minus 3, enter "-3" in the settings for magenta upwards.

If, for example, yellow is aligned downwards (G) with cyan at plus 4, enter "4" in the settings for yellow printing downwards.

G - Vertical offset from magenta to cyan in the range of +/- 5 pixels at 300 DPI

H - Vertical offset from yellow to cyan in the range of +/- 5 pixels at 300 DPI

I - Vertical offset from black (key) to cyan in the range of +/- 5 pixels at 300 DPI

J - Vertical offset from cyan, which is printed upwards, to cyan, which is printed downwards in the range of +/- 5 pixels at 300 DPI

K - Vertical offset from cyan printed upwards to magenta printed downwards in the range of +/- 5 pixels at 300 DPI

L - Vertical offset from cyan printed upwards to yellow printed downwards in the range of +/- 5 pixels at 300 DPI

M - Vertical offset from cyan, which is printed upwards, to black (key), which is printed downwards in the range of +/- 5 pixels at 300 DPI

9.3 Print Head Replacement

- Place the printhead unit on a clean, dry and level surface.
- Remove the front left hose plate flap and close all plastic hose clamps with 4 clicks each.
- Remove the electronics panel flap at the front right.
- Locate the small 4-pin plastic connector housing to the left of the corresponding angled circuit board of the printhead to be replaced and carefully pull it out of the socket. Do not pull on the cable, only on the connector housing!
- Use the short side of the 1.5 mm Allen key and carefully lever off the left side of the corresponding angled printhead PCB (see illustration).
- After the angled PCB has been pulled out of the connector strip on the left-hand side (A), it can also be removed from its fixation (B) on the right-hand side to the left (C).
- Using two fingers, carefully lift one of the two small plastic frames holding the FCC cables of the printhead by approx. 2 mm one after the other.
- As soon as both frames are unlocked, the FCC cables can be easily pulled out of the connections.
- Put the angled circuit board aside until the new printhead can be fitted.
- Completely remove the two M3 screws on the left and right front of the corresponding printhead.
- Screw the two M4 screws supplied a few turns into the threaded holes that are now visible.
- Lift the printhead housing at the front by approx. 5 cm by placing an object underneath it. This will prevent ink from leaking out of the ink bag when the tube is loosened.
- Hold or place a damp cloth under the hose connection of the ink bag to be replaced.
- Turn the hose connection anticlockwise and catch any leaking drops with the cloth underneath.
- Close both connections with the corresponding sealing plugs.
- Pull alternately on the two previously screwed-in M4 screws at the front to release the printhead and pull it out to the front. Ensure that the heating cable with the 4-pin housing is not trapped in the electronics compartment.
- Clean the area from which the printhead was removed with a damp cloth and realign the two white plastic spacers between the printhead and the screw connection to mount the new head.
- Remove the transport protection from the new printhead and screw it onto the old printhead.
- Press the white sealing tape lightly into its slot on the new printhead and carefully push it into the free slot. Make sure that the nozzle plate is not touched or damaged

and that the two FCC cables and the cable for the heater on the electronics side are threaded in without kinking or jamming.

- Carefully tighten the two previously removed M3 screws on the left and right of the printhead front to bring the printhead frame into its final position and secure it.
- Lay the FCC cables inside the electronics compartment without kinking them and prepare their position for mounting. The upper FCC cable coming from the printhead is connected to X1, the lower FCC cable to X2. The two blue markings must face each other so that the exposed contacts point away from each other.
- Plug the two FCC cables into the corresponding sockets on the angled PCB and lock them by pressing down the frame.
- Push the angled PCB back into the sheet metal holder on the right and then press it very precisely into the contact strip on the left. Make sure that it is really pressed correctly into the socket strip and is not mounted with a row of pins offset.
- Plug the 4-pin cable for the heater into the corresponding socket on the left-hand side of the angled circuit board.
- Close the flap of the electronics compartment
- Now look into the hose compartment, make sure that the hose clamp is open and remove the plug from the hose of the new printhead.
- Again, place a damp cloth directly under the connection of the ink bag to be connected.
- Remove the protective cap from the ink bag and connect the plug to the ink hose connection as quickly as possible. To do this, turn the hose counterclockwise to apply tension and then allow it to slide into the bag connection. If the connection is under tension and the bag twists in the ink compartment, loosen the connection again and try again as described above. With a little practice, a good, relaxed and secure connection is possible.
- Remove the object used to lift the printhead, lift the entire printhead and tilt it by approx. 45 degrees for a few seconds so that the printheads are facing the floor and shake it gently. This will remove any air bubbles that may have reached the outlets of the other colors due to the previous lifting by 5 cm.
- Put on protective gloves, hold a dust-free cloth under the printhead nozzles of the new printhead with one hand and press evenly on the corresponding ink bag with the spread fingers of the other hand.
- Observe how air bubbles and ink emerge from the nozzles and press until you can be sure that there is no more air in the tube and printhead. Whenever a wipe is relatively saturated, discard it and use a new wipe to pick up more ink. Always make sure that the new hose connection of the ink bag is tight and that no ink is leaking out.
- Clean the area around the printhead and close all flaps. Please note that there may still be air in the hose system after each printhead change, which can lead to ink failure. It is safest to print a few square meters for test purposes to avoid a possible ink failure during a print job.

9.4 Wi-Fi Connection

The wallPen APP software for controlling the machine is operated via a native APP. In general, the wallPen runs on a Unix 32-bit operating system, based on an ARM processor with 4GB RAM and an external 128GB USB3 flash drive.

When booting, the wallPen E2 acts as a Wifi router and provides a Wifi access point (AP) through which the device can be operated via the wallPen APP from the Wifi device. Standard operation is via an Android tablet, which is connected to the wallPen operating system via WiFi. For this purpose, a USB WiFi plug is used on the wallPen, which is plugged into the internal system board. This acts as a WiFi router and provides a WiFi network with the name "wallPen E2 XXX", where "XXX" is a printer-specific hexadecimal character string.

To connect the wallPen WiFi network, a WiFi connection is established with the printer and the wallPen APP is started.

Attention: The wallPen app is in simulation mode when it is started for the first time. This must be deactivated in the settings before the first connection to the wallPen.

The password for the connection to the wallPen can be found on the enclosed data sheet. If you lose it, you can request it from the wallPen service team.

Color Management

10 Color Management

10.1 Why Color Management?

The whole subject of "color management" is highly complex, involves various professional groups and fills countless specialist books. In this chapter, we will try to give you at least an overview and a basic understanding, at least in case you have not yet dealt with this topic in depth.

Basically, every inkjet printer is a device that fires tiny drops of ink onto a substrate at high speed. How these tiny ink droplets behave and what colors and intensities are ultimately produced depends on many factors that we as manufacturers cannot foresee and many conditions we cannot take into account in advance:

- Is the background white, colored, gray, yellowed or some other color?
- How "white" (white is not white!!!) or how "colorful" is the material?
- Is the surface absorbent, smooth, glossy, matt, dull, rough or porous?
- Is the substrate freshly painted, free of fingerprints, nicotine and other stains?
- How strongly does the substrate absorb the ink?
- How does the ink behave on the substrate? How well does it cure?
- What is the surface tension? In other words, do the ink droplets contract into small, isolated dots or do they spread out and mix intensively into one another?

All these and many other factors have a considerable influence on the appearance and effect of the colors on a substrate. In addition, there are many print-specific challenges such as dot gain, color strength, area coverage, black level, white point, color density and gray balance to consider.

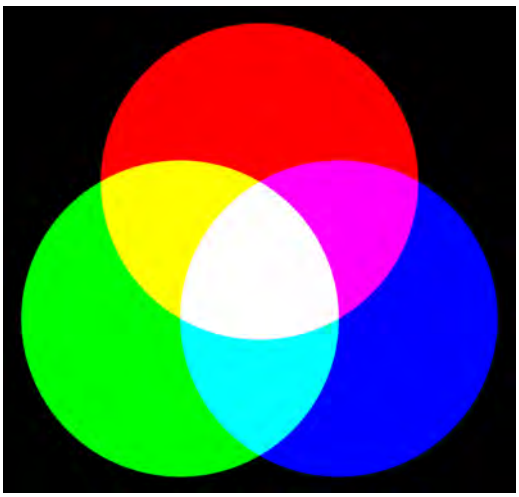
These factors are not insurmountable problems, but they show the many requirements and challenges that a wall print entails. You should not underestimate these and should at least have a basic understanding of the relationships and hurdles involved. Over time, you will learn to draw the right conclusions and achieve the best possible printing results on a wide variety of surfaces.

10.2 Color Models

Like most offset, laser and inkjet printers, the wallPen needs CMYK colors to work. But why? Let's take a closer look at the differences between the two most common color models "RGB" and "CMYK" to better understand the reason why most printers use CMYK and most monitors use RGB...

The RGB color model

RGB is a so-called "additive color model", which means that - starting from black - the sum of the three colors is white. In general, a dark or black background is assumed and the addition of these three colors results in white.

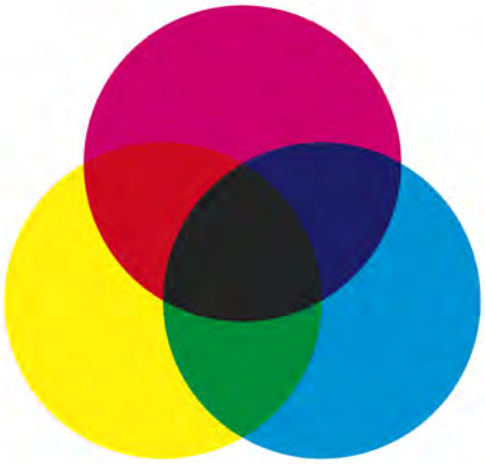


If you look at the three "drops" of red, green and blue on a black background in the picture above, you will see that the blending of red and green results in yellow, green and blue result in cyan and red and blue result in magenta. Finally, the sum of all three colors in the middle results in white. Since monitors (such as cell phones) usually have a black background, the RGB color model is ideal for displaying color images on dark displays.

But what about printers? Printers are usually expected to print on a white (or at least light) background, so an additive color model like RGB would not work and no meaningful results are possible.

The CMYK color model

Compared to RGB, the CMYK color model is a "subtractive color model". This means that the addition of its basic colors cyan, magenta and yellow on a white background results (at least theoretically) in black....

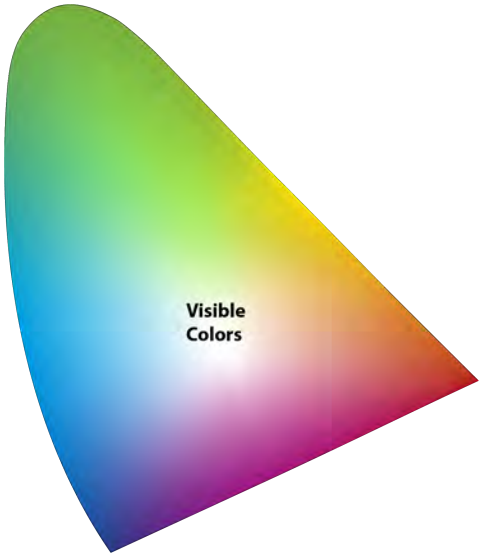


The illustration above shows that the mixture of yellow and magenta on a white background produces red, magenta and cyan produce blue and cyan, yellow becomes green. The combination of all three colors in the middle is (almost) black.

However, as the mixture of yellow, cyan and magenta does not produce a "deep black", but rather a deep dark brown, black is used as the fourth color. For this reason, the letter "K" in CMYK does not stand for "blacK", but for "key", as "black" is regarded as a "supporting color".

10.3 Color Spaces

Visible colors

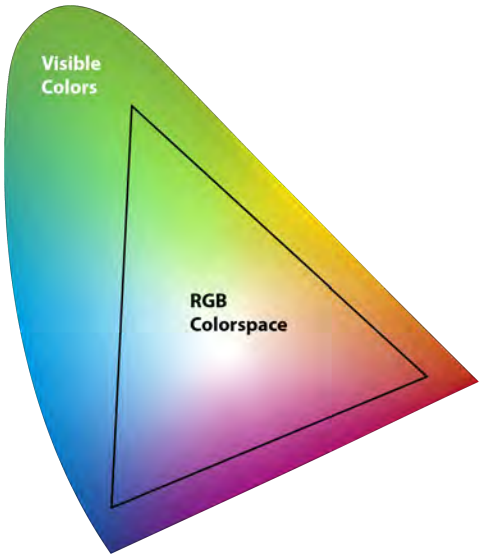


Humans can perceive electromagnetic radiation in a wavelength range from about 380 nm to about 780 nm ("visible light"). This wavelength spectrum includes the colors from blue-violet to green and yellow to dark red...

It is neither trivial nor technically possible to reproduce an image according to these natural colors. The wide range of colors is simply not technically feasible. Different technologies can only reproduce a certain range of the entire color space. Such a range is called a "color space". It is helpful to understand the basic relationships in order to better understand the limits of the different color spaces and the reasons for their limits.

The RGB color space

A color space contains all colors that can be displayed with a specific technology. RGB stands for the three primary colors red, green and blue, which make up the RGB color space. With the corresponding mixing ratios, they produce a total of around 16.8 million shades of color. Red, green and blue are the physical primary colors, which is why every representation in the digital domain is based on them - in other words, every image that is displayed on a screen. This includes, for example, photos taken with a digital camera.



RGB are colors of light; color perception is created by mixing light. This is why this is referred to as an "additive color model". The more color is used, the brighter the image becomes. If all three primary colors are used at 100%, the result is white.

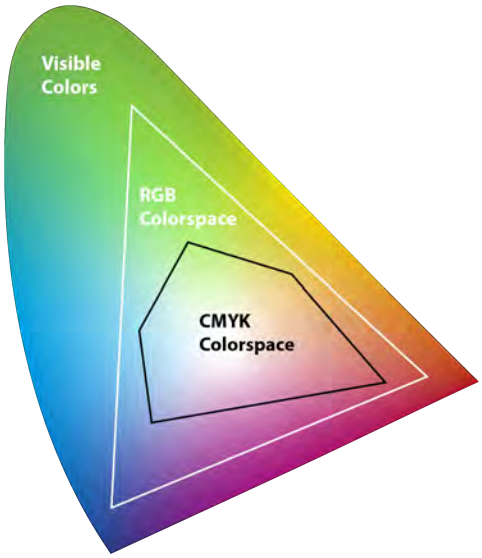
So if we look at the RGB color space, all colors inside the black triangle can be displayed, all colors outside cannot. It is therefore clear to see that the possibilities for displaying colors are limited.

Not all colors can be displayed on a computer monitor as they occur in nature, and every photo inevitably becomes a kind of compromise. If a hue (e.g. a particular shade of green) lies outside the triangle, it is "shifted" so that it is at least represented by a similar shade of green that comes as close as possible to the desired green. In practice, however, many color tones that are displayed only come very close to the target and the image becomes a compromise!

The CMYK color space

Printers, on the other hand, usually work in the CMYK color space, which further restricts the representation of colors...

In contrast to RGB, CMYK is a "subtractive color model". It consists of the three colors cyan, magenta and yellow as well as the key color black, which are printed on a light (= white) background. The more color is applied, the darker the result. The key color is necessary because a 100% application of cyan, magenta and yellow does not produce a true black, but only a dark brown. The CMYK color mode is used in offset printing, for home printers and also in the printing industry. The individual colors are applied to the substrate one after the other, creating all possible color nuances depending on the mixing ratio. Theoretically, over 4 billion colors are possible in the CMYK color space. However, only a much smaller number can be displayed and printed on the screen. In fact, the CMYK color space is smaller than the RGB color space.



This is one of the challenges when creating print data. Photos, images and other elements are usually provided in the RGB color space and must be converted to CMYK before printing. As many color tones cannot be "translated" one-to-one from RGB to CMYK, this results in certain color deviations. To avoid unpleasant surprises, you should always use a well-calibrated monitor and set the "Proof colors" option in PhotoShop under the "View" menu item to "Work in CMYK" (see also the "Color management | Color correction" chapter).

10.4 ICC Profiles

An ICC (International Color Consortium) profile is a standardized data set that describes the color space of a color input or color reproduction device, e.g. a monitor, printer, scanner, etc.

Colors that a printer or monitor may not be able to display are then "shifted" internally so that they are displayed as close as possible to the desired color. These color transfer requirements are stored in the color profile in the form of a table. The aim is to achieve the most consistent color reproduction possible. ICC profiles should therefore ensure that images are reproduced on an output device (printer) as faithfully as possible in terms of color.

The printer must "know" how which color appears on which background in order to print colors that are as true to the original as possible. To achieve this, ICC profiles must be created to correct the colors on different substrates and under different conditions. The approach to creating ICC profiles for printers is to print a specific color palette on a specific background and then read it with a colorimeter. Based on this measurement, the software can then determine to what extent which color tone deviates from the desired color tone.

10.5 Color Correction

An image in the larger RGB color space will always look brighter and more intense on a backlit monitor than a printed product. But how can you guarantee a certain color accuracy despite these differences?

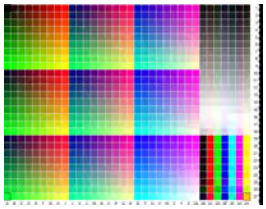
Especially when fully checking the individual RGB colors in the original document (e.g. 100% red), you will find that the CMYK color space cannot cover many color ranges. This can be counteracted on certain glossy or coated substrates, but inkjet printing reaches its limits here.

xrite i1

As every monitor - just like every printer - always displays colors slightly differently, the monitor should be well calibrated so that the colors displayed correspond to the colors actually required.

A color measurement system is required for calibration, such as this i1 system from xrite.

To calibrate a monitor, a color measurement system software is required that displays a specific color on the monitor, a separate color measurement device that measures the color tone of the screen, compares it with the expected color, compensates for any differences and saves them in a compensation table. This process is then automated one after the other with many different colors and takes some time. The result is a relatively extensive table with many colors and the corresponding correction values so that the colors are later displayed as accurately as possible on the monitor. If colors are missing from the list, the correction for these "intermediate colors" is interpolated and then displayed approximately. The more colors are measured, the more accurate the color representation will be later. As the monitor image changes over time, this calibration should be repeated from time to time.



A calibrated screen ensures that a certain color tone is displayed realistically on the monitor, but unfortunately this does not mean that the display will correspond to the later print result.

As the CMYK color space is smaller than the RGB color space, it is strongly recommended to display the image on the monitor with the CMYK color proof function activated before printing so that the target color space can be assessed as accurately as possible.

To create an ICC profile, it is necessary to print a specific color palette on a specific substrate and then read it with a colorimeter. This measurement enables the color calibration software to determine how far which color tone deviates from the desired color tone.

However, the accuracy of the measurement and the resulting ICC profile depends on many other factors, such as the print quality, the substrate, the number of color patches used, the quality of the measuring system, the setting of many parameters and much more.

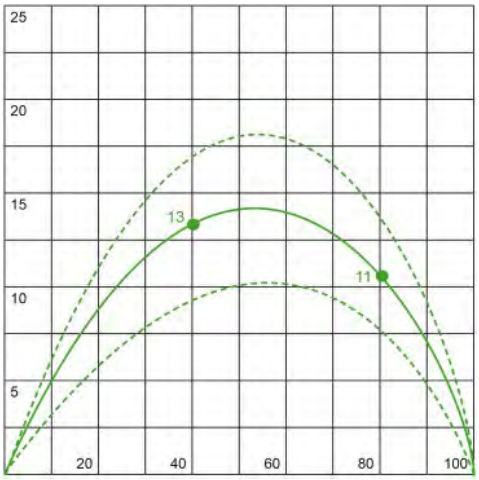
The documentation of the "ArgyllCMS" software at http://www.argyllcms.com/doc/ArgyllDoc.html provides a deep technical insight into the many possibilities and the influence of color correction on the print result.

A collection of universally applicable ICC profiles can also be found on our service website at https://service.wallpen.com.

10.6 Dot Gain

Dot gain refers to the effect that ink drops run larger on the printed substrate than was intended in the digital image file, making the print result darker and less differentiated. To be more precise, digital halftone dots cannot be transferred 1:1 to the substrate, but are deformed. In the vast majority of cases, this leads to enlargements, sometimes also to certain blurring.

For example, if you want to print a surface with a certain area coverage, it will be displayed darker due to the course of the drops, similar to the table.



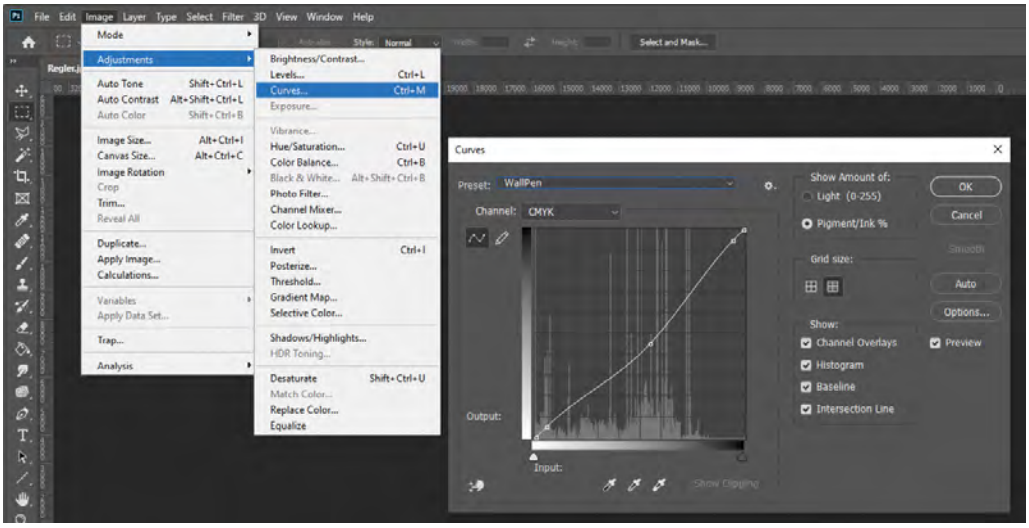
The horizontal axis of the table shows the ink coverage from 0 to 100 %. The vertical axis shows the percentage increase by which the printer could print a certain coverage more intensively. The dotted lines show a possible tolerance field. In this example, an area coverage of 40% is actually printed with 53% coverage (plus 13%). An area coverage of 80% is printed with 91% (plus 11%). The intensity of the droplet progression depends on numerous factors, such as the axis speed, the ambient temperature, the ink temperature, the type of substrate, the motif, the droplet speed, the distance of the printhead from the substrate and much more. No general rule can be defined here.

The increase in tonal value should be compensated for as far as possible by the ICC profile used, but can also be additionally corrected in Photoshop using the "Gradation curve" function by reducing the intensity of the mid tones by a few percentage points. Such manual correction of the dot gain always requires some experience and test prints, but usually produces very satisfactory results.

Without correcting the dot gain, print results, especially in low-contrast areas, often appear far too dark and undifferentiated. A correction by reducing the intensity in the wallPen Processor - which seems logical at first glance - fades the image not only in the mid-tones, but also overall and is not advisable. It is much better to either leave this correction to a suitable ICC profile or to carry it out "manually" in software such as Photoshop.

In general, the use of tonal value correction is **advisable for practically every motif** and will visibly improve the vast majority of print results.

A suitable way to compensate for the increase in tonal value is to use the "Curves..." function in Photoshop or Affinity Photo, similar to the curve shapes in the screenshots below...



The "Curves" function in Photoshop CC...

The "Curves" function in Affinity Photo...

Miscellaneous

11 Miscellaneous

11.1 Multi Pass Printing

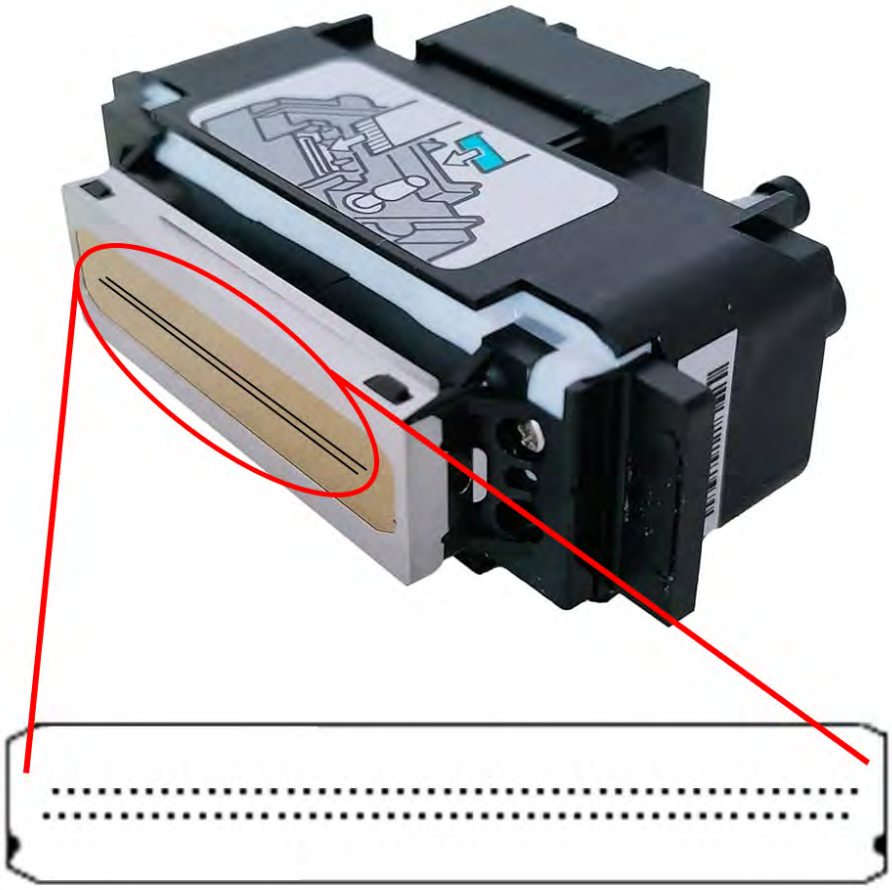
What does "Multi Pass" mean?

To understand the purpose of the "Multi Pass" print mode, a little background knowledge is first required.

Each Ricoh GH2220 printhead used in the wallPen E2 has two rows of nozzles, each with 192 nozzles, which are positioned just under one millimeter above each other and offset from each other by half a nozzle distance. So each printhead has 384 individually controlled nozzles.

The offset scheme looks something like this:

```
Row 1: …  O O O O O O O O O O O O O O O O O O O O O O O O …
Row 2: … O O O O O O O O O O O O O O O O O O O O O O O O  …
```



Schematic diagram of the arrangement of the two offset rows of nozzles

The density of the nozzles per row is 150 NPI (Nozzles per Inch), so the distance between the nozzles in a row is just under 0.17 mm.

As the second row of nozzles is offset by half a nozzle distance from the first row, both rows complement each other during printing, resulting in a cumulative 300 DPI (dots per inch) on the substrate, since the absolute nozzle distance of both rows combined is just over 0.08 mm from nozzle to nozzle.

300 vs. 600 DPI

Experience has shown, however, that the native printhead resolution of 300 DPI is not sufficient for printing, as not enough ink can be applied to the substrate to ensure a reasonable coverage for motifs. The question arises, what can be done?

Since the desired horizontal resolution for a meaningful print is 600 DPI, the wallPen OS commands the printer sideways by half a total nozzle distance (≈ 0.04 mm) alternately more and less with each swath in order to increase the resolution and achieve the required resolution of 600 DPI.

The width of the nozzle rows is 32.4 mm. So if you print with a resolution of 300 DPI (as for the nozzle test, for example), each swath is precisely 32.4 mm wide. If the resolution is now increased to 600 DPI, the printhead must pass over each area twice to turn 300 DPI into 600 DPI. This doubles the printing time because the lateral step-over changes from 32.4 to 16.2 mm. So whenever all nozzles print all available pixels in one pass during printing, we speak of 1-pass printing.

Single Pass Printing

If a motif is printed in one pass, the printing speed is extremely high, but the result is rather poor: colors will be relatively pale and any nozzle that does not function perfectly will be visible as a vertical stripe. In addition, there will be clearly visible overlaps or gaps in the lateral step-over, as a machine as large and mobile as the wallPen E2 cannot, of course, achieve an accuracy of a few hundredths of a millimeter, as required in this case, over many meters in height and width, free-standing on the floor, without a stationary upper counter support and with natural manufacturing tolerances. And again the question arises, what can be done?

This is exactly where Multi Pass printing technology comes into play.

Multi Pass Printing

This is best illustrated by the difference between 1-pass and 2-pass printing: For 2-pass printing, 50% of all pixels (pixels = ink drops) are removed from the current data set and saved in a second data set according to a carefully considered algorithm. The two data sets are therefore complementary, which means that if they were put together again, the original motif would result.

2-Pass Printing

The wallPen now prints these two data sets practically inside each other in 2-pass mode, whereby these two images, each with half the number of pixels, complement each other to form the original motif on the substrate.

As each swath only prints half of the required pixels, the printing time doubles, but the result is significantly better than a 1-pass print, as the lateral step-over is halved again to 8.1 mm instead of 16.2 mm before. Due to the 50% lower ink application, transitions are blurred and the printed image is considerably more homogeneous. As each nozzle only has to do half of the actual work, faulty nozzles have 50% less impact on the print result. In short: you buy quality with time.

Once you have internalized the principle of 2-pass printing, it is only logical to understand the remaining pass modes:

4-Pass Printing

With 4-pass printing, the total amount of pixels is distributed over four data sets, each with 25% of the pixels. The lateral step over is reduced to just under 4 mm and the printing time is doubled compared to 2-pass printing. The print result in 4-pass printing is sufficient for most applications if the viewing distance to the motif is more than approx. one meter and is therefore generally a good combination of quality and time.

8-Pass Printing

With 8-pass printing, the total number of pixels is distributed over eight data sets, each with 12.5% of the pixels. The lateral feed is reduced to just under 2 mm and the printing time is doubled compared to 4-pass printing. The print result is ideal for special applications and a good combination of quality and time when high demands are placed on a motif and viewers linger close to the motif.

16-Pass Printing

In 16-pass printing, the total number of pixels is distributed over sixteen data sets, each containing 6.25% of the pixels. The lateral feed is reduced to just 1 mm and the printing time is doubled compared to 8-pass printing. 16-pass printing is more of a special solution for certain applications or experiments and is rarely used in practice.

11.2 Multi Drop Printing

What is a "Waveform"?

Each Ricoh GH2220 print head has 384 individually controlled "drop-on-demand" nozzles. Each nozzle is essentially a microscopic ceramic (piezo) element that is deformed by electrical impulses. This impulse (called a "waveform") is modeled in such a way that the resulting expansion and contraction of a cavity within the piezo-element forms a tiny droplet of ink, which is then squeezed through a very small nozzle opening and shot at a speed of around 8 to 10 meters per second. A certain number of droplets, usually three, are fired super fast in succession and only merge in the air before they hit the wall. (More on this in the "Multi Drop in Detail" section below.)

It is an art to program and generate a proper waveform and electronically "shape" droplets so that they are as pure, fly as stably, quickly and far and produces as little "Overspray" (= unwanted mist droplets) as possible.

The standard waveform for the ink of the wallPen E2 is designed by wallPen in Germany and later generated in real time again and again by our electronic components for each shot during printing. We regularly optimize the waveform and make these improvements available via software updates. If necessary, waveforms can also be customized for specific applications, e.g., for water-based inks for textile printing. For more information and a quote, simply write to service@wallpen.com

UV printing is a sensitive process and many framework conditions are important and sometimes have a considerable influence on the ink drop quality. First and foremost, the ink temperature plays an important role. The waveform has been specially developed for the wallPen UV ink and the probability that our optimized waveform will work stably and flawlessly with other inks is rather low. Humidity, wind, vibrations or other external influences can also have a lasting effect on the drop image.

Firing speed per second

Each single nozzle of the wallPen E2 "fires" at a speed of up to 12 kHz. This means that each nozzle releases up to 12,000 droplets per second. So theoretically, due to the 384 individual nozzles per printhead, more than 4.6 million (!) drops of ink can be fired per head per second. This means up to 18.4 million ink drops using four heads (CMYK) and more than 23 million drops per second with five printheads (CMYKW).

Multi Drop in Detail

Now, a single drop of ink is extremely small and unstable at approx. 4 picoliters (= 0.000000004 milliliters), which is why the wallPen E2 works using the Multi Drop method...

After a first ink drop has been shot, another drop is immediately fired thereafter, which flies slightly faster than the first and catches up with it in the air in a fraction of a millisecond. Both drops then stabilize each other and thus combine to form a common drop that is then 8 picolitres in size.

Another fraction of a millisecond later, a third droplet is fired, which in turn flies again a little faster, catches up with the two previous droplets, combines with them as well to now form a 12 PL "large" droplet which then hits the substrate even more stable and faster, all three combined together.

In practice, this means that each drop of ink on the wall previously consisted of three separately generated drops that were combined into one in flight. This rather "delicate" technique makes it possible to bridge a distance of up to one centimeter and to print stable and clean images even on images on even on uneven substrates. Note that wallPen specifically chose three drop Multi Drop to get the best results for the application and any number of drops can be combined for other applications, provided that the waveform has been optimized accordingly beforehand.

11.3 Suitable Substrates

Printing indoors

General notes

The substrate / wall should not have excessive indentations. If the distance is more than one centimeter, the UV rays cannot reach the ink particles intensively enough and the print may not cure sufficiently. For optimum curing, you should therefore bring the printhead as close as possible to the wall. If in doubt, you should not print, especially indoors.

Risks and notes

Evaporation of incompletely cured UV ink can lead to odor and health hazards. If in doubt, test the substrate by printing a sample. On a usable substrate, the UV ink should be almost completely cured and firmly bonded immediately after printing. Once fully cured, the UV ink behaves like a polymerized plastic. The substrate has a significant influence on the degree of curing to be achieved. Information on the pre-treatment of substrates can also be found in the chapter "Miscellaneous | wallPen Glass Magic".

Other factors for achieving good printing results are Intensity of the LED light, distance of the printhead from the wall and duration of UV irradiation (= speed of the head).

Check the degree of curing using a sample before printing. If possible, print on the same material under the same conditions before the final print and check the durability of the ink on this substrate after a test print. If necessary, increase the intensity of the UV lamp and/or use a primer.

Substrates

A major advantage of UV printing is the wide range of substrates that can be printed on without any problems. The wallPen UV ink is particularly suitable for internal printing as, according to the manufacturer, it contains only a few chemical plasticizers and therefore hardly evaporates. It is generally advisable to check the suitability of each substrate thoroughly before printing. Here are a few examples: Is the printing surface possibly partially soiled? Is it contaminated with adhesive residue? Have different colors been used for varnishing? Are there any traces of grease or fingerprints?

In general, we have had very good experiences with direct printing on wood, concrete, stone and plastics, as well as on most latex and conventional wall paints.

Caution is advised when printing on melanin, silicone-based paints, metal or ceramics (e.g. tiles). Here, suitability should always be checked first with a test print. Many metals

and ceramic tiles can be printed on quite well, but some can only be printed on poorly. Unfortunately, there is no rule, so it is advisable to test print on every new material.

Fabric, paper, cardboard or leather are not suitable for UV printing, although customers have already successfully printed on these materials. It should be checked here whether a water-based ink is more suitable. This can be printed with the wallPen E2, but the Waveform must be adapted for the desired ink for a fee. In addition, the printheads would have to be flushed and the entire tubing and all ink bags replaced, as different types of ink must not be mixed.

Printing outdoors

Outdoor printing often poses greater challenges than indoor printing. On the one hand, the influence of frost and heat on the substrates and on the print itself is very different and difficult to calculate. On the other hand, it is often difficult to estimate how intensively environmental influences such as smog, solar UV radiation, wind and weather will affect the print.

Due to these many imponderables, it is not possible for us as a manufacturer to give binding guarantees for outdoor prints. Rather, it is up to the know-how and experience of the user on site to assess how a substrate must be pre-treated or sealed before and after printing in order to guarantee the longest possible service life and high durability. If in doubt, consider testing in a climate chamber to avoid the risk of being held liable later if an outdoor print does not meet the end customer's expectations.

11.4 wallPen Glass Magic

What needs to be generally considered with glass printing?

In general, printing on glass requires experience and some background knowledge. So it is advisable to treat at least the lead side and, if possible, also the air side of glass panes to be printed with an open, clean-burning gas flame that is briefly passed over the substrate surface.

Briefly exposing glass, metal and plastic surfaces to be printed to flame may break the molecular bonds of the substrates to be printed on and at the same time binds active ions in the flame. The originally non-polar material thus contains polar groups that measurably increase the surface energy of the treated substrate and enable reliable adhesion of UV ink. This increases both the tension and the wettability of the surface. The ink adheres better. Flame treatment creates further processes: On the one hand, a cleaning effect is created on the surface. On the other hand, roughening occurs on a microscopic scale, which is not visible but leads to an enlargement of the surface and thus enables better mechanical anchoring.

Warning!
Fire hazard!

It must be strictly observed that Glass Magic is highly flammable, must be kept away from naked flames and must never be applied directly to warm or hot materials.

If in doubt, consult a glass printing specialist or contact our support team.

What is wallPen Glass Magic?

wallPen Glass Magic enables UV ink to adhere significantly better to glass and similar smooth surfaces. It is a special liquid for wafer-thin application to degreased, clean smooth surfaces, primarily glass.

When should Glass Magic be used?

wallPen Glass Magic is used on smooth, non-absorbent surfaces such as glass or some ceramic tiles.

What does Glass Magic do?

wallPen Glass Magic destroys the oxygen layer, especially on previously flamed surfaces. The combination of flaming and Glass Magic creates the optimum basis for UV inks to adhere firmly and permanently to the substrate.

Danger warnings

- Danger! Corrosive!
- Risk of burns!
- Always wear protective goggles and gloves when working with Glass Magic!
- In the event of contact with eyes or skin, rinse immediately with clean water and seek medical advice.
- Danger! Glass Magic is highly flammable!
- Warning! Do not spray Glass Magic on hot or warm surfaces!
- Keep away from open flames!
- Always observe the fire protection regulations!
- Keep Glass Magic well protected and out of the reach of unauthorized persons, especially children and animals.

Working instructions

1. Clean the surface thoroughly so that it is free of fingerprints, dirt, grease or dust. The best cleaning results are achieved with pure alcohol. Alternatively, solvents or other degreasing cleaning fluids can be used. (Make sure that the cleaning agents used do not attack or damage the surface to be printed. If in doubt, test the cleaner on a sample of the substrate first).
2. Hold the spray bottle about 20 to 30 cm away from the print surface. Moisten the material with the fine spray mist by spraying a few short bursts. This spray mist must moisten the substrate evenly and completely without forming droplets. (Too much or too little spray will impair the bonding of the UV ink to the substrate.
3. If even small, irregular droplets form, use a dust-free, dry, grease-free cloth to distribute the liquid evenly. Gently, carefully and evenly wipe the cloth over the surface.
4. Wait at least 8 to 10 minutes until the spray coat has completely dried and evaporated. An even, light haze should form.
5. Now stop touching the surface and print as quickly as possible as usual on the prepared surface.
6. After printing, remove the spray residue from the surface with a cloth soaked in water.
7. The UV ink is fully cured after around 24 hours.

How to remove a print from glass

A simple and effective way to remove UV ink applied to a smooth surface with wallPen Glass Magic is to use a ceramic scraper or a conventional razor blade. When using solvents, there is a risk that the dissolved UV ink will smear, making it even more difficult to remove the ink without leaving any residue. Therefore, test a solvent on a sample first.

Packaging sizes

wallPen Glass Magic is supplied in 50 ml spray bottles.

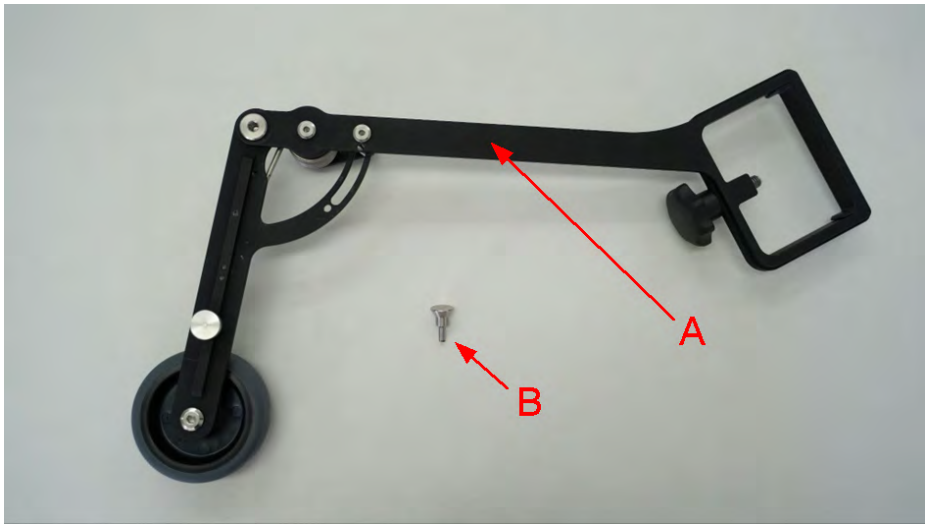
11.5 wallPen Apex (optional)

What is the wallPen Apex?

The wallPen Apex is a device for mounting on the vertical axis of the wallPen E2. Due to its special design with a spring mechanism, slight pressure is constantly exerted between the vertical axis and the wall, so that the wallPen practically leans against the wall, thus preventing and absorbing vibrations of the vertical axis. This is particularly helpful for very high prints, where vibrations and oscillations can build up in the machine due to the physical conditions of the structure and can have a lasting negative effect on the print result.

The decisive factor is that the spring mechanism compensates for different distances to the wall and therefore the printer does not necessarily have to remain at 100% the same distance, but can also compensate for deviations of up to 10 cm homogeneously.

Scope of delivery



- Apex (A)
- Safety split pin (B)
- Transport box with foam inlay

Preparation for use

Always take good care not to crush yourself on the moving parts during installation. In most cases, a ladder is required to install the Apex. Follow the manufacturer's safety instructions when using it.

The basic assembly of the wallPen E2 must be carried out in accordance with the instructions described in this manual. Make sure that the wallPen is mounted and aligned at an operational distance from the wall.

The slide system should be in a low position on the vertical axis, ideally still on the park profile. It is recommended but it is not necessary to have the printhead mounted in order to mount the Apex.

For easy installation, the apex should always be locked. To do so, press the spring mechanism together and insert the locking pin into the locking hole.

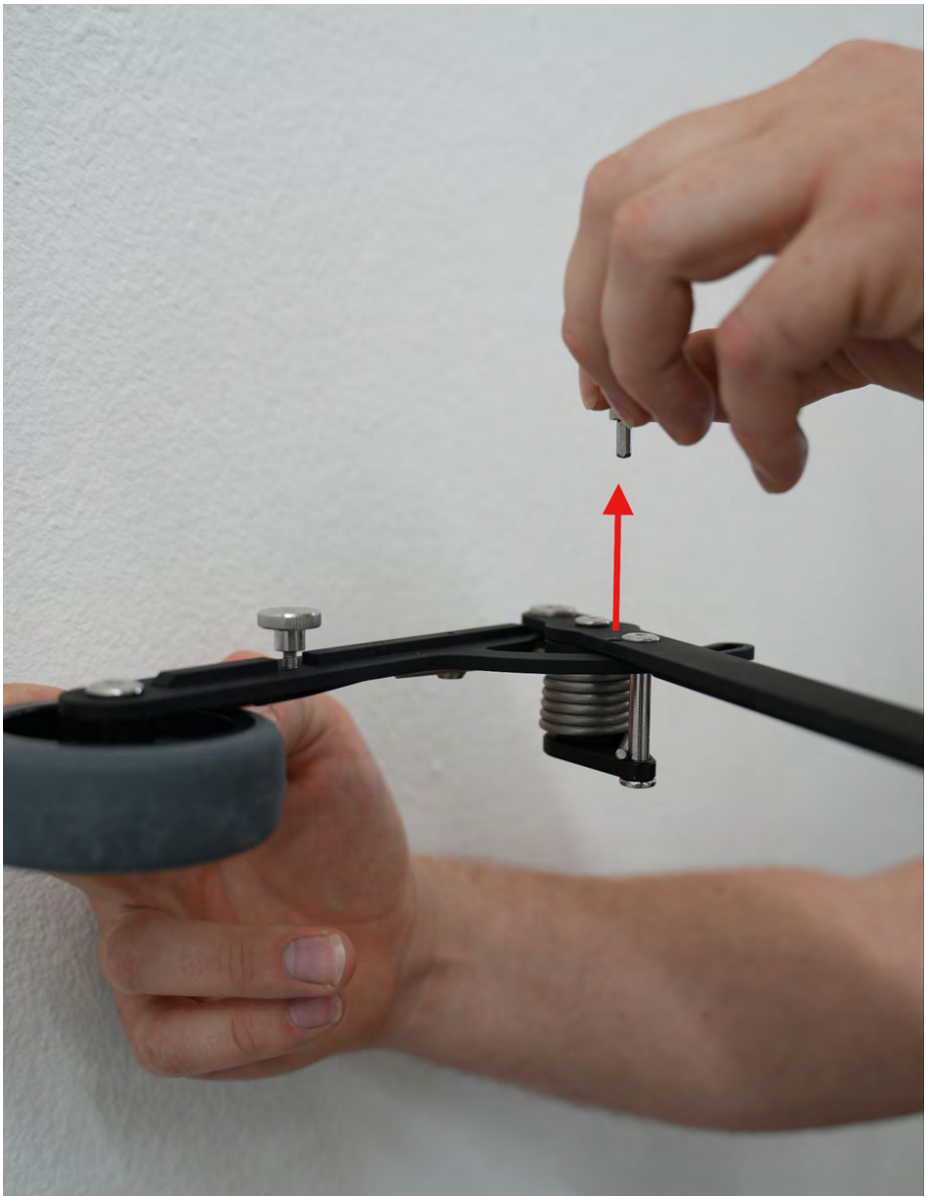
Next turn back the plastic knob of the fastening screw so that the front plastic buffer of the screw is approximately flush with the inner aluminum frame.

Fastening the Apex

Use a well-secured ladder to slide the wallPen Apex onto the vertical axis from above. Make sure the feather mechanism faces forward as in the picture towards the front wheels of the wallPen, so that the Apex wheel is "dragged" along the wall.

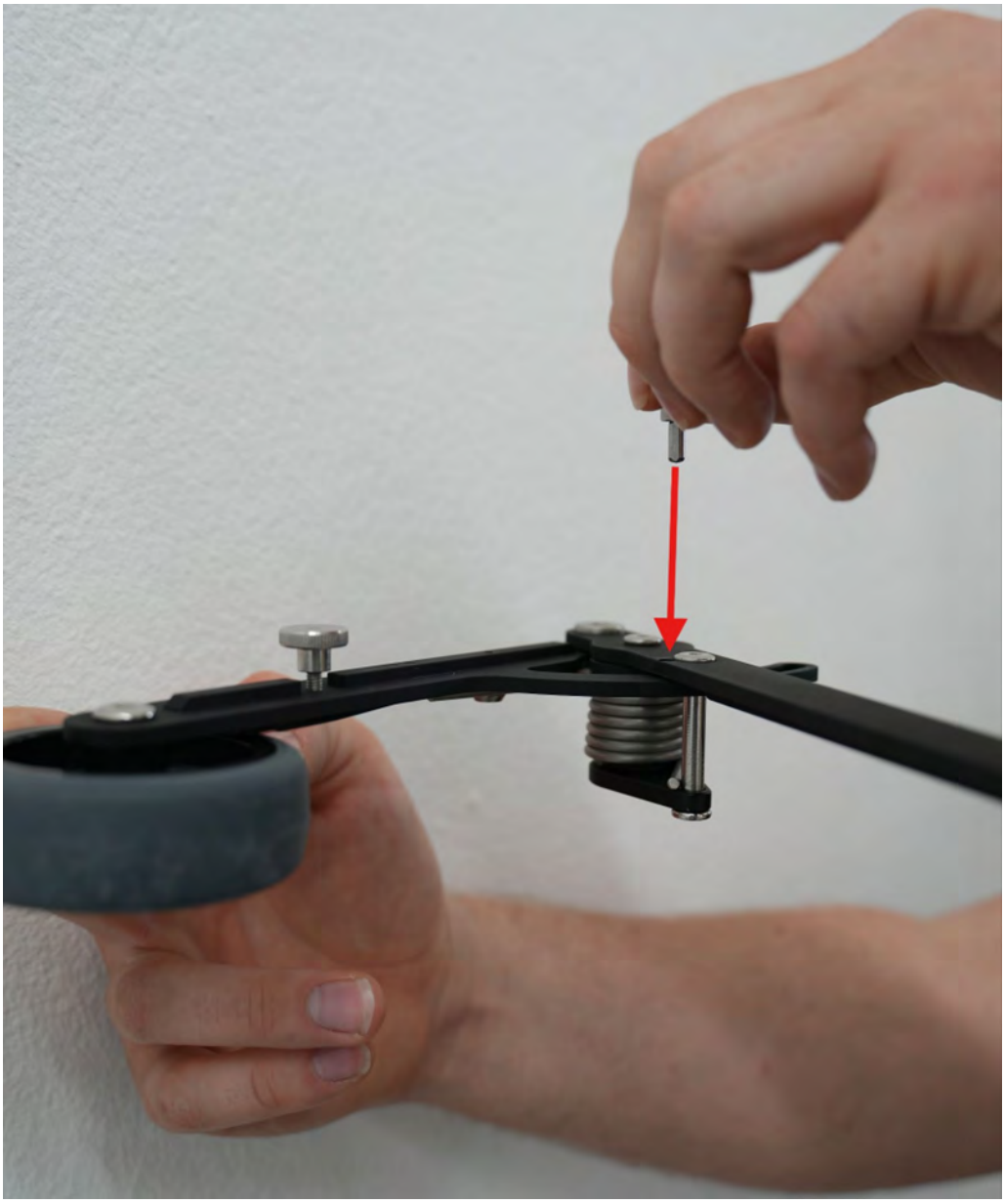
Slide the Apex to the desired height and tighten the fastening screw.

Tighten it with feeling and common sense! Not too tight. Not too loose.



After the Apex is firmly mounted on the axis in position, hold the wheel with one hand in place, pull the locking pin and allow the spring mechanism to push the wheel gently against the wall.

Removing the Apex



After printing is complete, compress the spring mechanism of the Apex and lock the device with the locking pin.

Then loosen the fastening screw and slide the Apex upwards beyond the end of the axle to remove it.

Adjusting the wheel brake

To achieve optimum print quality, the Apex wheel resistance should be adjusted so that it does not grind, but just turns. This setting can vary depending on the surface quality of the wall or the distance between the printer and the wall.

The marked screw is used to set the resistance of the wheel.

1. For adjustment, it has proven useful to mount the wallPen together with the apex, move the whole platform back and forth a bit sideways by hand and at the same time adjust the adjusting screw for the wheel resistance so that the wheel of the Apex is just blocked and no longer rotates with the horizontal movement.
2. Now turn it a quarter of a turn to the left (counterclockwise). This should be the ideal brake setting for most prints.

For optimum printing results, it is also important that the wallPen moves along the wall as parallel as possible and at the same distance if possible. To avoid damage or marks on the wall caused by the wheel, make sure that the wheel is dry and clean.

For very sensitive surfaces, it has also proved useful to apply masking tape horizontally across the entire printing width at the height of the wheel track on the wall, so that the wheel does not run directly on the wall but on this tape, thus avoiding soiling or possible sanding marks. The tape can be removed again immediately after the printing process. However, make sure that the tape does not damage the wall.

11.6 wallPen Track Guard (optional)

When is the Track Guard used?

The Track Guard was designed to guide the wallPen safely over longer distances on the rail system. The outside of the system is made of durable, black anodized high-strength aluminum and features easy-to-read laser lettering. The inner flanks are glued with wear-resistant plastic, which prevents the rail system from being scratched in the long term and guarantees running safety.

Both Track Guard disks (left & right) are attached to the left and right front wheels of the wallPen E2 standing on the wallPen rail system in seconds using a simple "turn-click system" and ensure that the E2 travels safely and stably on its rail system, even over long distances, without losing track.

For all printers without side threads in the front wheels, the wallPen Track Guard can be retrofitted on request by modifying the platform thru wallPen or a wallPen service partner. Alternatively, we also provide detailed video instructions so that customers can carry out this modification with a little skill. If you are interested, please contact our service team or your wallPen partner.

Fitting the Track Guard

The front wheel facing the wall is the “left wheel,” and the front wheel facing the room is the “right wheel.”

- Position the platform onto the rail system as usual

- One Track Guard disk is marked with the letter "L" for left and the other one with the letter "R" for right
- Place the Track Guard disks on the side of the respective wheel using the three guide pins and turn it in the direction of the "LOCK"-arrows
- The rail guard is locked in place when you hear a “click.”

Removing the Track Guard

- To release the Track Guard, turn each disk in the direction of the "RELEASE"-arrows
- Follow the same procedure to remove the opposite front wheel
- Positioning the platform on the track
- The track guards are fitted to both front wheels
- When placing the platform on the rail, make sure that the Track Guards are placed to the side of the rail

11.7 Recommended Third-party Software

Photoshop and the Adobe Cloud

Adobe Photoshop is a comprehensive graphics editing program that we use in our wallPen to prepare images perfectly

Here are some of the main features of Photoshop:

- Image Editing: Photoshop allows basic to advanced image editing techniques such as cropping, rotating, adjusting brightness and contrast, and removing blemishes and imperfections.
- Layers: An outstanding feature of Photoshop is working with layers. Images can be layered and edited separately, allowing for complex compositions and effects.
- Selection tools: Photoshop offers a variety of tools for the precise selection of image areas. These include rectangular and elliptical selection tools, cropping tools and magic wand tools.
- Filters and effects: There is a wide range of filters and effects that can be applied to images to produce creative looks or make certain corrections.
- Text tools: Photoshop allows the integration of text into images. It offers comprehensive text editing features, including different fonts, sizes and styles.
- Retouching and corrections: Advanced retouching tools allow skin blemishes to be removed, wrinkles to be smoothed and color casts to be corrected.
- 3D graphics: Photoshop supports the creation and editing of 3D graphics, which is particularly relevant for designers and artists.
- Color correction: With various tools for color adjustment and correction, Photoshop enables precise control over the color reproduction of images.
- Batch processing: By automating repetitive tasks, Photoshop allows users to process multiple images simultaneously.
- Web and print preparation: Photoshop offers functions for optimizing images for use on the web or for print.

This list is not exhaustive as Photoshop is a very powerful software with a wealth of features. It is used by photographers, designers, illustrators and many other professionals for editing and creating visual material.

Gigapixel

Topaz Gigapixel AI is an image editing software based on artificial intelligence that aims to scale images to a higher resolution while retaining fine detail and clarity. Here are the key features of Topaz Gigapixel AI:

- Image scaling: the software uses advanced neural networks to scale up images to a much higher resolution without significant loss of quality. This is particularly useful when high-resolution images are required.
- Detail preservation: Gigapixel AI is designed to preserve fine details in images even when they are greatly enlarged. This helps to ensure that the scaled images do not lose sharpness or detail.
- Clarity optimization: The software improves the clarity of images during the scaling process to ensure that scaled images remain sharp and appealing.
- Noise reduction: Gigapixel AI includes noise reduction features to ensure that scaled images are free from unwanted noise.
- Batch processing: The ability to process multiple images simultaneously enables efficient processing of large volumes of images.
- Areas of application: The software is used by photographers, graphic designers and other professionals who require high-resolution images for various purposes, such as printing, presentation or the creation of high-quality visual material.

Topaz Gigapixel AI thus offers a powerful solution for scaling images with a focus on quality and detail using advanced AI algorithms.

11.8 Technical Data & Dimensions

Voltage:	110-240 Volt
Power requirement ...	
... in idle mode:	approx. 40 watts
... in operation:	approx. 200 watts
Frequency:	50/60 Hz AC (alternating current)
printheads:	RICOH GH2220
printhead electronics:	wallPen E2HDGH22
Main control board:	wallPen E2MCTLGH
Printhead cable:	FFC, 24 positions, 0.5 mm spacing
Computer system:	Raspberry Pi 4B /w 4GB
OS:	wallPen OS 3.x
Drive communication:	CANopen
Control system:	wallPen App 1.x
Dimensions:	80 x 60 x 170 / 400 cm (W x D x H)
Total weight:	Approx. 93 kg (basic appliance incl. consumables)
Warranty:	12 months
Shipment:	Shipment by air freight on a Euro pallet
Shipping dimensions:	120 x 80 x 60 cm
Shipping weight:	approx. 120 kg (basic unit)

Change Log

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Version	date	Remarks
2.0.0	September 11, 2021	• First release
2.0.1	September 15, 2021	• Additions
2.0.2 - 2.0.3	September 22, 2021	• Chapter "Printing" added • Chapter "Replacing a printhead" added
2.0.4	September 23, 2021	• Various corrections
2.0.5	September 30, 2021	• Various corrections
2.0.6	December 28, 2023	• Various updates
2.1.0	July 5, 2025	• Complete revision
2.1.1	July 10 ,2025	• Small corrections
2.1.2	July 11, 2025	• Printing passes explanation added
2.1.3	July 12, 2025	• Chapter "Multi Pass Printing" added • Chapter "Multi Drop Printing" added
2.1.4	July 14, 2025	• Chapter "Multi Pass Printing" modified • Chapter "Multi Drop Printing" modified
2.1.5	July 21, 2025	• Layout improvements • Chapter "Notes" removed • Chapter images added • Index slightly rearranged

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