

Contac S4

Operating instructions

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LPKF

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Translation of the German original document

General information

This document contains all information for the intended use of the system/product delivered. This document is intended for persons with basic knowledge of installation and operation of software-controlled systems. General knowledge of operational safety as well as basic knowledge of using PCs running Microsoft Windows® are required.

- ▶ Read this document and possibly associated safety data sheets carefully before first start-up and usage of the components.
- ▶ Observe the safety regulations as well as the regulations on operational health and safety and protection of the environment.
- ▶ Use the system/product only in a technically perfect condition.
- ▶ Observe all labels and safety signs on the system/product.
- ▶ Never remove the safety signs and replace or clean them if not readable anymore.
- ▶ Persons who install, operate, uninstall, or maintain our systems/products must not be under the influence of alcohol, other drugs, or medication that impairs the ability to react.
- ▶ Use only approved spare parts and accessories in order to prevent injuries due to unsuitable spare parts and accessories.
- ▶ Observe the technical data and ambient conditions specified in this document.

Validity

This document is part of the system/product and corresponds to the technical state at the time of publication. This document has always to be present at the system/product and has to be available to the operating personnel without restrictions, in a complete and legible form and at all times. If the operator changes, this document has to be handed over together with the system/product. The operator has to ensure that all safety measures specified in this document are observed.

The operating personnel must have read and understood this document before performing any task. A basic requirement for safe work is observance of all safety notes and steps. This document contains important information about the system/product that has to be observed when installing, first starting up, or maintaining the system/product. Its structure allows trained personnel to perform all tasks.

LPKF Laser & Electronics SE (abbreviated to **LPKF** in the following) reserves the right to make changes in respect to the content of this document. The figures in this document serve as basic understanding and can differ from the actual state of the system.

Structure of warning messages and safety notes

The safety notes and warning messages in this document identify hazards and risks and they are created in accordance with ANSI Z535.6-2011 and the standards series ISO 3864.

The warning messages are structured as follows:

- Warning sign (only for injuries)
- Signal word indicating the hazard class
- Type and source of the hazard
- Consequences of non-observance
- Measures to avoid the hazard

 + SIGNAL WORD
Type and source of the hazard! Consequences of non-observance. ► Measures to avoid the hazard. ► Further measure(s) to avoid the hazard.

Warning messages can also be embedded in the format of the surrounding text in order to avoid a *visual disruption* in a sequence. In this case, they are distinguished as follows:

Type and source of the hazard!

Consequences of non-observance.

- Measure(s) to avoid the hazard.

Warning messages are classified in hazard classes represented by the signal word. In the following, the warning messages are described in accordance to their hazard classes:

 DANGER
Type and source of the hazard! This warning message indicates a hazard of high risk that causes death or serious injury if not avoided. ► Measures to avoid the hazard.

 WARNING
Type and source of the hazard! This warning message indicates a hazard of medium risk that can cause death or serious injury if not avoided. ► Measures to avoid the hazard.

 CAUTION
Type and source of the hazard! This warning message indicates a hazard of low risk that can cause minor or moderate injury if not avoided. ► Measures to avoid the hazard.

NOTICE

Type and source of the hazard!

This warning message indicates a hazard that can lead to possible property damage.

► Measures to avoid the hazard.

Text styles

Various text attributes, notations, and text structures facilitate reading the document. The text attributes (highlightings) inside this document are defined as follows:

Attribute	Function
<i>italic</i>	highlights elements of the user interface and of control elements of the system
bold	highlights important information and keyboard input
Courier New	highlights file paths
[]	highlights elements of buttons on software user interfaces
key	highlights keys of the keyboard

Tasks or procedures that are described in steps are compiled to sequences in this document. A sequence consists of at least three components: objective, step, and result.

Component	Description
■	Indication of an objective. The sequence starts here.
1. 2. 3.	Indication of a sorted list of steps. The specified order must be observed.
□	Indication of an intermediate result that is followed by further steps or the result.
☑	Indication of the result. The sequence is finished.
►	Indication of a single step.

Additional information

The following symbols are used to indicate additional information:



This note indicates especially useful information.

**Advanced information**

This advanced information indicates special knowledge.

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All data, notes and instructions in this document have been prepared with consideration to the statutory standards and regulations, the present state of technology, as well as our many years of knowledge and experience.

LPKF accepts no liability for damage due to:

- non-observance of this document
- improper use of the system/product
- employment of personnel that is not sufficiently qualified
- unauthorized modification
- technical changes
- unauthorized manipulation of the safety devices
- use of spare parts that are not approved by LPKF

The actual scope of delivery can deviate from the explanations and presentations given here, due to custom designs, the utilization of additional order options, or due to the most recent technical changes.

We reserve the right for technical modifications of the product for reasons of improved usability and future development.

The responsibilities agreed in the delivery contract, the General Terms and Conditions as well as the delivery conditions of the manufacturer and the statutory regulations valid at the time of the conclusion of the contract are effective.

Warranty

Please note that the warranty is subject to the current regulations in combination with the current General Terms and Conditions.

All information and instructions in this document have been compiled in observance of current regulations and the current state of the art. Before working with the system/product, this document has to be read carefully. The manufacturer assumes no liability for damage and faults due to non-observance of this document.

LPKF Laser & Electronics SE provides a 12-months warranty if the following conditions are met:

- The warranty starts on delivery.
- The warranty covers defects in material or manufacture. During the warranty period, such defects are remedied without cost by replacement or rework of the defective parts. This service is provided by the LPKF Service.
- The operating conditions described in this document have been complied with.
- The maintenance work described in this document has been executed and documented at the specified maintenance intervals.

For further information on wear parts refer to the chapter scope of delivery.

Customer service

For technical information contact our LPKF Service:

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In our continuous effort to improve our documentation we are asking you to give us your feedback if you notice any discrepancy when working with the system/product, or if you have any comments or suggestions for improvement.

At the moment of packaging, the system/product has been equipped with the latest software version and with the software and hardware documentation currently valid. By now, new versions of the documentation as well as new software versions might be available.

For all the latest news and updates visit the support area of our homepage:
www.lpkf.com/en/support-services.

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1 Safety

This chapter provides an overview of all important safety aspects for protecting persons as well as for a safe and fault-free operation of the system/product. There are further warning messages in the sections of the individual lifecycle stages.

1.1 Intended use

The system can be used for through-hole plating of double-sided and multi-layer PCBs and for galvanic strengthening of copper surfaces. When copper build-up is completed, the PCBs can be tin-plated. Drilled holes with a diameter of at least 0.2 mm (> 8 mil) and an aspect ratio of 1:8 can be plated.

Use only the described chemicals approved by LPKF for filling the tanks.

Operate the system only in a well-ventilated room and wear the described protective equipment.

Furthermore, the intended use of the system is ensured by complying with the following points:

Place of installation

- The ambient conditions have to be observed (see page 22).
- The minimum required space of the system has to be observed (see page 46).
- The system may only be used in laboratory environments.

Service life

- The system is designed for a service life of 10 years used in one-shift operation (8 hours a day, 5 days a week).
- The system has to be maintained within the specified intervals (see page 93) to ensure the service life of the system.

Personnel

- The system has to be operated by personnel who are sufficiently qualified and trained (see page 16).

Processing conditions

- The materials used must not exceed the maximum processing size of the system (see page 22).

Intended use also includes compliance with all information in this manual.

Improper use

- ▶ Never fill the tanks with other chemicals than the chemicals indicated and approved by LPKF.
- ▶ Do not operate the system with a different or modified software.
- ▶ Only use materials and objects for through-hole plating that are approved by LPKF. Contact the LPKF Service if in doubt.

Foreseeable misuse

Any other kind of usage is considered as not intended and is thus prohibited. The manufacturer is not liable for any resulting damage; the operator alone bears the risk. Part of the intended use is also to follow the instructions for safety in this user manual with regard to operation and maintenance of the system.

1.2 Residual risks

No residual risks have currently been identified, if the intended use as well as all safety regulations are observed. Any identified residual risks and their avoidance are listed in the form of safety instructions starting in chapter 1.3. Non-observance can cause personal injuries and property damage.

1.3 Basic hazards

Always comply with the warning messages and information listed here and in the individual sections of this documentation to reduce the risks of injuries and property damage and to avoid dangerous situations.

1.3.1 Electrical hazards

 DANGER
Danger to life by electrical shock! Touching energized parts causes a direct danger to life by electrical shock. Damage to the insulation or damaged individual parts can be dangerous to life. ▶ Use only the mains cable included in the delivery or a mains cable approved by LPKF. ▶ All work on energized components of the system must be performed by a qualified electrician. ▶ If the insulation is damaged, switch off the power supply immediately and initiate the repair. ▶ De-energize all energized components of the system or equipment, before working with them. Ensure that the system or equipment is de-energized for the whole time of the task. ▶ Never bridge or deactivate fuses. ▶ Always keep moisture away from energized parts because it can cause a short circuit.

1.3.2 Thermal hazards

 CAUTION
Danger of burns by touching the heated liquid! The liquid in tank 1 is heated to approx. 60 °C (140 °F) and can cause burns in case of skin contact. ▶ Avoid contact with the liquids. ▶ Always wear your personal protective equipment.

1.3.3 Hazards by materials or substances



WARNING

Health hazard by contact with chemicals!

Contact with the chemicals can cause serious damage to health:

Inhalation can irritate/harm nose, throat, and lungs and cause allergic respiratory problems.

Skin contact can cause burns, allergies, and hypersensitivity.

Eye contact can irritate the eyes and mucous membranes with burning and tears and can cause impaired vision and serious eye damage.

Ingestion can cause burns of mucous membranes, throat, esophagus, and stomach and cause gastrointestinal complaints. Stomach pain, diarrhea, and vomiting can also occur.

- ▶ Always read the safety data sheets before working with chemicals and always observe the instructions given therein.
- ▶ Work in well-ventilated rooms.
- ▶ Wear your personal protective equipment.
- ▶ Avoid direct contact with the chemicals.
- ▶ Take off clothes that are contaminated with chemicals immediately.
- ▶ Wash your hands thoroughly after work.
- ▶ Consult a physician in case of complaints after contact with chemicals.



WARNING

Health hazard by inhalation of fumes!

Inhalation of the resulting fumes can cause health damage.

- ▶ Work only in rooms with an air change rate of at least 4/h.

NOTICE

Damage by inadequate tap water quality!

An inadequate tap water quality (e.g. due to excessive chlorine content) can degrade the process results.

- ▶ Use de-ionized water for all process steps in case of inadequate tap water quality.

1.3.4 Mechanical hazards

CAUTION

Risk of crushing injury by movement of the motorized frame!

The motorized frame moves during the through-hole plating process and can cause crushing injuries.

- ▶ Do not grasp the motorized frame during through-hole plating.

CAUTION

Risk of injury by sharp glass splinters!

The cover at the top of the system is made of safety glass. Damage to the glass produces splinters that can cause cutting injuries.

- ▶ Wear your personal protective equipment.
- ▶ Remove the broken glass with a vacuum cleaner.
- ▶ If broken glass enters a tank, empty the tank and filter the liquid.
- ▶ Contact the LPKF Service.

CAUTION

Tripping hazard by hoses and cables!

Hoses and cables are routed to the system. If the hoses and cables are laid inappropriately they pose a tripping hazard for the operating personnel.

- ▶ Always ensure that the hoses and cables do not pose a tripping hazard.

CAUTION

Danger of slipping by leaking or spilled liquids!

Spilled or leaked liquid constitutes a slipping hazard for the operating personnel.

- ▶ Wear your personal protective equipment.
- ▶ Remove the chemicals according to the instructions in the safety data sheets.

1.4 Responsibility of the operator

Operator

The operator is the person/company who operates the system/product themselves for industrial or commercial purposes, or makes it available to a third party for use and has the product responsibility for the safety of the system operator/user, the personnel in general, and other persons present.

Operator's obligations

The system/product is used in the industrial sector. The operator of the system/product is thus subject to the statutory obligations for occupational health and safety.

In addition to the safety instructions in this document, the safety, accident prevention, and environmental protection regulations must also be observed at the system's/product's place of operation.

The following applies in particular:

- The operator must inform himself about the effective industrial safety regulations and determine additional hazards in a risk assessment that result from the special working conditions at the system's/product's place of operation. The operator has to implement these in the form of operating procedures for the operation of the system/product.
- During the total operating life of the system/product, the operator has to check and ensure that the established operating procedures comply with the current state of the rules and standards and adapt them, if necessary.
- The operator has to define clear-cut responsibilities for installation, operation, trouble-shooting, maintenance, and cleaning.
- The operator has to make sure that all persons who are working with the system/product have read and understood this document. Furthermore, the personnel has to be trained and informed about the dangers on a regular basis.
- The operator has to provide the required personal protective equipment and instruct the personnel to wear it.
- The operator has to instruct the personnel to maintain a clean and tidy workplace. Eating and drinking at the workplace and especially while operating the system/product must not be permitted.

The operator is also responsible to keep the system/product in good working order. Thus, the following applies:

- The operator has to ensure that the maintenance intervals stated in this document are observed.
- The operator has to check all safety devices for proper function and completeness on a regular basis.

1.5 Personnel requirements

WARNING

Accident hazard due to insufficiently qualified personnel!

Insufficiently qualified personnel cannot assess the risks of using the system/product and put themselves and others in danger.

- ▶ Allow only qualified personnel to use the system/product.
- ▶ Keep insufficiently qualified personnel out of the working area.

The different tasks described in this document require different qualifications of the persons who are to perform these tasks.

If no personnel qualifications are listed in the individual chapters of this document, the operating personnel is intended to perform the tasks.

Only persons who can be expected to perform the tasks reliably are authorized to perform the tasks. Persons whose ability to react is impaired e.g. by drugs, alcohol, or medicine, are not authorized.

This document uses the following qualifications for persons for the different tasks.

Qualified electrician

A qualified electrician is able to perform work on electrical systems and to detect and avoid possible dangers on his/her own based on his/her professional training, know-how and experience as well as knowledge of the applicable standards and regulations.

The qualified electrician has been trained for the special field where he/she works and knows the relevant standards and regulations.

Maintenance personnel of the operator

Maintenance personnel are those persons who are designated by the operator to perform simple maintenance tasks (e.g. cleaning the system/product, removing parts from the system/product). The operator has to ensure that the personnel is suited for performing the work.

The maintenance personnel is able to perform his/her work and to detect and avoid possible dangers on his/her own based on his/her professional training, know-how and experience as well as knowledge of the applicable standards and regulations.

The maintenance personnel has been trained for the special field where he/she works and knows the relevant standards and regulations.

Service personnel

Service personnel are persons who are authorized by the manufacturer LPKF for servicing the system/product. These tasks may only be performed by the LPKF Service.

Operating personnel

Operating personnel trained by the operator is able to perform his/her work and to detect and avoid possible dangers on his/her own based on the training performed by the operator, his/her professional training, and his/her know-how and experience.

The operating personnel has been trained by the operator for the special field where he/she works and knows the relevant standards and regulations.

1.6 Personal protective equipment

Personal protective equipment protects against health or safety risks when working with the system.

The individual sections of this document each point out the personal protective equipment (PPE) that has to be worn during the different tasks of working on the system.

Personal protective equipment

- Safety shoes (acc. to EN ISO 20345:2022, at least class S1)
- Protective gloves (acc. to EN 388:2016 - at least class 2121X)
- Heat-resistant protective gloves (acc. to EN 407:2020 - at least class 4343XX)

Personal protective equipment for working with hazardous substances and chemicals

- Splash goggles (acc. to EN 166:2001)
- Chemical-resistant gloves (acc. to EN ISO 374-1:2016)
- Closed work clothes

► Always read the safety data sheets before working with hazardous substances and chemicals and always observe the instructions given therein.

Description of the personal protective equipment



Splash goggles

Splash goggles protect the wearer's eyes against chemicals, dust, and splinters.



Chemical-resistant gloves

Chemical-resistant gloves protect the hands against immediate skin contact with hazardous substances. Refer to the safety data sheet for the required glove material and thickness.



Protective gloves

Protective gloves protect the hands against friction, abrasions, puncture hazards and deep cuts as well as when touching hot surfaces.



Protective clothing

Protective clothing protects the body (except head, hands, and feet) against hazards caused by e.g. heat, cold, and chemicals.



Safety shoes

Safety shoes protect the feet against crushing injuries, falling objects and from slipping on slippery surfaces.

1.7 Safety signs

This chapter lists the safety signs/pictograms that are applied to the system and describes their meaning.

WARNING

Risk of injury by non-observance of safety signs!

The safety signs on the system instruct you on safe usage of the system. Non-observance of the safety signs can cause severe injuries.

- ▶ Always observe the safety signs.
- ▶ Never remove the safety signs.
- ▶ If a safety sign is no longer legible, clean or replace the safety sign.

Safety signs at the housing



Risk by defective system!

Injury or property damage possible. Remedy defects of the system immediately. Switch off the system and disconnect it from the power supply.



Warning! Corrosive chemicals!

Wear your personal protective equipment. Avoid contact with eyes or skin and do not inhale fumes.



Warning! Chemicals hazardous to health!

Wear your personal protective equipment. Avoid contact with eyes or skin and do not inhale fumes.



Warning! Environmentally hazardous chemicals!

A release of the chemical (e.g. by improper disposal) can cause damage to the environment.



Warning! Irritant chemicals!
Wear your personal protective equipment.
Avoid contact with eyes or skin and do not inhale fumes.

1.8 Safety devices

This chapter describes the safety devices of the system and their function.

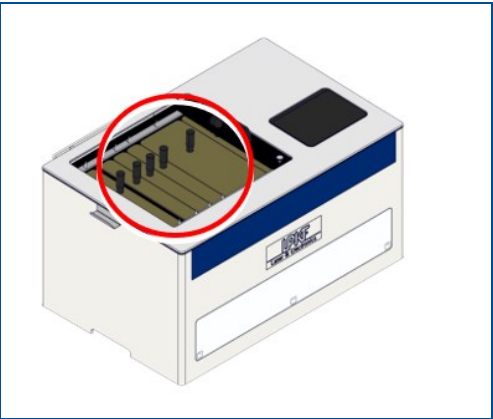


Fig. 1: Tank covers



Fig. 2: Fuse

Figure	Description
	The covers (figure 1) protect the operating personnel against inadvertent contact with chemical baths that are not in use. They also reduce evaporation and thus loss of chemicals.
	The fuse (figure 2) prevents damage to the system and injury to the operating personnel caused by overcurrent (e.g. due to a short circuit).

Table 1: Safety devices

1.9 Actions in case of an emergency

Preventive measures

- Always be prepared for fires and accidents!
- Keep first aid equipment (first aid kit, blankets etc.) and fire-fighting equipment functioning properly and close at hand.
- Instruct the personnel on incident reporting, first-aid equipment, and rescue equipment.
- Keep access routes clear for emergency vehicles.

Response to fire and accidents

- Immediately execute an emergency stop.
- Switch the main switch to 0 (OFF).
- Disconnect the supply of external components as quickly as possible.
- Recover persons from the danger zone if safe to do so.

1.10 Environmental protection

NOTICE

Environmental hazard by improper handling of substances!

Improper handling of environmentally hazardous substances, especially improper disposal, can cause considerable damage to the environment.

- ▶ Take appropriate measures immediately if environmentally hazardous substances are accidentally discharged into the environment. If you are in doubt, inform the appropriate local authorities about the damage and ask for appropriate measures that have to be taken.

This system uses several environmentally harmful substances. These may cause long-term adverse effects in the aquatic environment. The substances must not enter surface waters, drains, or soil.

Spent chemicals must not be emptied into the drains, they have to be filled into the containers intended for disposal.

Check which local and national regulations apply and observe these. For recommendations on disposal refer to the safety data sheets. If the regulations differ from the recommendations, observe the regulations.

The following environmentally hazardous substances are used:

- DS 650 C Intensifier
- CU 400 D Copper concentrate
- Electroless Tin Liquid

The following substances are not classified as environmentally hazardous. It is possible, however, that large quantities or frequent release are harmful to the environment and especially surface waters. Avoid the release of the following substances into the environment:

- DS 270 Cleaner/Conditioner
- DS 400 Catalyst Part A/Pre-Dip
- DS 500 Catalyst Part B
- DS 650 L Intensifier
- DS 650 P Intensifier
- CU 400 A Additive

Handling of wastewater

The wastewater produced when rinsing the PCB can have a high copper content and must not be discharged into the drain without treatment. Check which local and national regulations apply and observe these.



The PCB cleaning system that is optionally available from LPKF filters and retains the copper particles contained in the waste water. If you are using this system when through-hole plating, the water thus filtered may be drained off safely.

2 Technical data

General data

Data	Value	Unit
Protection class (EN 60529:1991 + A1:2000 + A2:2013)	IP20	–
Service life	10	years

Climatic conditions

Data	Value	Unit
Temperature range (operation)	20 to 25 (~68 to 77)	°C (°F)
Temperature range (storage, transport)	-30 to 60 (~-22 to 140)	°C (°F)
Max. humidity, non-condensing	90	%

Electrical data

Data	Value	Unit
Power supply	110/230	V
	50/60	Hz
Output power	750	VA

Mechanical data

Data	Value	Unit
Dimensions (width × height × depth)	856 × 450 × 540 (~33.7 × 17.7 × 21.3)	mm (in)
Weight (without packaging)	without anodes: 60 (~132.3) with anodes: 77 (~169.8)	kg (lbs)

Process data

Data	Value	Unit
Maximum base material size	230 × 330 (~9.06 × 12.99)	mm (in)
Maximum PCB size	200 × 300 (~7.87 × 11.81)	mm (in)
Process temperature range	20 to 25 (~68 to 77) and 60 (~140) (tank 1)	°C (°F)
Maximum aspect ratio	1:8	–

Emissions

Data	Value	Unit
Sound pressure level LpA (EN ISO 3744:2010)	< 70	dB (A)
Sound power level LwA (EN ISO 3744:2010)	< 70	dB (A)
EMC limit class (IEC 61326-1:2020)	A	-

3 Structure and function

This chapter describes the technical structure and the functions of the system.

3.1 Brief description

The Contac S4 is used for through-hole plating of PCBs and for galvanic strengthening of copper surfaces. This creates an electric connection between the different layers of the PCB. The through holes can have a minimum diameter of 0.2 mm (> 8 mil) and are plated.

The system is suited for processing double-sided and multi-layer PCBs. The process consists of the following six phases:

1. Cleaning the PCB
2. Conditioning th PCB
3. Activating the PCB
4. Active-cleaning the PCB
5. Copper-plating the PCB
6. Tin-plating the PCB

The fifth phase uses an air injection to create a more homogeneous copper deposition on the surface of the PCB.

The active-cleaning of the drilled holes after applying activation solution enabled bonding of the copper to the inner copper layer. This is especially important for plating micro vias and blind vias.

The **tin-plating** option is intended for applying a tin layer on copper surfaces of PCBs. The tin layer is chemically deposited, i.e. without electric current, and is intended to protect the copper surface against corrosion and to improve solderability. This also ensures further processing after a period of storage.

Reverse Pulse Plating

Reverse Pulse Plating (RPP) is implemented in the special LPKF control circuit that monitors the whole through-plating process.

Conventional electroplating results in increased deposition of material on the rims of the via holes due to the distribution of flux lines. This ridge buildup (dog-bone effect) during metal deposition occurs especially at a large depth-to-diameter ratio of the via holes (see **1** in the following figure).

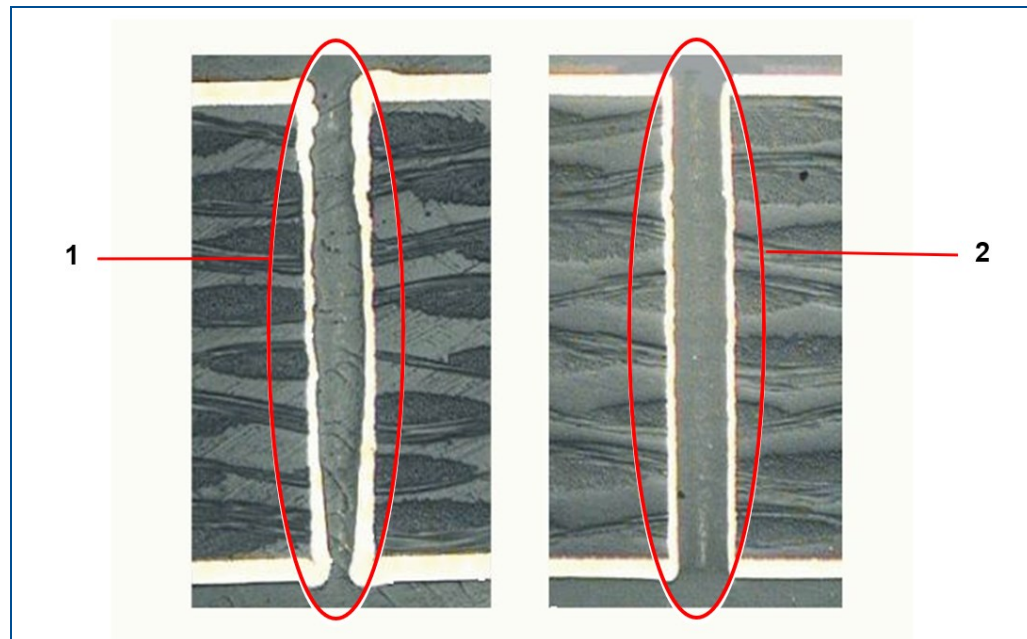


Fig. 3: Dog-bone effect

1 With dog-bone effect

2 Without dog-bone effect

Reverse pulse plating uses short inverted pulses during which the circuit board acts as the anode. This causes parts of the built-up material spikes to be removed so that the overall copper deposition is more uniform (see **2** in the figure above).

The **RPP function** is activated in the copper-plating profile as default, but it can be deactivated in the menu *Profiles* for newly created profiles.

It is recommended to use the **RPP function** for PCBs with holes of diameters < 0.4 mm (~0.02 in). The **RPP function** is also to be used if a uniform layer thickness and less board margin losses are desired.



The PCB surface is slightly matte after copper-plating with **RPP**. If you desire a more glossy surface, start another copper-plating cycle with 75% of the original amperage without **RPP** for 15 to 30 minutes.

3.2 Scope of delivery

This chapter provides an overview of the system's scope of delivery. For information on optional modules, accessories and extras refer to chapter Optional modules, accessories, extras on page 29.

- Contac S4 system
- Contac S4 user manual
- Mains cable (110 V)
- Mains cable (230 V)
- Protective gloves
- Safety glasses
- Measuring cylinder
- Skimmer
- Teflon rod
- 3× draining tubes (80 cm/31.5 in)
- 2 × pipette
- 2 × spray bottles

3.3 Type label

The type label is located at the housing of the system. For information on identifying the system and the relevant equipment, specify the system model and the serial number on the type label when you contact the LPKF Service.



Fig. 4: Type label

Name	Description
Model	System type
Version	Version number
Serial No.	Serial number
Voltage	Operating voltage
Frequency	Line frequency
Phase	Number of phases
Fuse	Fuse protection
Power	Power rating
Manufactured	Year of manufacture
Made in Slovenia	Country of origin

Table 2: Type label

3.4 System components

This chapter describes the components of the system. First of all, make yourself familiar with the individual components of the system before starting the operation. Before operating the system, also inform yourself about the important software elements and the different operation modes.

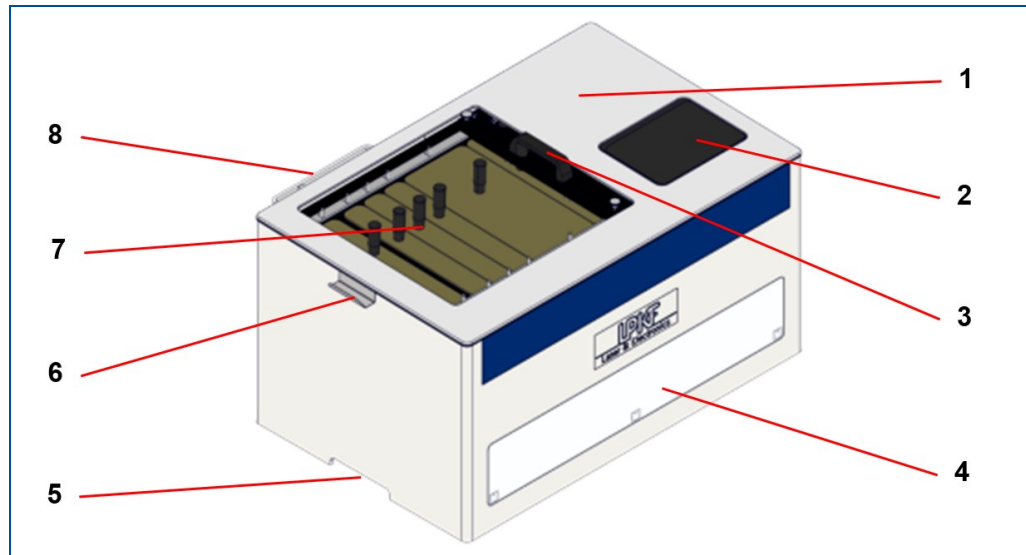


Fig. 5: System overview

- | | |
|------------------------------|----------------------------|
| 1 Glass cover (safety glass) | 5 Recessed grip |
| 2 Touch screen | 6 Retainer for PCB holders |
| 3 PCB holder | 7 Process tanks |
| 4 Cover for drain valves | 8 Deposit for tank covers |

3.4.1 Tanks

The system has six tanks for the individual phases of the through-hole plating process. The PCBs can be inserted into the tanks after fastening to the PCB holder. The tanks can be individually covered which prevents excessive evaporation of the chemicals and inadvertent contamination. Contamination of tank 3 can render the activation solution useless and necessitate complete replacement.

Tank 1 is heated to 60 °C (~140°F) at the start of the system if sufficiently filled. A sensor determines the fill level of the tank. If it is too low, an error message is displayed.

Tank 5 is equipped with an air injection that constantly keeps the contained chemical in motion. Thus, a more uniform distribution of the copper components and a more uniform through-hole plating is enabled. This function is activated as soon as the copper-plating phase is started.

The chemicals in the tanks can be drained via drain valves inside the system. The drain valves are accessible behind a cover on the front of the system.

The system contains the following tanks:

	Function	Chemical	Capacity	Heated?
Tank 1	Cleaning	DS 270 Cleaner/Conditioner	5 liters	yes, 60 °C
Tank 2	Conditioning	DS 400 Catalyst Part A/Pre-Dip	5 liters	no
Tank 3	Activating	DS 400 Catalyst Part A/Pre-Dip DS 500 Catalyst Part B	5 liters	no
Tank 4	Active-cleaning	DS 650 L Intensifier DS 650 P Intensifier DS 650 C Intensifier	5 liters	no
Tank 5	Copper-plating	CU 400 D Copper concentrate CU 400 A Additive	15 liters	no
Tank 6	Tin-plating	Electroless Tin Liquid	5 liters	no

Table 3: Overview of the tank

3.4.2 Touchscreen

The system has a touch screen that can be operated with bare fingers or gloves on. The touch screen is chemical-proof.

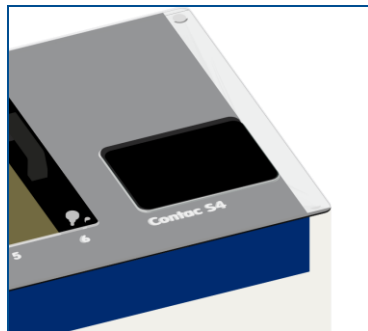


Fig. 6: Touch screen

3.4.3 PCB holder

A PCB is fastened to the PCB holder for the through-hole plating process so that they can be inserted into the tanks. The PCB holder can be used for all tanks, no matter whether they use a current or not.

The PCB holder is mounted into a motorized frame that moves the PCB during the process in order to remove potential air bubbles from the PCB.

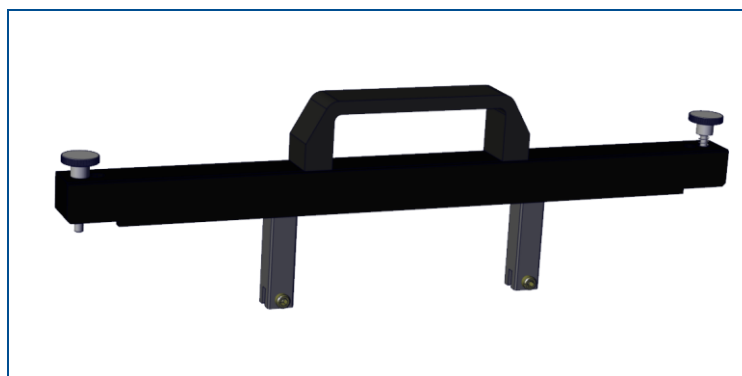


Fig. 7: PCB holder

3.5 Optional modules, accessories, extras

The following consumables are required for filling and using the tanks:

Name	Quantity
DS 270 Cleaner/Conditioner	0.5 liters
DS 400 Catalyst Part A/Pre-Dip	2 × 5 liters
DS 500 Catalyst Part B	1 liter
DS 650 L Intensifier	3 liters
DS 650 P Intensifier	0.5 liters
DS 650 C Intensifier	0.1 liters
CU 400 D Copper concentrate	15 liters
CU 400 A Additive	1 liter
Electroless Tin Liquid	5 liters
Distilled water	10 liters

Table 4: Consumables



The consumables mentioned above can be purchased at LPKF with the following order code: 10149151 Set of chemicals Palladium Contac S4

The following items are needed additionally:

- Containers for disposal of spent chemicals
- Sink for rinsing the PCBs

3.6 Connections

The connectors are on the right side of the system:

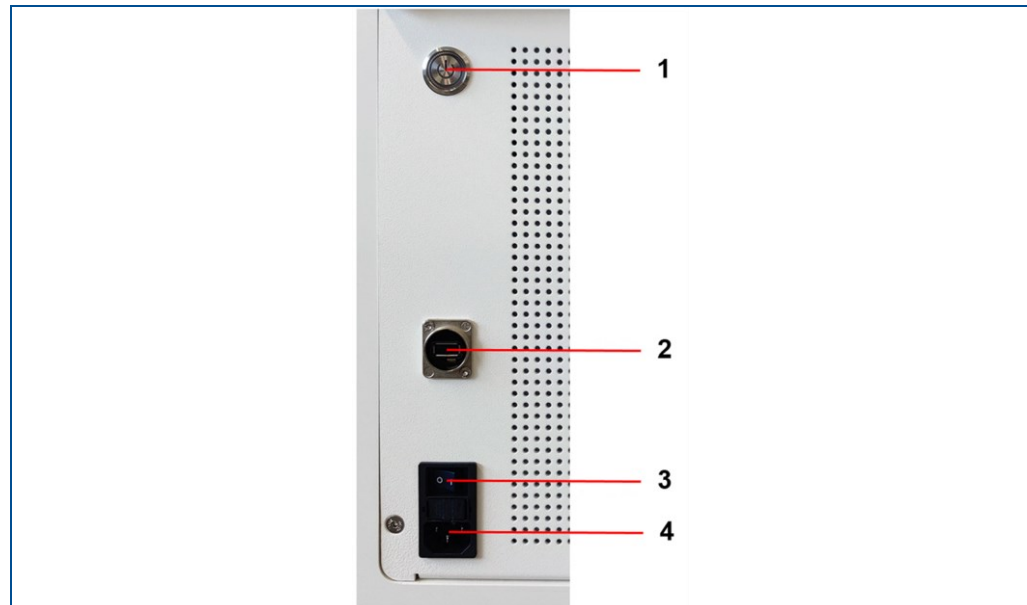


Fig. 8: Connectors

1 On/Off button

2 USB port

3 Main switch

4 System power inlet

The **USB port (2)** can be used to install newer versions of the system software.

3.7 Displays and control elements

This chapter describes the displays and control elements of the system. First of all, make yourself familiar with the individual components of the system before starting the operation.

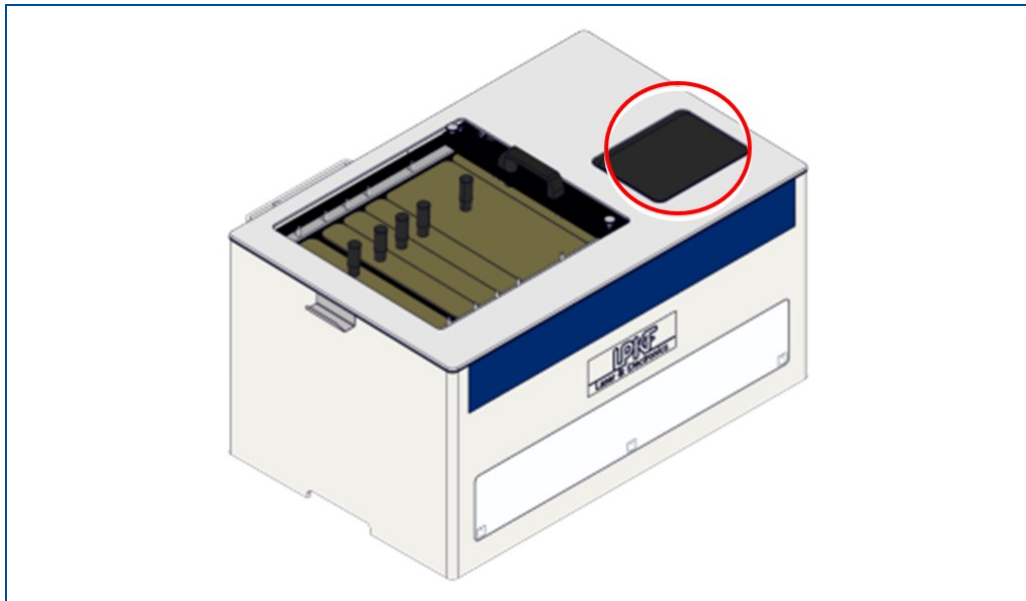


Fig. 9: Touch screen

Figure	Description
	The touch screen is used for operating the system, it reacts to touch with bare fingers or with chemical-resistant gloves.

3.8 Software

The system is controlled with the pre-installed firmware called EPIC (Electroplating Integrated Control). The firmware assists you during the through-hole plating process by displaying the instructions and the processing time of the current phase or other important information (e.g. the current temperature of tank 1). The firmware also starts certain functions (e.g. air injection) automatically as soon as the corresponding phase is started.

Default profiles are preset for certain materials and processes. Custom profiles that are optimized for your purposes can also be created. You can set the duration of certain phases, the amperage in tank 5 etc. individually in these profiles.

You can also display information on the state of the chemicals and thus determine in time which tank contents have to be replaced.

The system is operated using the touch screen on the top side of the system.

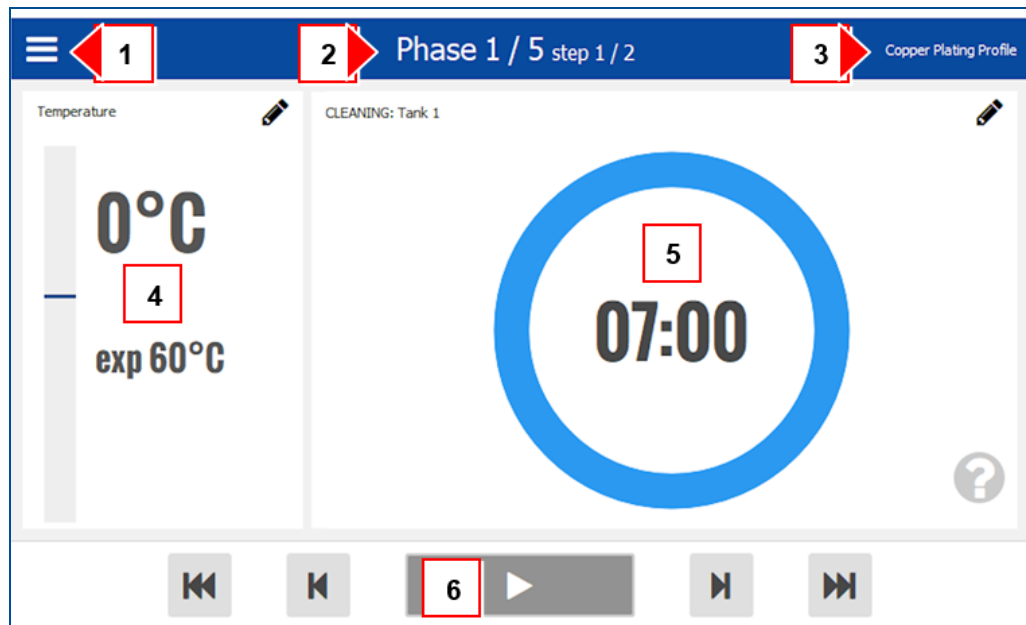


Fig. 10: User interface

- | | |
|----------------------------------|------------------------------|
| 1 Main menu | 4 Special process properties |
| 2 Current process phase and step | 5 Process duration |
| 3 Active profile | 6 Navigation bar |

Profiles

The process parameters can be adjusted and stored in the profiles. The parameters are defined for PCBs of specific sizes and should only be used for these sizes to achieve optimum results. Sizes that differ from the defaults can be defined in user-defined profiles.

Fig. 11: Profile view

The following parameters can be defined in a profile:

Name	Description
Name	Profile name
Height and width	Dimensions of the PCB (in mm)
Cleaning (tank 1)	Duration (in minutes) and temperature (in °C) of the first process phase.
Conditioning (tank 2)	Duration (in minutes) of the second process phase.
Activation (tank 3)	Duration (in minutes) of the third process phase.
Active-cleaning (tank 4)	Duration (in minutes) of the fourth process phase. This is calculated automatically.
Copper-plating (tank 5)	Duration (in minutes) of the fifth process phase and thickness of the deposited copper layer (in μm). The functions RPP , Air , and Pause can be activated additionally.
Tin-plating (tank 6)	Duration (in minutes) of the sixth process phase and thickness of the deposited tin layer (in μm).
RPP	Reverse pulse plating see page 23.
Air	Activates the air injection.
Pause	Activates/Deactivates a pause for turning the PCB around after the first half of the copper-plating phase. This achieves a homogeneous copper-plating of both sides.

Table 5: Profile parameters

The following profiles are available by default:

		Dimensions (in mm)		Tanks (duration in minutes)								
No.	Name	Height	Width	1	2	3	4	5	6	RPP	Air	Pause
1	Copper Plating Profile	305	230	7	1	7	4	90	0	On	On	On
2	Tin Plating Profile	305	230	0	0	0	/	0	30	Off	Off	Off

Table 6: Profiles overview

You can also create and edit new profiles. For further information refer to page 80.

4 Transport and storage

This chapter contains important information on transport, packaging and storage of the system.

CAUTION

Risk of crushing injury by improper transport of the system!

Body parts can be crushed by improper transport of the system.

- ▶ Wear your personal protective equipment.
- ▶ Carry the system only at the recessed grips.
- ▶ When setting the system down, ensure that no body parts get pinched or crushed.

4.1 Transport inspection

Check the delivered goods immediately upon receipt for completeness and for transport damage.

If transport damage is evident, proceed as follows:

- ▶ Do not accept the delivery or only with reservations.
- ▶ Record the extent of damage on the transport documentation or on the delivery note of the transport company.
- ▶ Initiate a complaint.

4.2 Packaging

The packaging is chosen according to the transport conditions.

The packaging is to protect the system from transport damage, corrosion, and other kinds of damage until installation.

- ▶ Keep the packaging in its original form.
- ▶ Only remove the packaging just before installation.

4.2.1 Handling packaging material

- ▶ Dispose of the packaging material according to the current laws and local regulations.

NOTICE

Environmental hazard by wrong disposal of packaging!

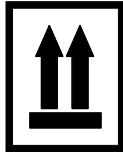
Wrong disposal of packaging material can cause environmental hazards.

- ▶ Dispose of the packaging material environmentally friendly.
- ▶ Observe the local disposal regulations and hire a specialized company for the disposal, if necessary.

- ▶ The system may only be shipped in the original packaging of LPKF. Contact the LPKF Service if you need the packaging.

4.2.2 Symbols on the packaging

Observe the following symbols on the packaging when transporting the system:

**Top**

The arrowheads of the symbol indicate the top side of the package. These always have to point upwards, otherwise, the contents could be damaged.

**Keep dry**

Protect packages against moisture and keep them dry.

**Fragile**

Identifies packages with fragile or sensitive contents. Handle the package with care, do not drop, and do not subject it to shocks.

4.3 Unpacking the system

This chapter describes how to unpack the system.

The system weighs 60 kg (~132.3 lbs) (without anode plates) and has to be carried by two persons. The system has a recessed grip on both sides for lifting and carrying the system.

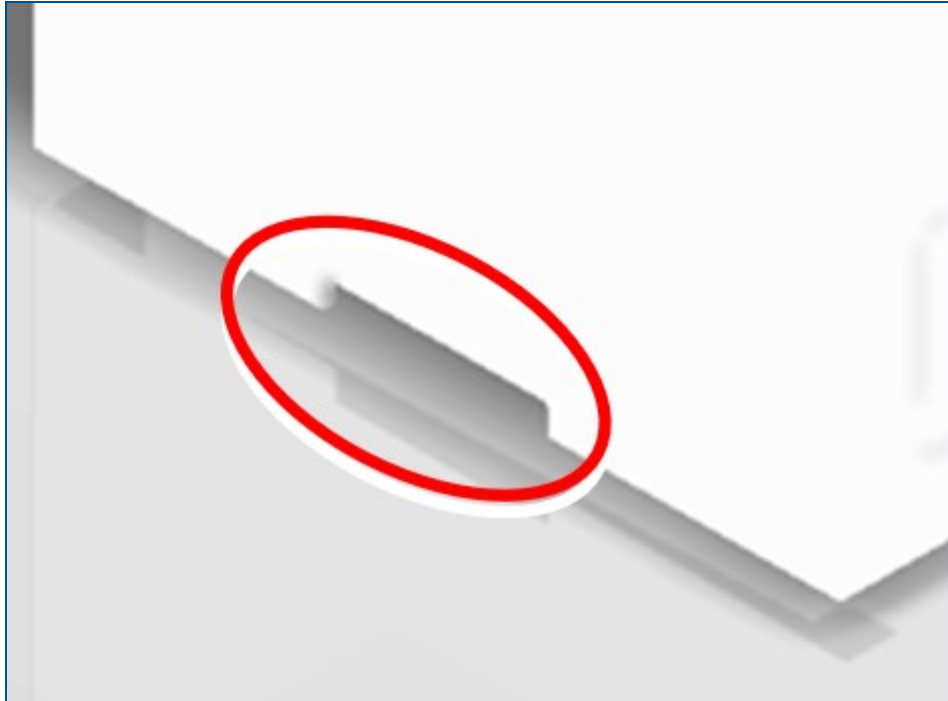


Fig. 12: Recessed grip

Ensure that the following prerequisites are fulfilled before performing the described tasks:

Prerequisites

- Wear protective gloves
- Wear safety shoes
- Work in a team of two persons.

Spare parts and auxiliaries

- (Cordless) screwdriver

■ Unpacking the system

1. Remove the screws from the lid.

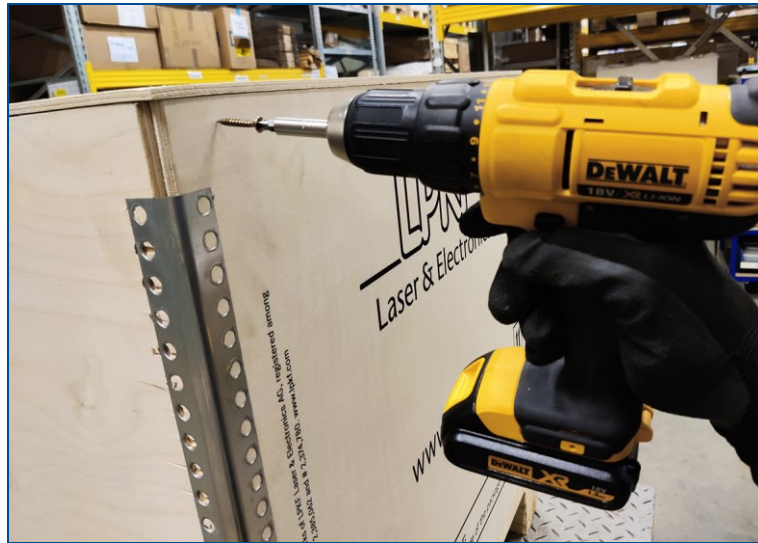


Fig. 13: Removing screws of the lid

2. Remove the lid.



Fig. 14: Removing the lid

3. Remove all the screws at the lower side of all side panels.

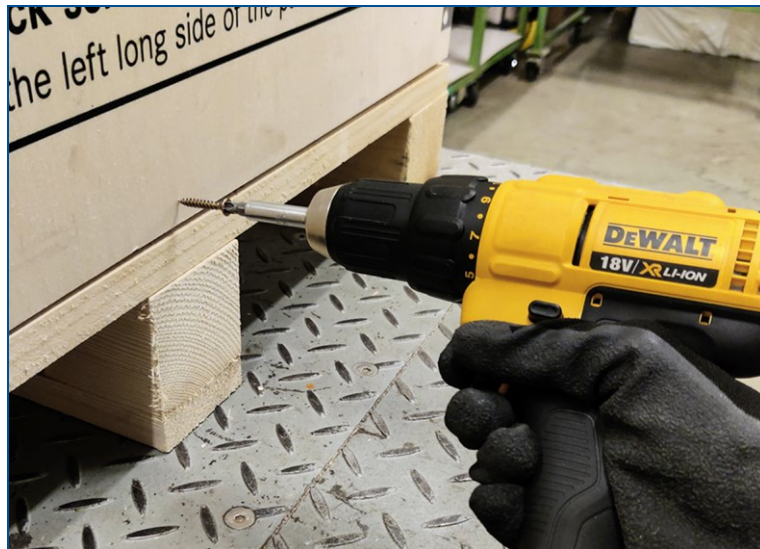


Fig. 15: Removing the screws

4. With the help of another person, pull the transport box upwards.



Fig. 16: Pulling the transport box upwards

- ☐ The foam padding is accessible.

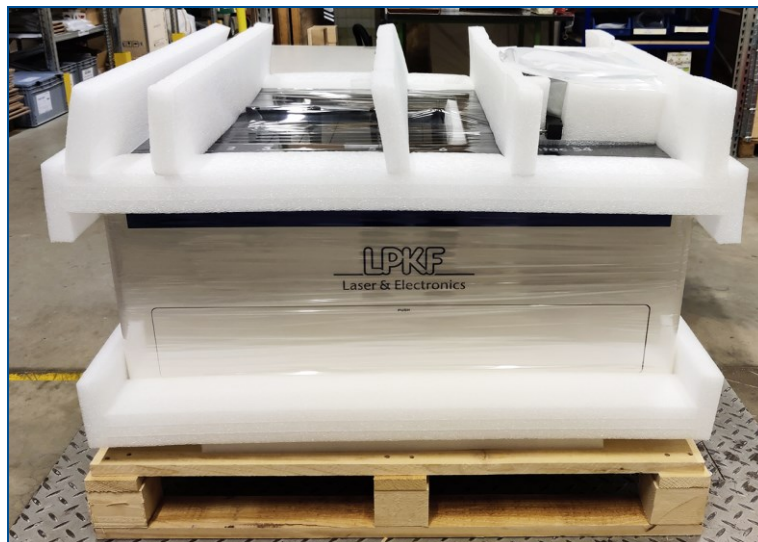


Fig. 17: Foam support and accessories

5. Remove the foam padding and the accessories.



Fig. 18: Foam padding and accessories removed

CAUTION! Risk of crushing injury by improper transport of the system!

Body parts can be crushed by improper transport of the system.

- ▶ Wear your personal protective equipment.
- ▶ Carry the system only at the recessed grips.
- ▶ When setting the system down, ensure that no body parts get pinched or crushed.

6. Lift the system **with the help of another person** by using the recessed grip on both sides.



Fig. 19: System lifted by two persons

7. Put the system onto a stable and even surface with an appropriate load-bearing capacity.



The system can be transported over short distances (e.g., within a room or a building) using a table trolley. Make sure that the table trolley has an appropriate load-bearing capacity.



☒ The system has been unpacked.

4.4 Transporting the system

Ensure that the following requirements are met before performing the steps below:

Prerequisites

- Wear safety shoes
- Wear protective gloves
- Work with another person
- System is switched off.
- System is not filled with chemicals.

The system weighs 60 kg (~132.3 lbs) (without anode plates) and has to be carried by two persons. The system has a recessed grip on both sides for lifting the system.

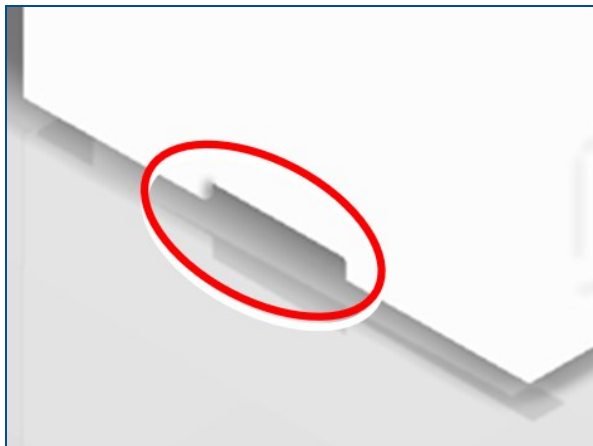


Fig. 20: Recessed grip

■ Transporting the system

1. Ensure that the system is switched off.
 2. Ensure that all chemicals have been drained.
 3. Remove the mains cable.
 4. Lift the system with another person simultaneously at the two recessed grips.
 5. Set the system down at the intended place.
- ☒ The system has been transported.

4.5 Storage

- ▶ Store the system in its original packaging according to the symbols on the packaging.
- ▶ Store the packages under the following conditions:
 - Do not store outdoors.
 - Store dry and dust-free.
 - Do not expose to aggressive substances.
 - Protect against sunlight.
 - Storage temperature: 15 °C - 35 °C (59 °F - 95 °F)
 - Relative air humidity: 60 % max, non-condensing.
 - If storing for more than 3 months, check the general condition of all components and the packaging on a regular basis.

5 First startup

This chapter contains important information on first startup of the system.

5.1 Safety

Observe the following safety instructions for the first startup of the system:

DANGER

Danger to life by electrical shock!

Touching energized parts causes a direct danger to life by electrical shock. Damage to the insulation or damaged individual parts can be dangerous to life.

- ▶ Use only the mains cable included in the delivery or a mains cable approved by LPKF.
- ▶ All work on energized components of the system must be performed by a qualified electrician.
- ▶ If the insulation is damaged, switch off the power supply immediately and initiate the repair.
- ▶ De-energize all energized components of the system or equipment, before working with them. Ensure that the system or equipment is de-energized for the whole time of the task.
- ▶ Never bridge or deactivate fuses.
- ▶ Always keep moisture away from energized parts because it can cause a short circuit.

WARNING

Accident hazard due to insufficiently qualified personnel!

Insufficiently qualified personnel cannot assess the risks of using the system and put themselves and others in danger.

- ▶ Allow only qualified personnel to use the system.
- ▶ Keep insufficiently qualified personnel out of the working area.

WARNING

Health hazard by contact with chemicals!

Contact with the chemicals can cause serious damage to health:

Inhaling can irritate nose, throat and lungs and can cause allergic respiratory problems.

Skin contact can cause chemical burns, allergies, and hypersensitivity.

Eye contact can irritate the eyes and mucous membranes with burning and tears and can cause impaired vision and serious eye damage.

Ingestion can cause chemical burns of the mucous membranes, throat, esophagus, and stomach and can cause gastrointestinal complaints.

- ▶ Read the provided safety data sheets carefully.
- ▶ Work in well-ventilated rooms.
- ▶ Wear your personal protective equipment.
- ▶ Avoid direct contact with the chemicals.
- ▶ Take off contaminated clothes immediately.
- ▶ Wash your hands thoroughly after work.

NOTICE**Property damage due to contaminants on the anodes!**

Contaminants like e.g. finger prints interfere with the copper release of the anodes and cause a particle discharge that contaminates the bath.

- ▶ Touch the copper anodes only with clean protective gloves.

NOTICE**Property damage by spilled liquids!**

Spilling liquids over electrical components can cause a short circuit.

- ▶ Switch the system off and disconnect it from the power supply.
- ▶ Remove the liquid with dry paper towels.
- ▶ If CU 400 D Copper concentrate has been spilled, contact the LPKF Service.
- ▶ Let the system dry at room temperature, at least one day before the next start.

5.2 Requirements of the place of installation

Before installing the system, the following requirements of the place of installation have to be ensured.

- Climatic conditions
- Minimum required space
- Floor
- Connections provided by the customer

5.2.1 Climatic conditions

The following climatic conditions have to be ensured for operating the system:

Climatic conditions

Data	Value	Unit
Temperature range (operation)	20 to 25 (~68 to 77)	°C (°F)
Temperature range (storage, transport)	-30 to 60 (~-22 to 140)	°C (°F)
Max. humidity, non-condensing	90	%

Ventilation of the place of installation

The choice of the place of installation must ensure that 4 air exchanges per hour are possible.

The following table provides an overview on air exchange rates that you can achieve by opening the windows of the laboratory.



The values in the table are guidelines and can vary strongly depending on the building, room size, window sizes, and ambient temperature. The operator has to ensure that the required air exchange is always achieved during operation.

Window position	Air exchanges per hour
Window tilted	0.8 – 4.0
Window fully open	9.0 – 15.0
Window fully open and opposite door or opposite window fully open (cross ventilation)	Up to 40.0

Table 7: Air exchange depending on window position



Great differences between the indoor temperature and the outdoor temperature enhance the air exchange via opened windows. LPKF recommends to ensure air exchange by cross ventilation in case of warm outdoor temperatures.

5.2.2 Minimum required space

System dimensions

Width: 891 mm (~35.1 in)
 Depth: 562 mm (~22.1 in)
 Height: 450 mm (~17.7 in)

Minimum space requirements for operation and maintenance

Width: 991 mm (~39.0 in)
 Depth: 1562 mm (~61.5 in)
 Height: 800 mm (~31.5 in)

A space of approx. 10 cm (~3.9 in) to the right of the system has to be kept clear for maintenance. In front of the system, at least 1 m (~3.3 ft) of space should be available for operation and movement. On the left side of the system should be enough space for using the retainers. Additionally, on the right side of the system there should be a safety distance of 1 m (~3.3 ft) to the water connection (e.g. sink).

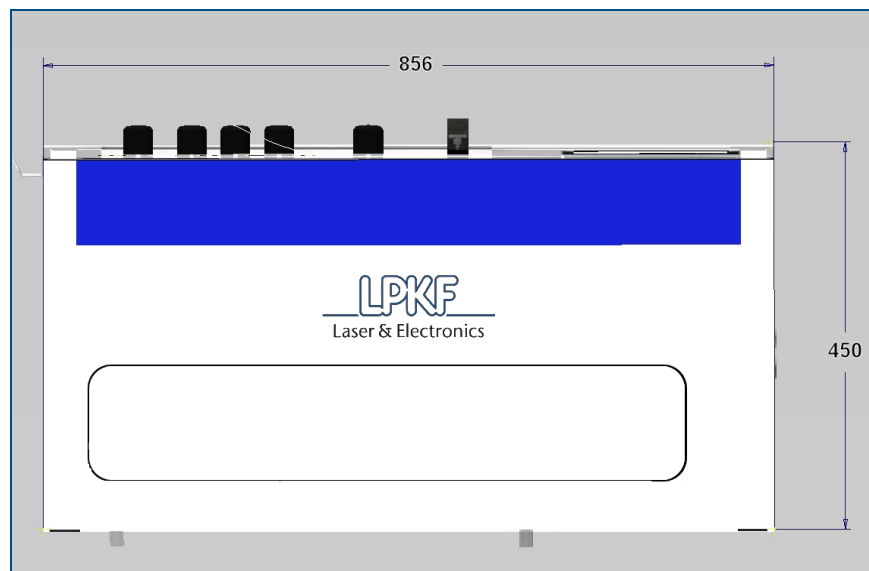


Fig. 21: System dimensions - front view

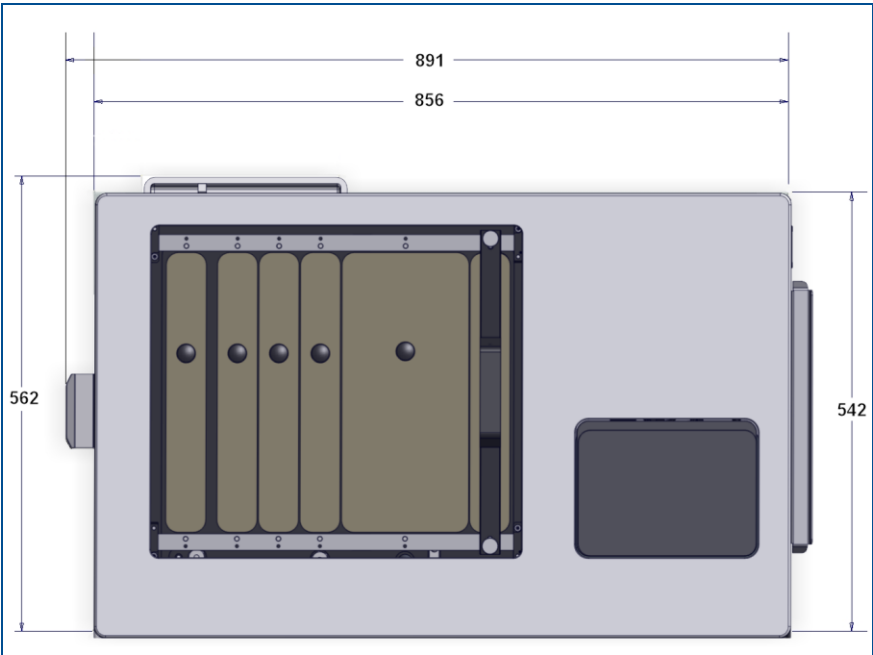


Fig. 22: System dimensions - top view

5.2.3 Floor

The floor has to be level and antistatic and has to have a sufficient load-bearing capacity for the total weight of the system (117 kg/~258 lbs with filled tanks). We recommend to use a sturdy, fixed table without casters.

 **WARNING**

Risk of injury by loss of stability!
Loss of stability due to an improper floor or missing locks can cause uncontrollable movement or tilting of the system. This can cause serious injuries.

- ▶ Ensure that the floor is even and has a sufficient load-bearing capacity.
- ▶ Secure the system properly so that it cannot roll away unintentionally.

5.2.4 Connections provided by the customer

Electrical data

Data	Value	Unit
Power supply	110/230	V
	50/60	Hz
Output power	750	VA

5.3 Preparations

The copper anodes have to be installed before the system can be put into operation.

NOTICE

Property damage due to contaminants on the anodes!

Contaminants like e.g. finger prints interfere with the copper release of the anodes and cause a particle discharge that contaminates the bath.

- Touch the copper anodes only with clean protective gloves.

■ Installing the copper anodes

1. Take the copper anodes and the anode bags out of the packaging.
2. Put the anodes into the bags with the holes at the mouths of the bags.



Fig. 23: Copper anode in bag

Notice! Damage by falling copper anodes!

- Put padding (e.g. expanded material) into tank 5 before installing the anodes.

3. Hang one copper anode by its two holes onto the gray pins on the left wall of tank 5.



Take care that the small hole at the edge of the anode points to the front of the system and that the anode bag is not jammed between the anode and the pins.



Fig. 24: Gray pins

4. Hang the other copper anode by its two holes onto the gray pins on the right wall of tank 5.

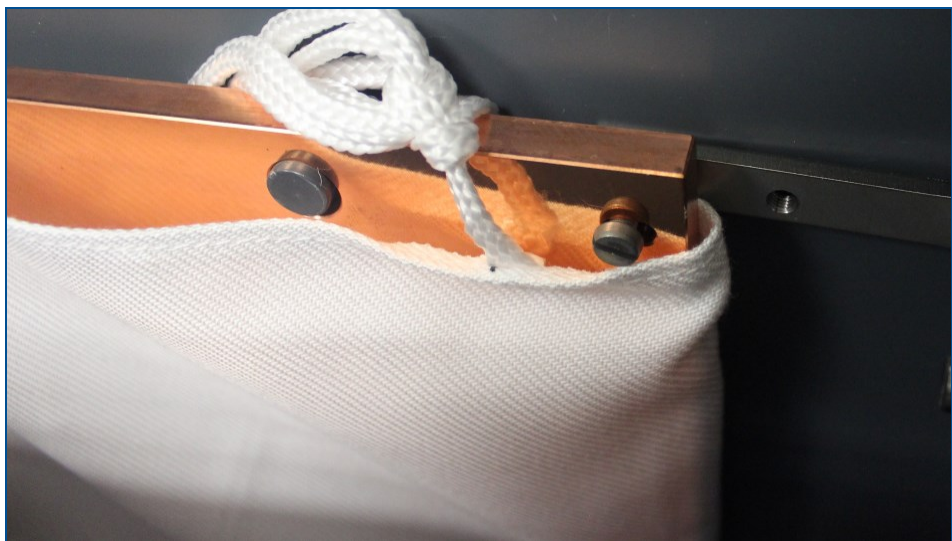


Fig. 25: Installing the copper anodes

5. Fasten the anode plates to one titan bracket each using a flat-bladed screwdriver.



Fig. 26: Fastening the anode to the titan bracket

- ☒ The copper anodes have been installed.

5.4 Connecting the system

The following tasks have to be executed to start up the system.

- **Filling the tanks**
 - Filling tank 1 (cleaning)
 - Filling tank 2 (conditioning)
 - Filling tank 4 (active-cleaning)
 - Filling tank 5 (copper-plating)
 - Filling tank 6 (tin-plating)
 - Filling tank 3 (activation)
- **Connecting the system to the power supply**
- **Initializing the system**

5.4.1 Filling the tanks

Ensure that the following prerequisites are fulfilled before performing the described tasks:

Prerequisites

- Wear splash goggles
- Wear chemical-resistant gloves
- Wear closed work clothes

Spare parts and auxiliaries

- Chemicals for filling the tanks
- Jerry can



The tanks have been cleaned and rinsed before delivery, thus the chemicals can be filled without delay.



Ensure that the drain valves are closed to prevent leakage of the liquids.

■ Filling tank 1 | Cleaning solution

1. Remove the cover of tank 1 and put it into the holder slot.
2. Mix the cleaning solution (5 liters). Proceed as follows:
 - Fill 4.85 liters of de-ionized water into tank 1.
 - Shake the container **DS 270 Cleaner/Conditioner** well.
 - Add 0.15 liters of **DS 270 Cleaner/Conditioner**.
 - The cleaning solution is mixed and ready to use.



Ensure that tank 1 is always sufficiently filled. Evaporation losses can be compensated with de-ionized water.

3. Place the cover on tank 1.



Tank 1 has been filled.

■ Filling tank 2 | Conditioning solution

1. Remove the cover of tank 2 and put it into the holder slot.
2. Fill tank 2 with **DS 400 Catalyst Part A/Pre-Dip** up to the mark (5 liters).
3. Place the cover on tank 2.

☒ Tank 2 has been filled.

■ Filling tank 4 | Active-cleaning solution

1. Remove the cover of tank 4 and put it into the holder slot.
2. Mix the active-cleaning solution (5 liters). Proceed in exactly this order:
 - Fill 2 liters of de-ionized water into tank 4.
 - Add 2.15 liters of **Intensifier DS650 L**.
 - Add 0.5 liters of **Intensifier DS650 P**.
 - Add 0.05 liters of **Intensifier DS650 C**.
 - If necessary, add de-ionized water up to the mark in tank 4.
 - The active-cleaning solution is mixed and ready to use.
3. Place the cover on tank 4.

☒ Tank 4 has been filled.

■ Filling tank 5 | Copper-plating solution

1. Remove the cover of tank 5 and put it into the holder slot.
2. Fill tank 5 with **CU 400 D Copper concentrate** up to the mark (15 liters).
3. Place the cover on tank 5.

☒ Tank 5 has been filled.

■ Filling tank 6 | Tin-plating solution

1. Remove the cover of tank 6 and put it into the holder slot.
2. Fill tank 6 with **Electroless Tin Liquid** up to the mark (5 liters).
3. Place the cover onto tank 6.

☒ Tank 6 has been filled.



Tank 3 (activation) should be filled last to avoid malfunction of the chemical caused by inadvertent splashes.



Never pass the Cleaner liquids through the same tube as the activation solution. This could cause contamination and quality losses in processing.

■ Filling tank 3 | Activation solution

1. Remove the cover of tank 3 and put it into the holder slot.



The activation solution is very sensitive and can easily become unusable. Tank 3 has to be absolutely dry before being filled.

2. Mix the activation solution (5 liters). Proceed in exactly this order:

- Fill 4 liters of **DS 400 Catalyst Part A/Pre-Dip** in tank 3.
- Add 1 liter of **DS 500 Catalyst Part B**.
- The activation solution is mixed and ready to use.

3. Place the cover on tank 3.



Tank 3 has been filled.



It is recommended to store the containers for later disposal of the chemicals.

■ Connecting the system to the power supply

1. Check whether the main switch is switched to 0 and switch it to this position if not.



Fig. 27: Power supply

2. Plug the mains cable into the appliance inlet.



Fig. 28: Mains cable plugged into appliance inlet

3. Plug the mains cable into the wall socket.

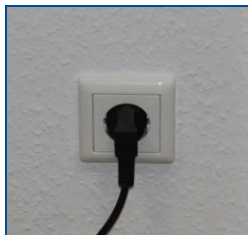


Fig. 29: Mains cable plugged into wall socket

- ☒ The system has been connected to the power supply.

The system has to be initialized after connecting and filling. This requires a PCB that subsequently, however, cannot be processed any further. Thus, you should use a dummy PCB that is not intended for further processing.



Initialization

The initialization of the copper anodes takes 240 minutes. Initialization creates a thin homogeneous phosphorus layer that helps creating shiny copper layers. Insufficient initialization can cause matte and inhomogeneous copper layers to be deposited during the first process runs.

■ Initializing the system

1. Switch the main switch on the right side of the system to I (On).



Fig. 30: Main switch On

2. Press the On/Off button for at least two seconds.



Fig. 31: On/Off button

- ☐ Tank 1 is heated.
- 3. Follow the instructions on the touch screen.
- ☐ The process view is displayed.
- 4. Tap on .
- ☐ The following view is displayed:

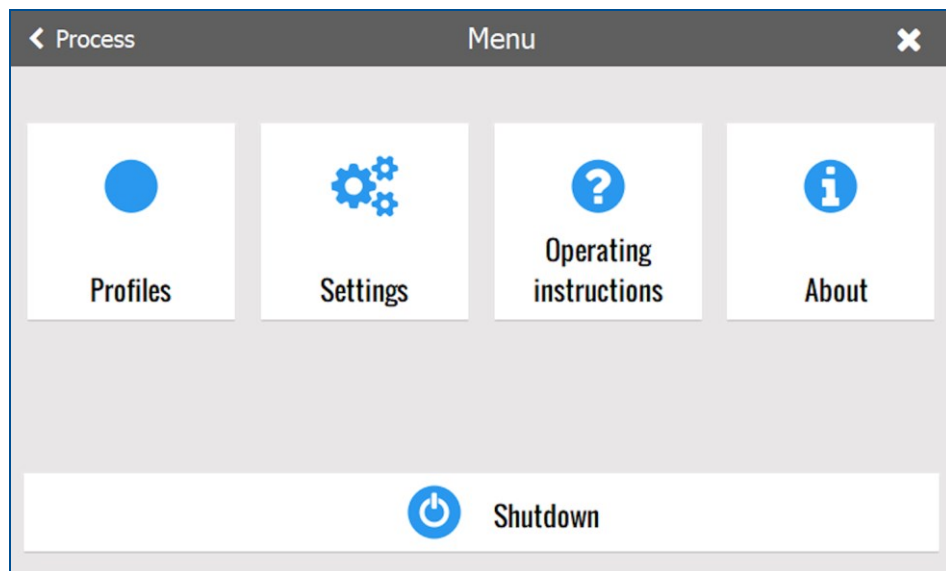


Fig. 32: Main menu

5. Tap on [Settings].

- The following view is displayed:

Fig. 33: Settings | General

6. Switch to the tab *Service*.

Item	Date	Time left	Action
Anode maintenance	11.03.2025	343 days	Service
Cleaning solution	0 mm²	100 %	Reset
Conditioning solution	0 mm²	100 %	Reset
Activation solution	0 mm²	100 %	Reset
Active-cleaning solution	0 mm²	100 %	Reset
Plating solution filtered	11.03.2025	68 days	Reset
Copper-plating solution	11.03.2025	343 days	Service
Additive CU 400 A	0 Ah	100 %	Service
Tin-plating solution	557420 mm²	50 %	Reset

Fig. 34: Settings | Service

7. In the line *Anode maintenance* tap on [Service].
8. Fasten the dummy PCB to the PCB holder.
9. Rinse the dummy PCB with water.
10. Insert the dummy PCB into tank 5.
11. Tap on .
- The displayed processing time is counted down.
12. Wait until the time has elapsed.

- ☐ The next task is displayed.
- 13. Remove the dummy PCB from the tank.
- 14. Let the dummy PCB drip off into tank 5.
- 15. Rinse the dummy PCB with water.
- 16. Dispose of the dummy PCB according to regulations.
- 17. Add 60 ml of **CU 400 A Additive** to tank 5
- ☒ The system has been initialized.

6 Operating the system

This chapter contains important information on operating the system and the associated software programs.

6.1 Safety

WARNING

Health hazard by contact with chemicals!

Contact with the chemicals can cause serious damage to health:

Inhaling can irritate nose, throat and lungs and can cause allergic respiratory problems.

Skin contact can cause chemical burns, allergies, and hypersensitivity.

Eye contact can irritate the eyes and mucous membranes with burning and tears and can cause impaired vision and serious eye damage.

Ingestion can cause chemical burns of the mucous membranes, throat, esophagus, and stomach and can cause gastrointestinal complaints.

- ▶ Read the provided safety data sheets carefully.
- ▶ Work in well-ventilated rooms.
- ▶ Wear your personal protective equipment.
- ▶ Avoid direct contact with the chemicals.
- ▶ Take off contaminated clothes immediately.
- ▶ Wash your hands thoroughly after work.

WARNING

Health hazard by inhalation of fumes!

Inhalation of the resulting fumes can cause health damage.

- ▶ Work only in rooms with an air change rate of at least 4/h.

CAUTION

Risk of crushing injury by movement of the motorized frame!

The motorized frame moves during the through-hole plating process and can cause crushing injuries.

- ▶ Do not grasp the motorized frame during through-hole plating.

NOTICE

Property damage due to missing cover!

A cover missing on a tank can cause the bath to be not ready for use or to become completely unusable (by evaporation or contamination).

- ▶ Cover the tanks that are not in use with the provided covers.

NOTICE**Property damage by contamination of the activation bath!**

The activation bath is very sensitive to contaminants and can become unusable if even slightly contaminated.

- ▶ Avoid any contamination of the activation bath.
- ▶ Always cover the activation tank when not in use.
- ▶ Never compensate evaporation losses with water. Replenish with DS 400 Catalyst Part A/Pre-Dip up to the mark.

NOTICE**Property damage by spilled liquids!**

Spilling liquids over electrical components can cause a short circuit.

- ▶ Switch the system off and disconnect it from the power supply.
- ▶ Remove the liquid with dry paper towels.
- ▶ If CU 400 D Copper concentrate has been spilled, contact the LPKF Service.
- ▶ Let the system dry at room temperature, at least one day before the next start.

6.2 Preparations for use

Before working with the system check the following settings and conditions:

- Ensure that the room temperature is between 20 and 25 °C (~68 and 77 °F).
- Check the fill level of tank 1.
- Check whether copper sulphate crystals have formed at the edge of tank 5/the anodes and put the crystals back into the copper-plating solution, if present.
- Place a spray bottle filled with de-ionized water next to the system.

6.3 Typical production process

This chapter describes a typical production process.

Ensure that the following consumables and auxiliaries are available before performing the described tasks:

Consumables

- Base material with drilled holes

Auxiliaries

- Splash goggles
- Chemical-resistant gloves
- Protective gloves
- Oil-free compressed air
- Cleaning brush
- Distilled water
- Tap water
- Teflon rod
- Hair-dryer

The following steps are performed:

- [Process preparation](#)
- [Process sequence](#)



During the through-hole plating process, all required steps are prompted and described by messages on the screen.

Process preparation

This chapter describes the preparations for the process of copper-plating a PCB with subsequent tin-plating. The following tasks are executed:

- [Switching on the system](#)
- [Selecting a profile](#)

■ Switching on the system

1. Switch the main switch on the right side of the system to I (On).



Fig. 35: Main switch On

2. Press the On/Off button for at least two seconds.



Fig. 36: On/Off button

- ☐ Tank 1 is heated.
- 3. Follow the instructions on the touch screen.
- ☐ The following view is displayed:

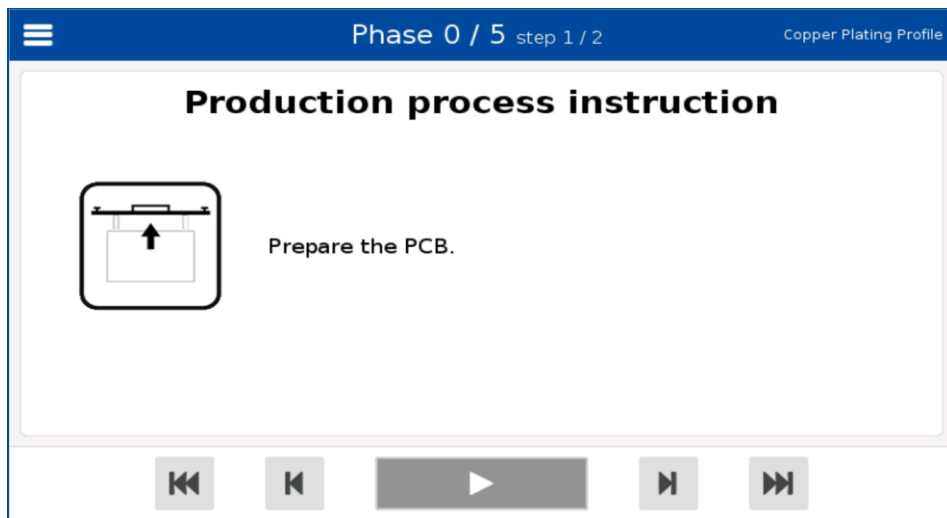


Fig. 37: Process view

- ☒ The system has been switched on.



Before starting the through-hole plating of the PCB, you should select the correct profile. This defines which steps you will execute and how long the PCB will dwell in the tanks. For information on creating and editing profiles refer to page 80.

■ Selecting a profile

1. Tap on .
- ☐ The menu is opened.

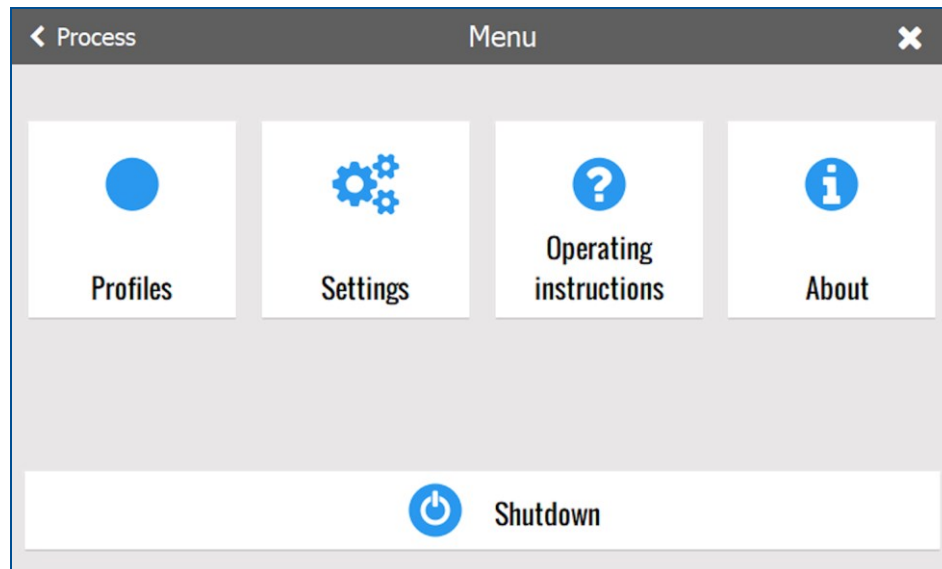


Fig. 38: Main menu

2. Tap on [Profiles].
- ☐ The profile overview is displayed:

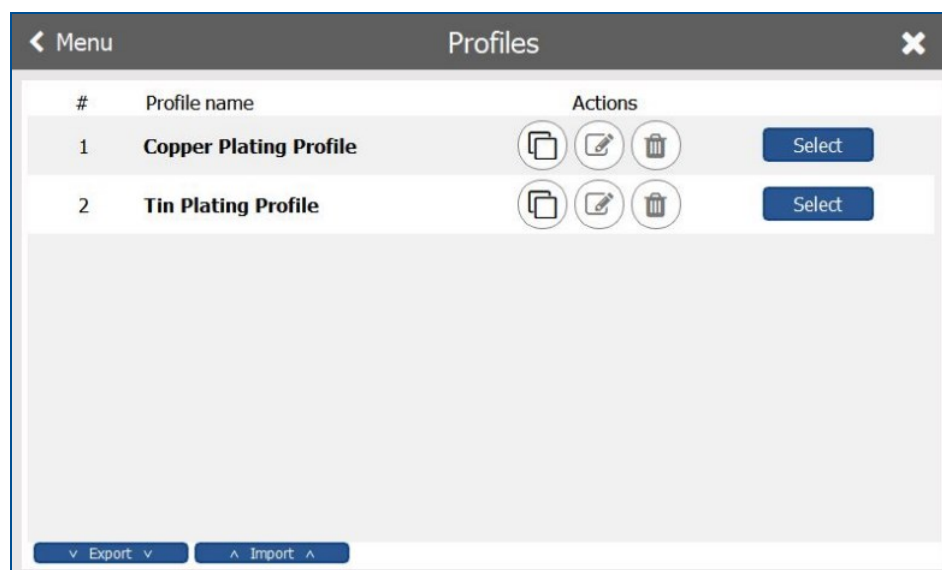


Fig. 39: Profiles overview

3. Tap on [Select] of the desired profile.
Select the profile *Copper Plating Profile* for the following process.
- ☐ The process view is displayed with the selected profile.
- ☒ The profile has been selected.

Process sequence

This chapter describes the process of copper-plating a PCB with subsequent tin-plating.

- Starting the process
- Preparing the PCB
- Cleaning the PCB
- Conditioning the PCB
- Activating the PCB
- Active-cleaning the printed circuit board (PCB)
- Copper-plating the PCB
- Tin-plating the PCB
- Switching off the system

■ Starting the process

- ▶ Open the process view by tapping on .

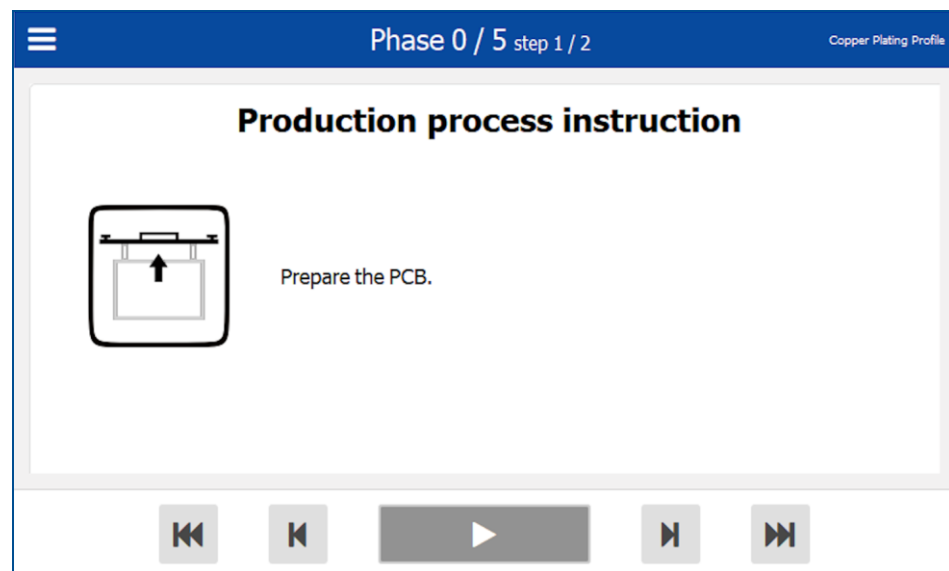


Fig. 40: Process view

- ☐ The first step is displayed.
- ☒ The process is started.

■ Preparing the PCB

1. Loosen the two screws on the side so far that the PCB can be inserted into the PCB holder.

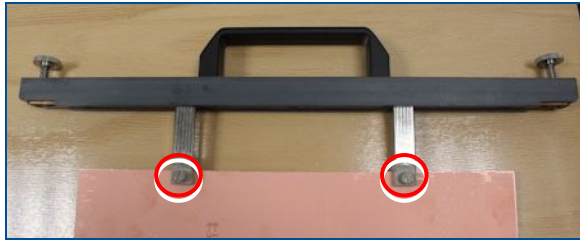


Fig. 41: Screws on side

2. Insert the PCB into the PCB holder in such a way that it is aligned to the middle.
 3. Tighten the screws on the side until the PCB is safely fastened.
 4. Tap on .
- ☐ The following message is displayed:

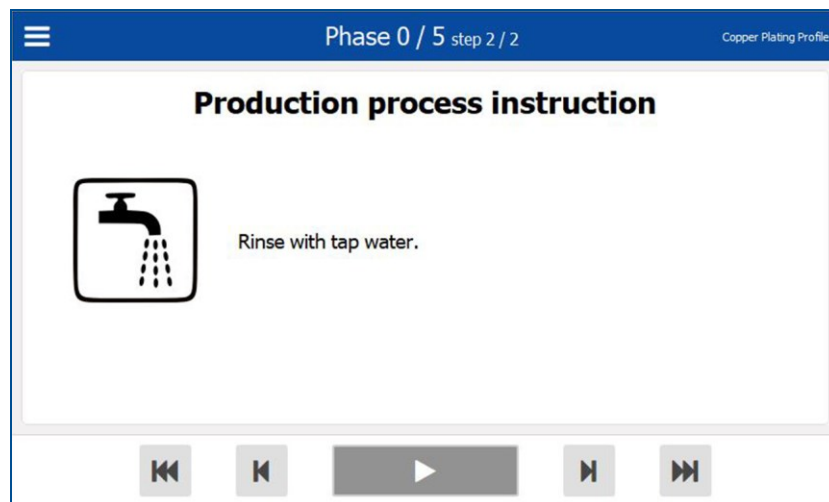


Fig. 42: Message *Rinse with tap water*

5. Rinse the PCB for at least 30 seconds with water.
You can use clean tap water instead of de-ionized water.



Fig. 43: Rinsing with tap water

6. Tap on .

☐ The processing time and the temperature of the bath in tank 1 are displayed.

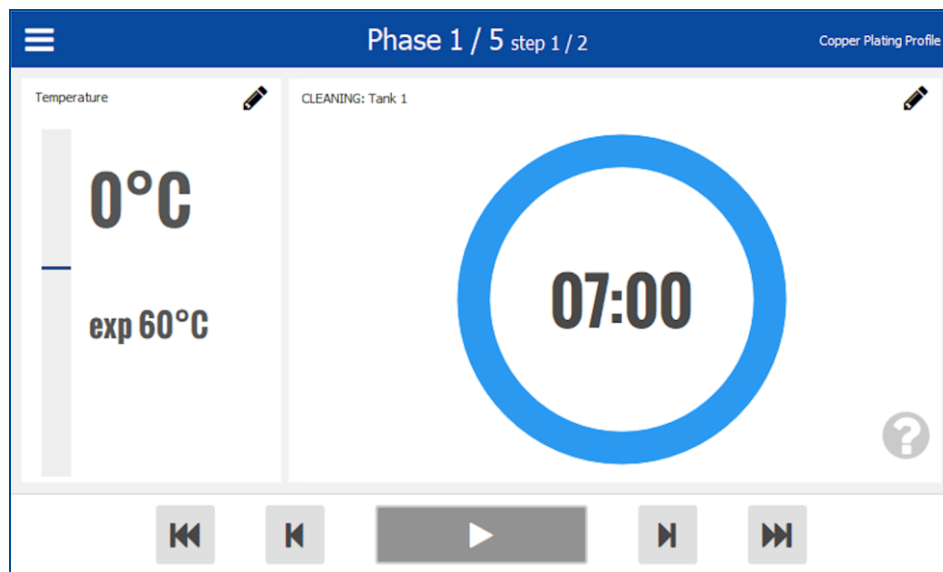


Fig. 44: Processing time and bath temperature

☒ The PCB has been prepared.



Contaminants at the inside of the PCB holder can impair copper-plating. Clean these surfaces with a coarse sponge and water if necessary.

■ Cleaning the PCB

1. Wait until the temperature display shows 60 °C (140 °F).
2. Remove the cover of tank 1 and put it into the holder slot.



Fig. 45: Holder slots for the covers

3. Insert the PCB into tank 1.

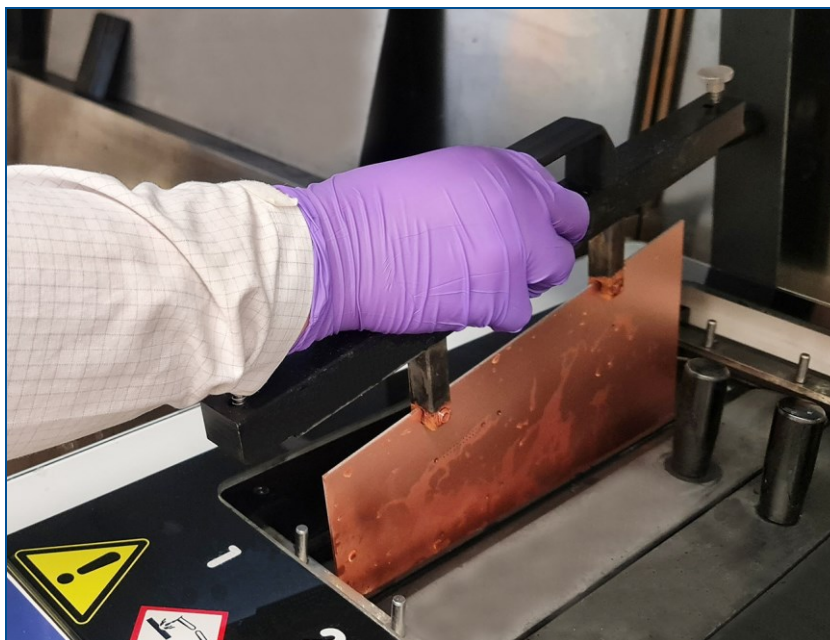


Fig. 46: Inserting PCB into tank 1

The pins on the tank's edge must fit into the openings of the PCB holder.

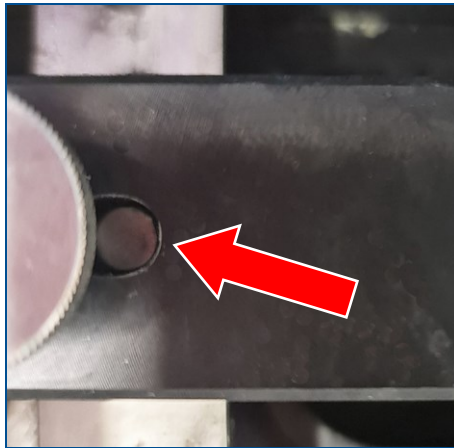


Fig. 47: Pin fits into the opening

4. Lift the front end of the PCB holder for approx. 3 cm (~1.2 in) and knock it several times (8 to 10 times) on the frame before setting it down again. This removes the possible air bubbles from the holes in the PCB.



Fig. 48: Knocking the PCB holder

5. Fasten the PCB holder by hand-tightening the knurled screws.

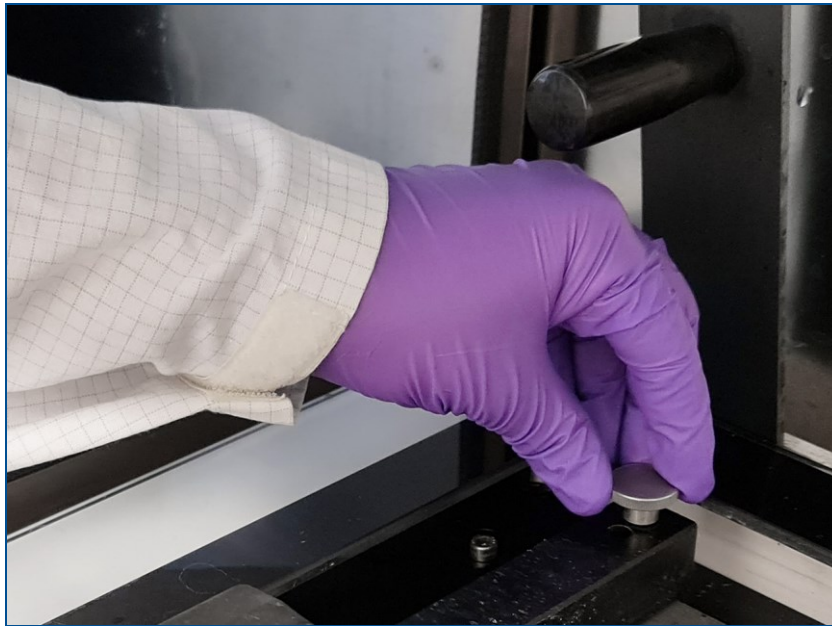


Fig. 49: Tightening the knurled screw

6. Tap on .
- ☐ The processing time is counted down.
7. Wait until the time has elapsed.
- ☐ The message *Rinse with tap water* is displayed.
8. Loosen the knurled screws of the PCB holder.
9. Remove the PCB from the tank.
10. Place the cover back on tank 1.
11. Rinse the PCB for at least 30 seconds with water.
- ☒ The PCB has been cleaned.

■ Conditioning the PCB

1. Remove the cover of tank 2 and put it into the holder slot.
 2. Insert the PCB into tank 2 so that the pins on the tank's edge fit into the openings of the PCB holder.
 3. Fasten the PCB holder by hand-tightening the knurled screws.
 4. Tap on .
- ☐ The processing time in tank 2 is displayed:

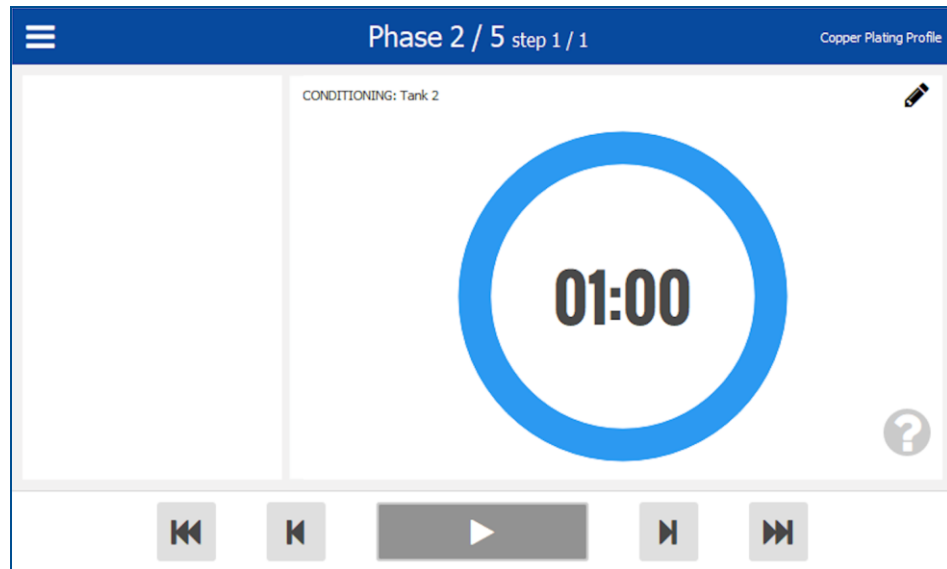


Fig. 50: Processing time

5. Tap on .
- ☐ The processing time is counted down.
6. Wait until the time has elapsed.
 7. Loosen the knurled screws of the PCB holder.
 8. Remove the PCB from the tank.
 9. Place the cover back onto tank 2.
 10. Tap on .
- ☒ The PCB has been conditioned.

■ Activating the PCB

1. Remove the cover of tank 3 and put it into the holder slot.
 2. Insert the PCB into tank 3 so that the pins on the tank's edge fit into the openings of the PCB holder.
 3. Fasten the PCB holder by hand-tightening the knurled screws.
 4. Tap on .
- ☐ The process duration of tank 3 is displayed:

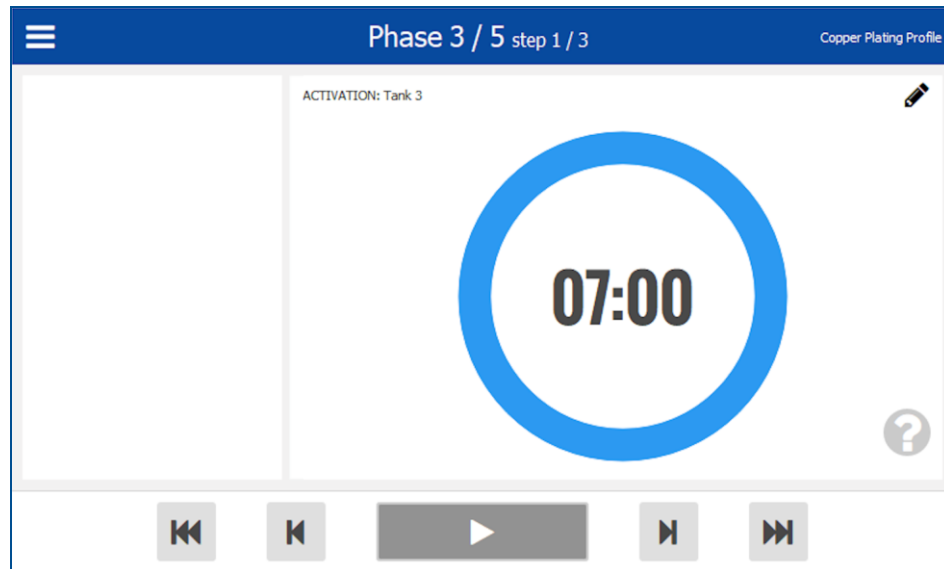


Fig. 51: Process duration

5. Tap on .
- ☐ The processing time is counted down.
6. Wait until the time has elapsed.
 7. Loosen the knurled screws of the PCB holder.
 8. Remove the PCB from the tank.
 9. Rinse the PCB for at least 30 seconds with water.
 10. Place the cover on tank 3.
 11. Tap on .

- ☐ The following message is displayed:

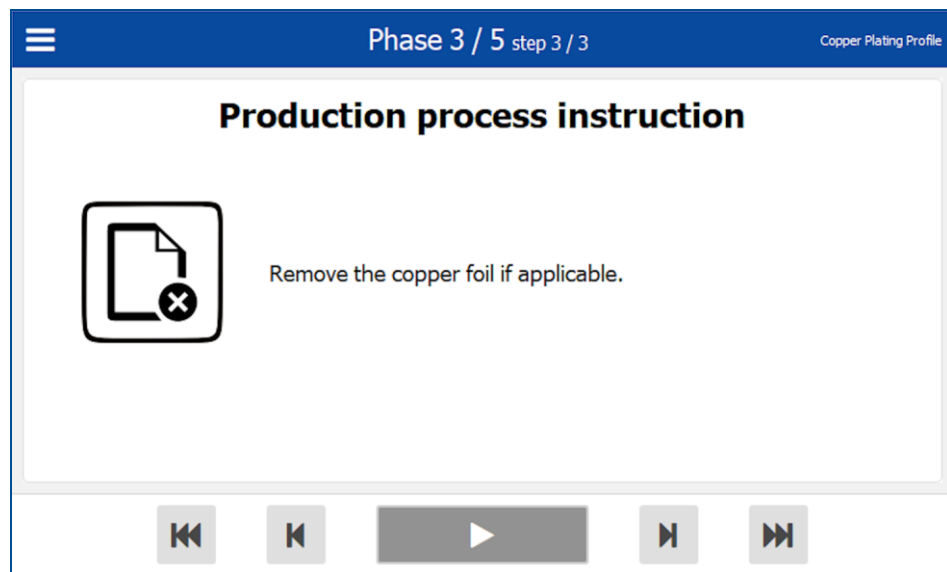


Fig. 52: Message *Remove the copper foil*

12. If you are using FR4 material with protective foil, remove the foil.
 13. Fasten the PCB to the PCB holder.
- ☒ The PCB has been activated.

■ Active-cleaning the printed circuit board (PCB)

1. Remove the cover of tank 4 and put it into the holder slot.
 2. Insert the PCB into tank 4 so that the pins on the tank's edge fit into the openings of the PCB holder.
 3. Lift the front end of the PCB holder for approx. 3 cm (~1.2 in) and knock it several times (8 to 10 times) on the frame. After that, reinsert it.
 4. Fasten the PCB holder by hand-tightening the knurled screws.
 5. Tap on .
- ☐ The process time and the temperature of tank 4 are displayed:

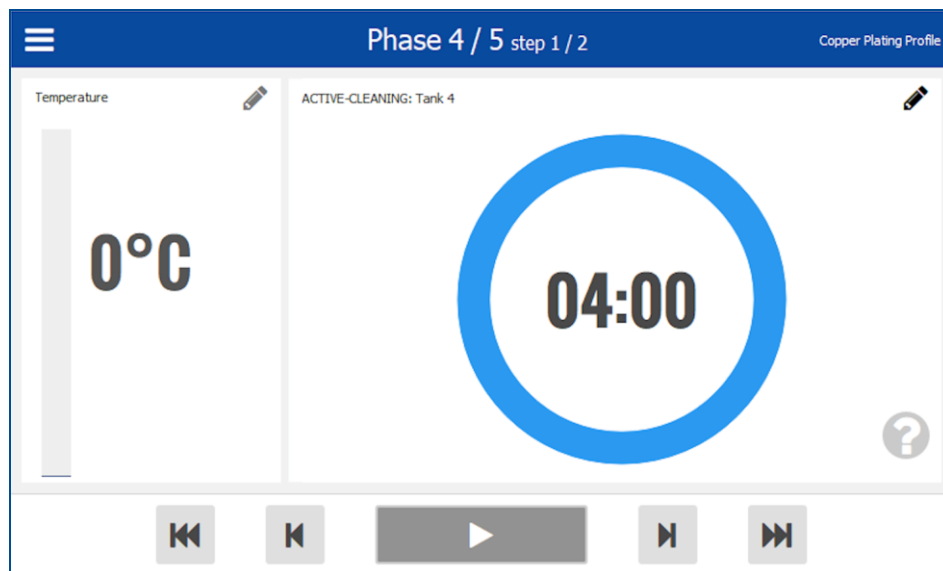


Fig. 53: Process duration and tank temperature

6. Tap on .
 - ☐ The processing time is counted down.
 7. Wait until the time has elapsed.
 - ☐ The message *Rinse with tap water* is displayed.
 8. Loosen the knurled screws of the PCB holder.
 9. Remove the PCB from the tank.
 10. Place the cover on tank 4.
 11. Rinse the PCB for at least 30 seconds with water and use a soft cleaning brush to remove excess active-cleaning solution from the PCB, if necessary.
- ☒ The PCB has been cleaned.



A filling of tank 4 is sufficient for cleaning a maximum of **15** double-sided PCBs (standard size 305 mm × 230 mm/~12 in × 9 in).

■ Copper-plating the PCB

1. Remove the cover of tank 5 and put it into the holder slot.
2. Insert the PCB into tank 5 so that the pins on the tank's edge fit into the openings of the PCB holder.
3. Lift the front end of the PCB holder for approx. 3 cm (~1.2 in) and knock it several times (8 to 10 times) on the frame. After that, reinsert it.
4. Fasten the PCB holder using the knurled screws.



The contact surface between the PCB holder and tank 5 can get very hot if the knurled screws are not sufficiently tightened and if the contact surface is dirty. Ensure that the knurled screws have been tightened sufficiently and that the contact surface has been cleaned.

5. Tap on .

☐ The process duration and the amperage of tank 5 are displayed.

Notice! Damage by excessive waiting period!

- Start the process immediately after inserting the PCB into tank 5.

6. Tap on .

☐ The processing time is counted down.

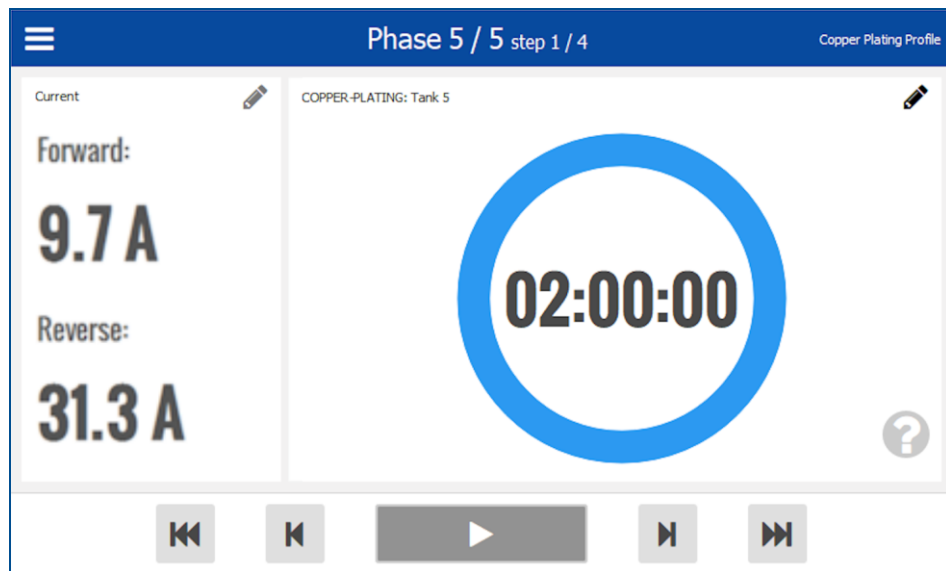


Fig. 54: Process duration and amperage of tank 5



Turning the PCB during processing

For more efficient through-hole plating, the PCB should be turned in tank 5 after half of the processing time. If *Pause* is selected in the profile, the system pauses after half of the processing time has elapsed. You are prompted by an acoustic signal to turn the PCB. Perform the following steps:

1. Loosen the knurled screws of the PCB holder and remove the PCB from the tank.
2. Turn the PCB by 180°.

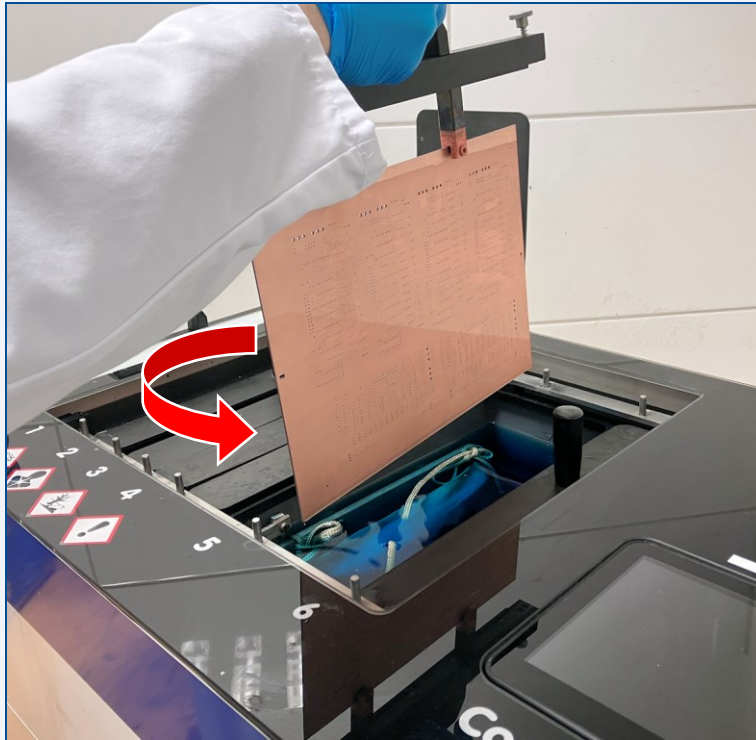


Fig. 55: Turning the PCB

3. Insert the PCB into the tank.
4. Fasten the PCB holder using the knurled screws.
5. Tap on .

Processing is resumed. Proceed with step 7 of the instructions *Copper-plating the PCB*.

7. Wait until the time has elapsed.
- ☐ The message *Rinse with tap water* is displayed.
8. Loosen the knurled screws of the PCB holder.
9. Remove the PCB from the tank.
10. Let the PCB drip off into tank 5.
11. Use the provided spray bottle to spray the PCB slightly on both sides above tank 5 and let the de-ionized water drip into the tank.
The de-ionized water can be used to compensate evaporation losses.
12. Rinse the PCB for at least 30 seconds with water.
13. Tap on .

- ☐ The following message is displayed:

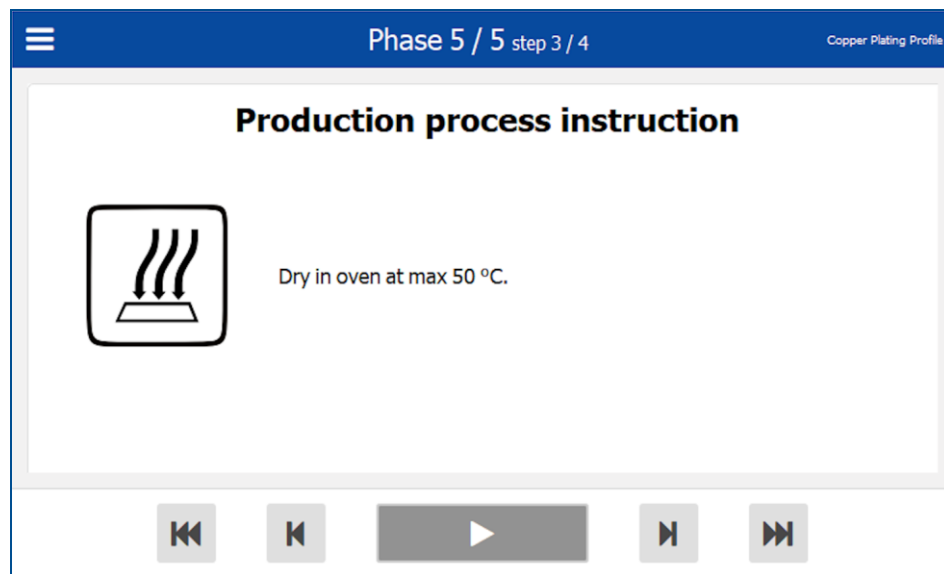


Fig. 56: Message *Drying the PCB*

14. Dry the PCB as quickly as possible with warm air (e.g. using a hair-dryer) to avoid oxidation of the copper.
15. Tap on .

- ☐ The following message is displayed:

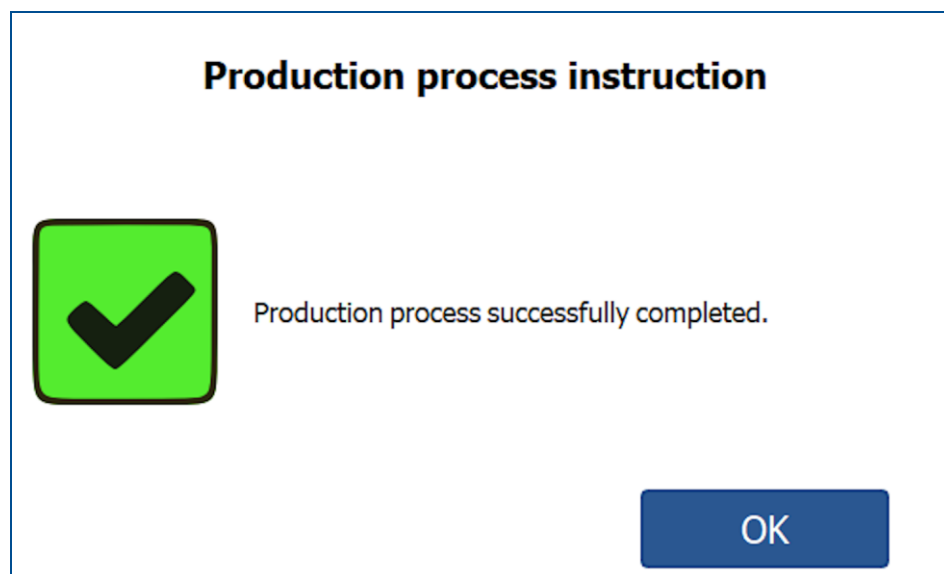


Fig. 57: Message *Production process successfully completed*

16. Tap on [OK].
- ☐ The PCB can now be processed further (e. g. using a ProtoMat system).
- ☒ The PCB has been copper-plated.



Tin-plating the PCB

Tin-plating the PCB is optional, but it can be advantageous for further processing because the tin-plated PCB is protected against corrosion and can be soldered more easily.

The following PCBs can be tin-plated:

- Unprocessed PCBs
- Through-plated but not milled PCBs
- PCBs milled with an LPKF ProtoMat and through-plated

Tin-plating the PCB

1. Change to the **Tin Plating Profile** (see page 61).

□ The following message is displayed:

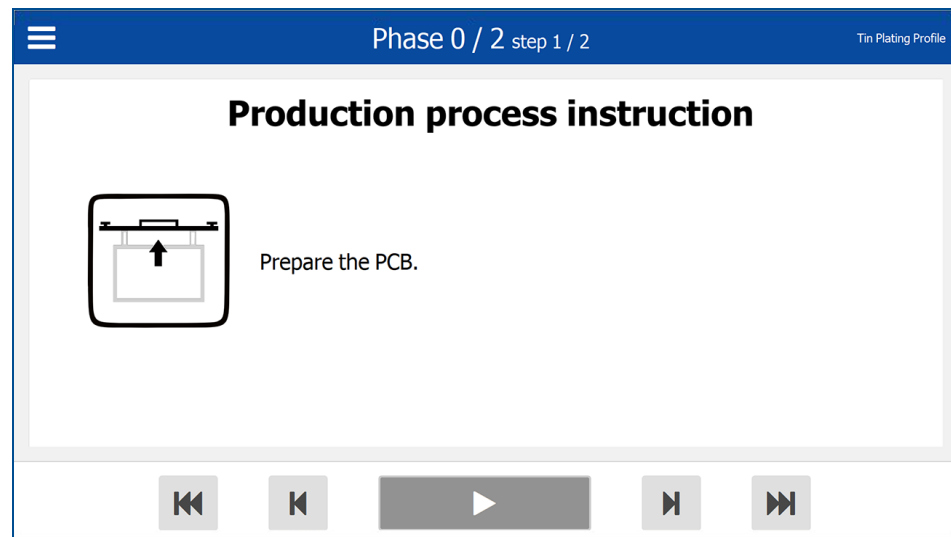


Fig. 58: Message *Prepare the PCB*

2. Fasten the PCB to the PCB holder.

3. Tap on .

- ☐ The following message is displayed:

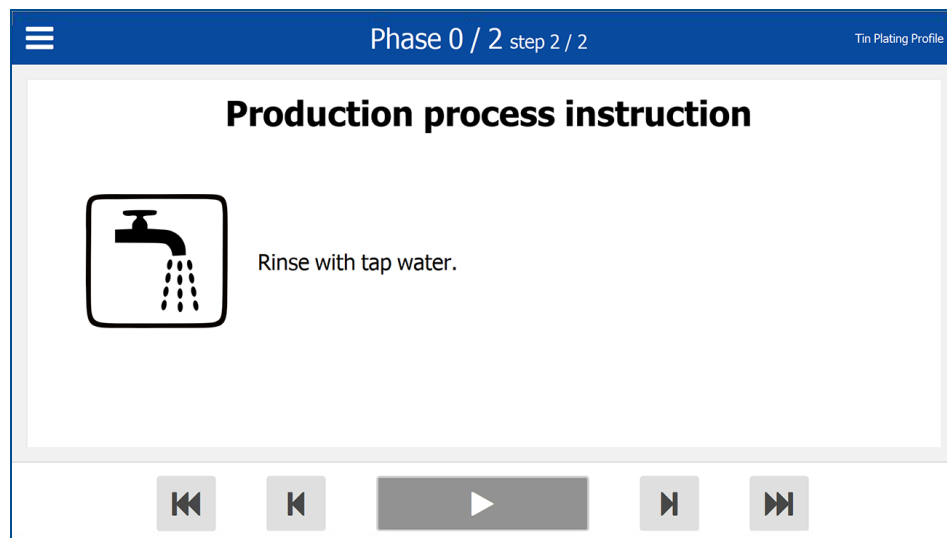


Fig. 59: Message *Rinse with tap water*

4. Rinse the PCB for at least 30 seconds with water.
5. Brush and polish the PCB gently with a non-woven pad or a PCB brushing machine.
Clean the holes as well to remove possible chips and burrs.
6. Remove the cover of tank 4 and put it into the holder slot.
7. Insert the PCB into tank 4 so that the pins on the tank's edge fit into the openings of the PCB holder.
8. Lift the front end of the PCB holder for approx. 3 cm (~1.2 in) and knock it several times (8 to 10 times) on the frame before setting it down again.
9. Fasten the PCB holder by hand-tightening the knurled screws.
10. Tap on .

- ☐ The processing time and the temperature of the bath in tank 4 are displayed:

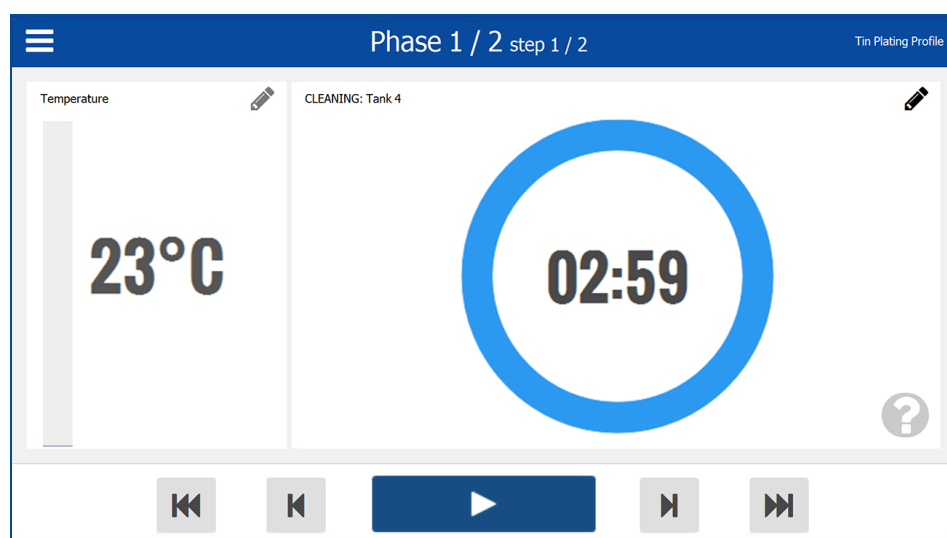


Fig. 60: Processing time and bath temperature

11. Tap on .
- ☐ The processing time is counted down.
12. Wait until the time has elapsed.

- ☐ The message *Rinse with tap water* is displayed.
- 13. Loosen the knurled screws of the PCB holder.
- 14. Remove the PCB from the tank.
- 15. Place the cover back on tank 4.
- 16. Rinse the PCB for at least 30 seconds with water.
- 17. Remove the cover of tank 6 and put it into the holder slot.
- 18. Stir the contents of tank 6 with a glass fiber rod to avoid sedimentation of the chemicals.
- 19. Insert the PCB into tank 6 so that the pins on the tank's edge fit into the openings of the PCB holder.
- 20. Fasten the PCB holder by hand-tightening the knurled screws.
- 21. Tap on .
- ☐ The processing time of the bath in tank 6 is displayed:

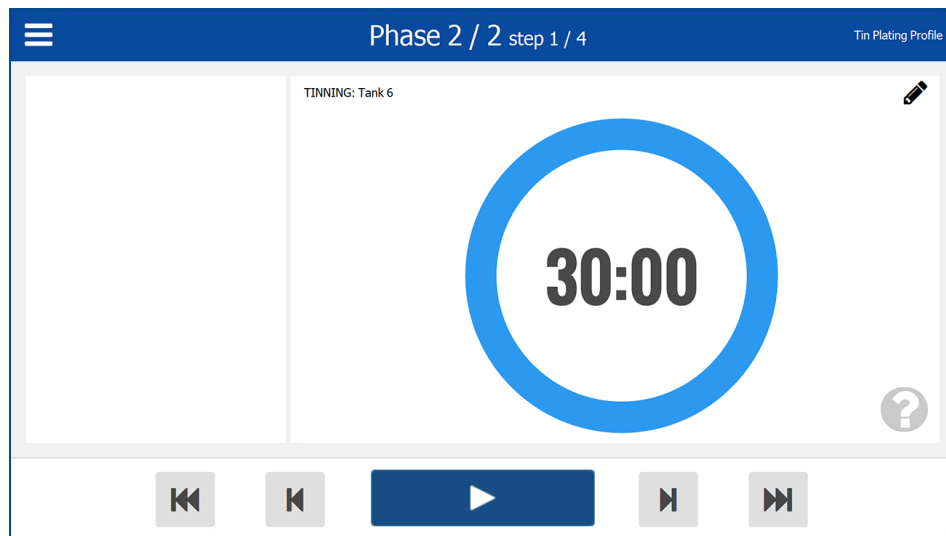


Fig. 61: Processing time

- ☐  The maximum layer thickness of the deposited tin layer is approx. 1 μm . The preset processing time of 30 minutes should be sufficient to achieve this layer thickness.
- 22. Tap on .
- ☐ The processing time is counted down.
- 23. Wait until the time has elapsed.
- ☐ The message *Rinse with tap water* is displayed.
- 24. Loosen the knurled screws of the PCB holder.
- 25. Remove the PCB from the tank.
- 26. Rinse the PCB for at least 30 seconds with warm water.
- 27. Tap on .

- ☐ The following message is displayed:

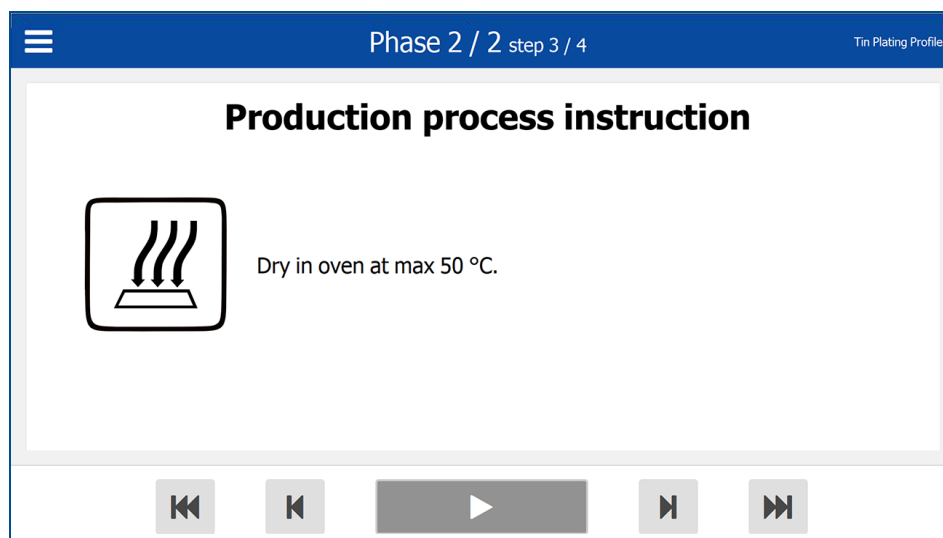


Fig. 62: Message *Dry the PCB*

28. Dry the PCB as quickly as possible with warm air (e.g. using a blow-dryer).

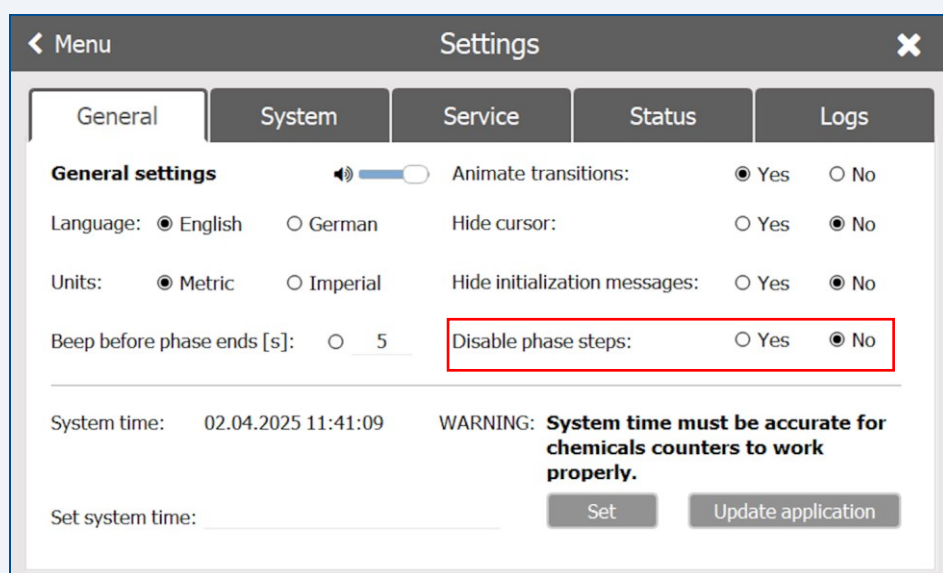
29. Remove the PCB holder.

- ☒ The PCB has been tin-plated.



Disabling messages on the touch screen

Messages on the touch screen that display the required steps during the through-hole plating process can be disabled in the *Settings*. In the tab *General* in the section *Disable phase steps* select the radio button *Yes*.



■ Switching off the system

1. Ensure that no PCB is in any of the tanks.
2. Check that all covers are on the tanks and cover the tanks if necessary.
3. Open the menu.

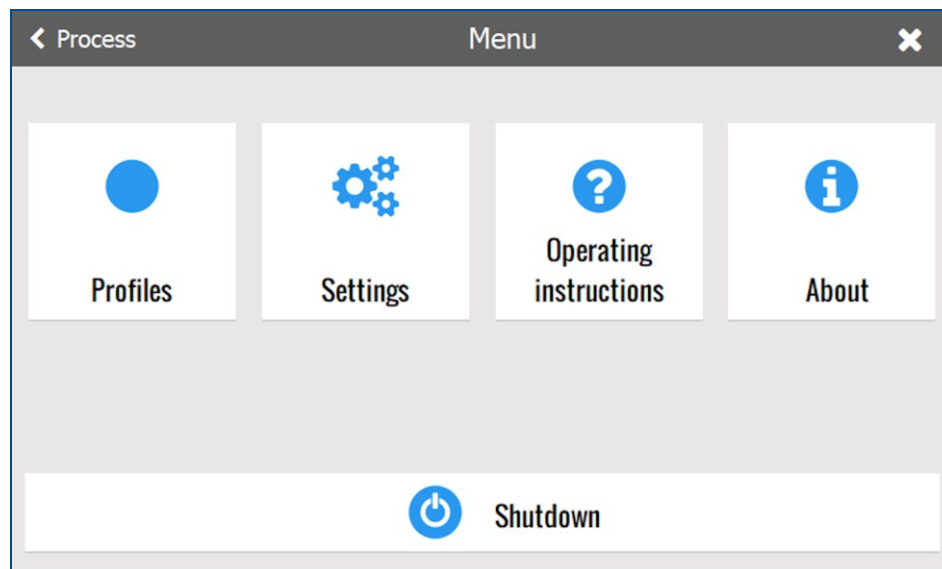


Fig. 63: Menu

4. Tap on [Shutdown] to open the dialog *Shutdown*.
 5. Tap on [YES].
- Alternatively, you can shut down the system by pressing the On/Off button for at least three seconds and swiping across the touch screen from top to bottom.
- ☐ The touch screen is switched off and tank 1 is no longer heated.
 - ☒ The system has been switched off.

6.4 Special tasks

This chapter describes tasks that are not part of the typical production process.

The following tasks are described:

- Cleaning tank 3
- Creating a new profile
- Editing a profile
- Setting the copper-plating rate
- Preparing the vacuum table



When changing the chemicals from **Active Carbon** to **Palladium** it is important to **clean tank 3 thoroughly** before using the Palladium chemicals!

Ensure that the following prerequisites are met before performing the described tasks:

Prerequisites

- The system is switched off.

Spare parts and auxiliary supplies

- Jerry can or container with sufficient volume.
- LPKF Cleaner, if necessary
- Dish soap
- Dish brush
- Water
- Distilled/De-ionized water

■ Cleaning tank 3

1. Open the drain valve behind the cover at the front of the system (see page 94).
2. Remove the remaining activation solution from tank 3 and fill it into a suitable container or a jerry can.
3. Rinse the tank with water to remove remaining quantities of the activation solution:

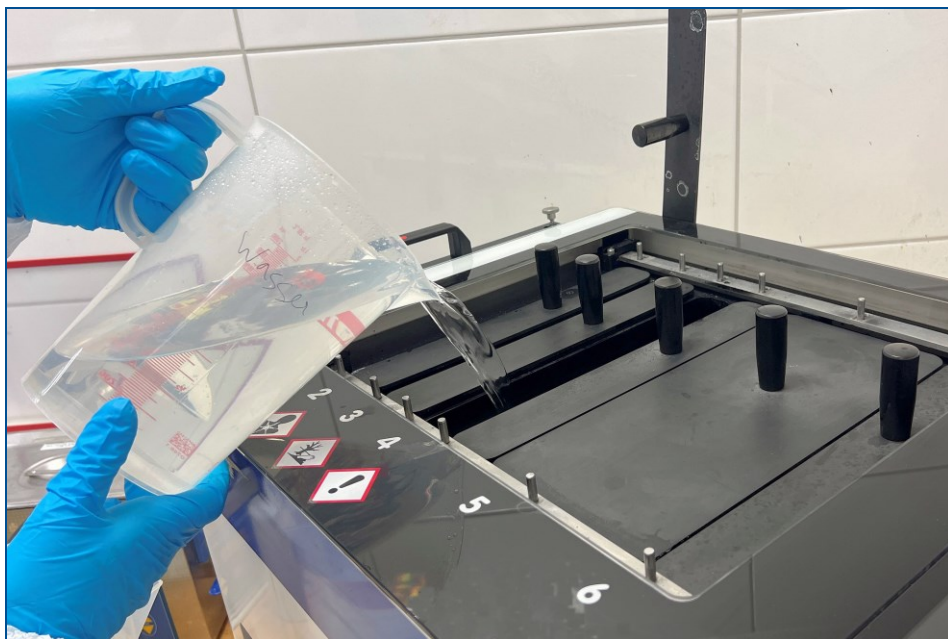


Fig. 64: Rinsing tank 3 with water



For stubborn dirt you can use LPKF Cleaner for conditioning the tank.

4. Fill tank 3 with LPKF Cleaner and leave the solution to work for approx. 5 to 10 minutes, if necessary:

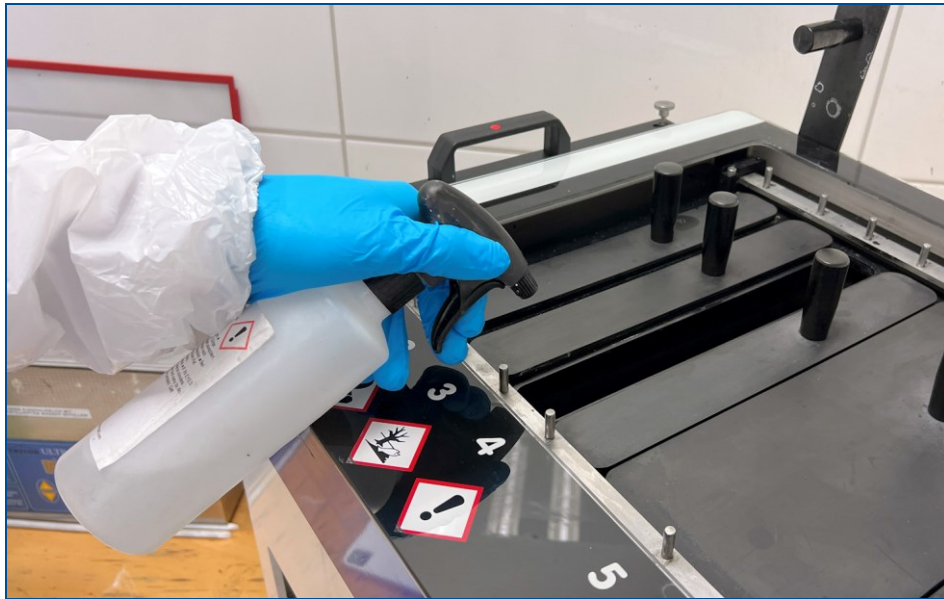


Fig. 65: Conditioning with LPKF Cleaner

5. Close the drain valve of tank 3.
6. Fill the tank to approx. $\frac{1}{4}$ with water.
7. Add common dish soap:

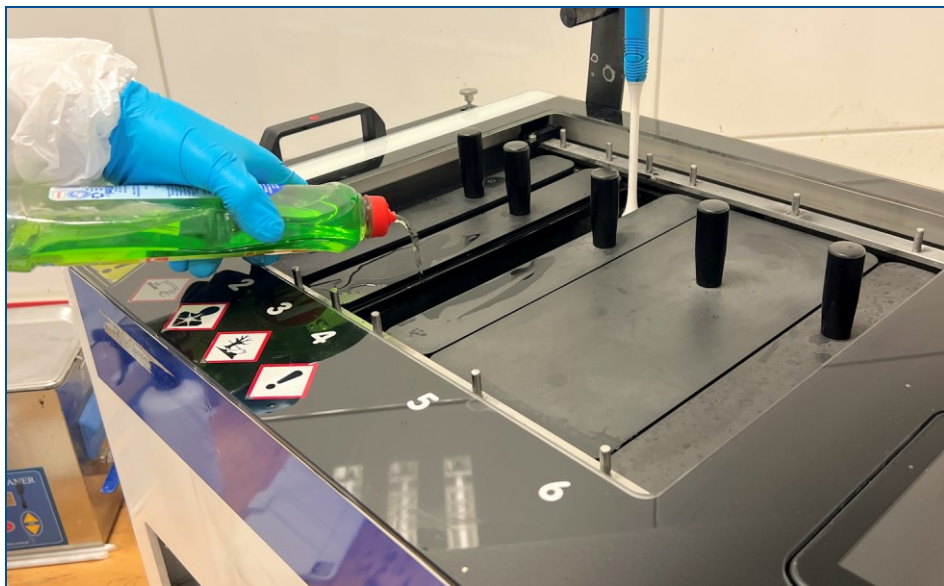


Fig. 66: Adding dish soap

8. Scrub the tank with a dish brush:

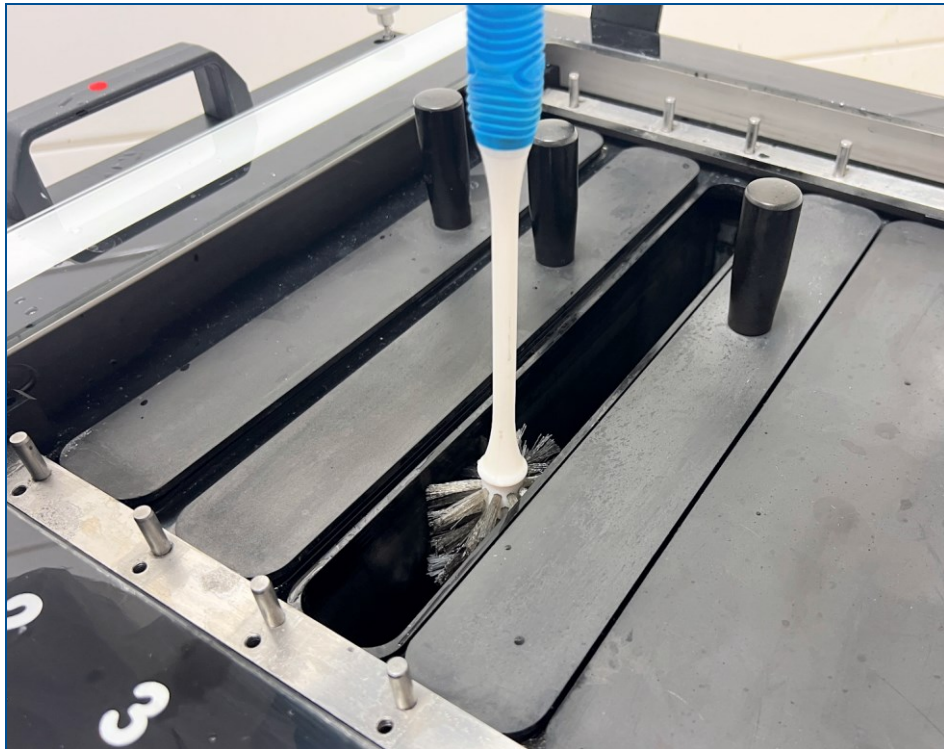


Fig. 67: Scrubbing with a dish brush

9. Reopen the drain valve of tank 3 to remove the rinsing liquid.
Ensure to have a suitable container to collect the liquid!
10. Repeat the steps 6 to 9, if necessary.
11. Rinse remaining dish soap residues with water, if necessary.
12. In a last step, rinse tank 3 with distilled/de-ionized water:



Fig. 68: Final rinsing with distilled/de-ionized water

13. Allow tank 3 to air dry with the cover open until no moisture remains.
 14. Dispose of the drained activation solution properly and in accordance with the local disposal regulations.
- ☒ Tank 3 has been cleaned.



Advanced information

When changing to the Palladium chemical, remember to update the firmware of Contac S4.

After that, you have to activate the Palladium chemical in the system settings of the software (after a successful firmware update):

The screenshot shows the 'Settings' application with the 'System' tab selected. The 'System settings' section is visible, and the 'Chemicals' option is highlighted with a red box. The 'Chemicals' section shows 'Palladium' selected with a radio button and 'Active Carbon' unselected with a radio button. Other settings visible include 'Avg. plating rate [μm/min]: 0.14000', 'Avg. tinning rate [μm/min]: 0.06700', 'Current characteristic K: 0.00014', 'N: 0', 'ViaCleaner characteristic A: 0.13130', 'B: -16.66600', 'C: 493.16000', 'Port name: COM3', and 'Password: *****'. There are 'Default' and 'Reset settings' buttons.

Fig. 69: Activating Palladium chemicals

■ Creating a new profile

1. Tap on
- The following view is displayed:

The screenshot shows the 'Main menu' with a dark header bar containing a back arrow, the text 'Process', and a close button. Below the header, there are four white cards with blue icons: 'Profiles' (a blue circle), 'Settings' (a blue gear icon), 'Operating instructions' (a blue question mark icon), and 'About' (a blue information icon). At the bottom, there is a white bar with a blue power button icon and the text 'Shutdown'.

Fig. 70: Main menu

2. Tap on [Profiles].
- The following view is displayed:

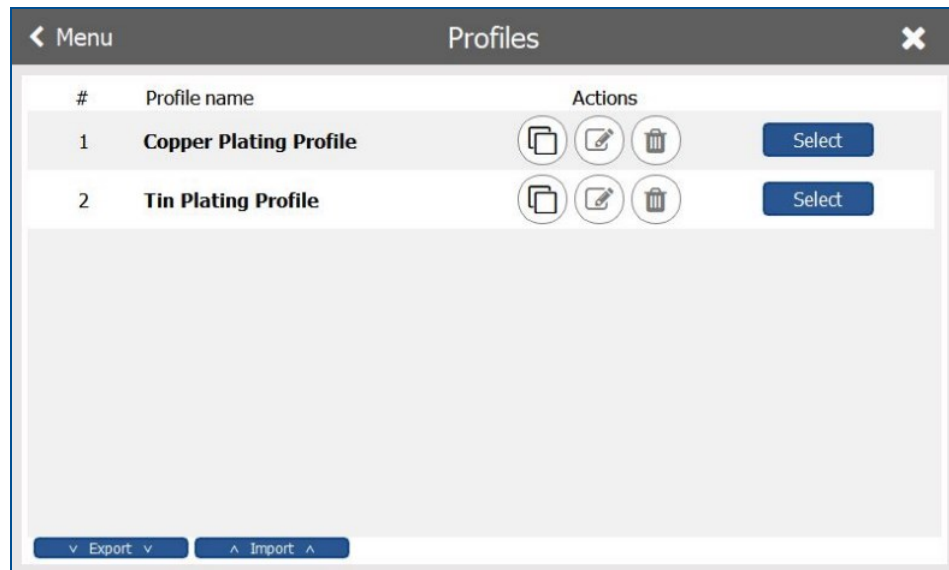


Fig. 71: Profiles overview

3. Tap on next to an existing profile.

☐ The following view is displayed:

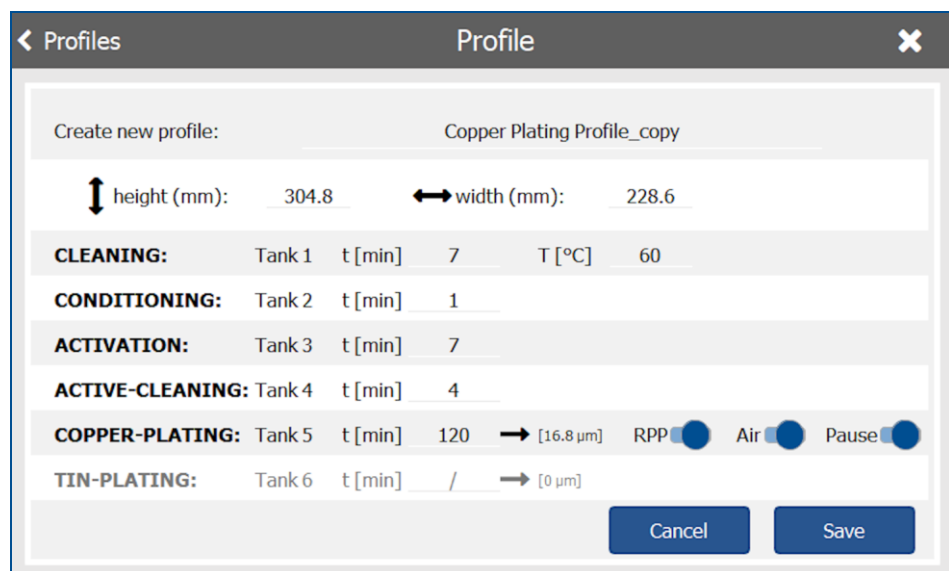


Fig. 72: Creating a new profile

4. Enter the name for the profile.

5. Enter the dimensions of the PCB.

Use the profile only for PCBs having the entered dimensions. These are used for calculating the amperage.

6. Enter the other parameters.

7. Tap on [Save].

☒ A new profile has been created.

■ Editing a profile

1. Tap on .
- The main menu is displayed:

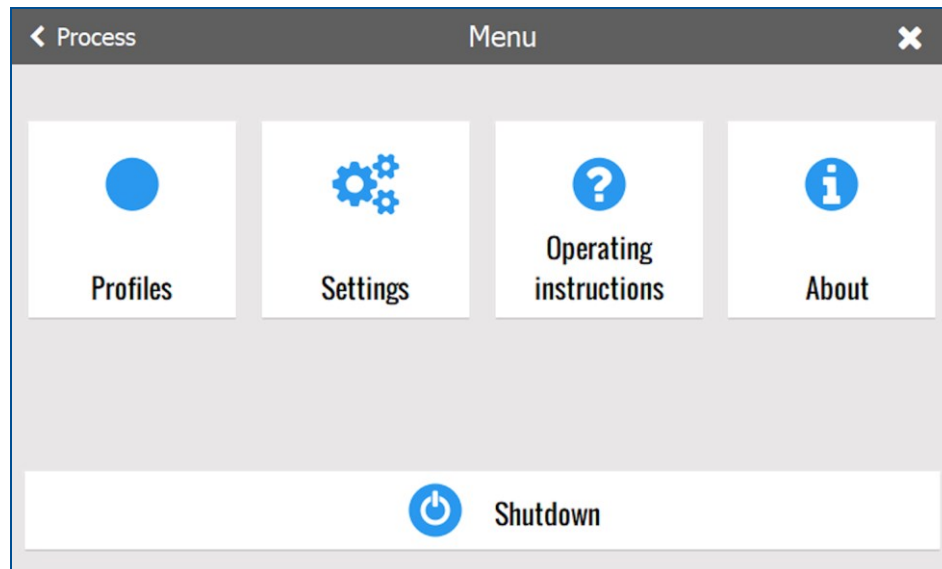


Fig. 73: Main menu

2. Select [Profiles].
- The profile overview is displayed:

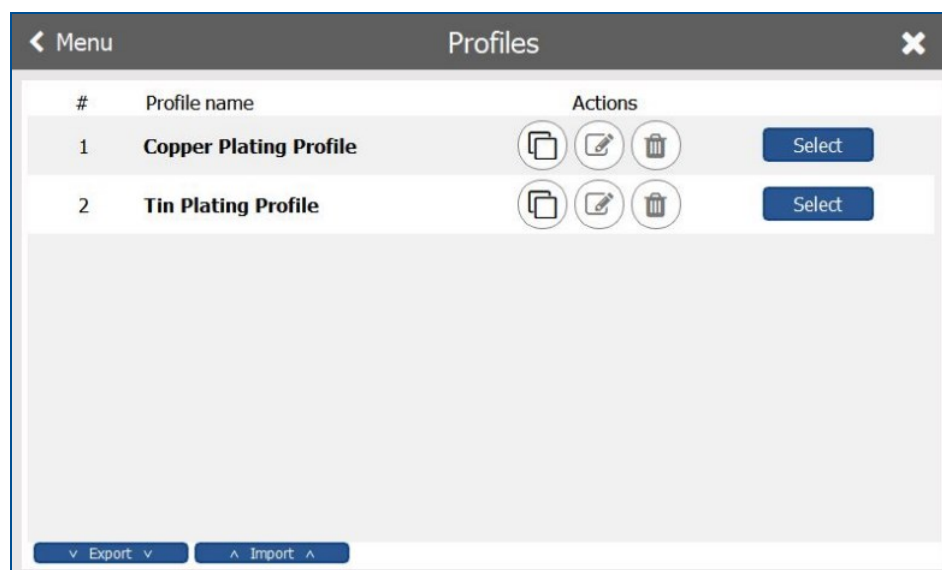


Fig. 74: Profile overview

3. Tap on  next to the profile to be edited.
The default profiles cannot be edited. The  icon cannot be selected for these profiles.

- ☐ The profile view is displayed:

Fig. 75: Profile view

4. Edit the parameters of the profile.
5. Confirm your entries by tapping on [Save].

- ☒ The profile has been edited.



The copper-plating rate determined in the system software is used to calculate the copper thickness applied to your PCB in tank 5.

The pre-set values for the copper-plating rate are only default values. You may have to set better fitting values for copper-plating your PCB.

■ Setting the copper-plating rate

1. Tap on .
- The following view is displayed:

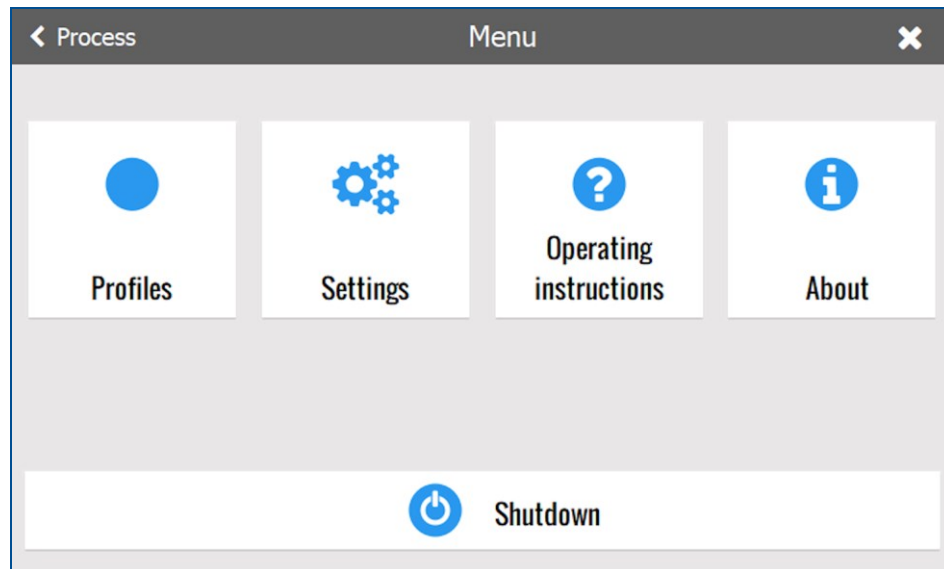


Fig. 76: Main menu

2. Tap on [Settings].
- The following view is displayed:

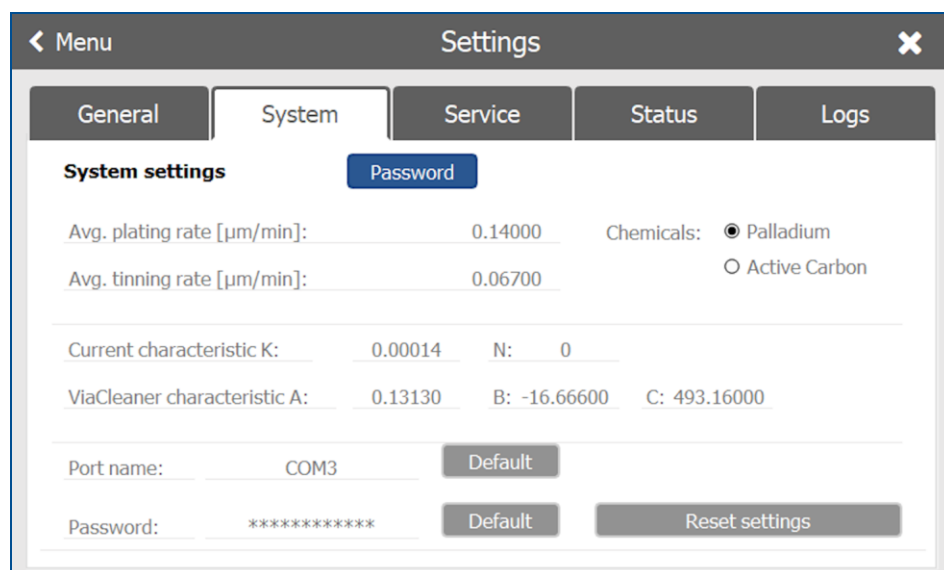


Fig. 77: Settings | System

3. Tap on [Password].

- A dialog for entering the password is displayed.

The screenshot shows a 'Settings' dialog with a 'Name' field containing '31415'. Below the field is a numeric keypad (0-9), a QWERTY keyboard, and a bottom row with 'Caps', 'Del', 'Space', 'Cancel', and 'Done' buttons. The 'Done' button is highlighted in blue.

Fig. 78: Entering the password

4. Enter the password **31415** and tap on [Done].
5. Tap on the pre-set value in the field *Avg. plating rate* [$\mu\text{m}/\text{min}$].

The screenshot shows the 'System settings' dialog with tabs for 'General', 'System', 'Service', 'Status', and 'Logs'. The 'System' tab is active, and a 'Password' button is visible. The 'Avg. plating rate [$\mu\text{m}/\text{min}$]' field is highlighted with a red box and contains the value '0.14000'. Other fields include 'Avg. tinning rate [$\mu\text{m}/\text{min}$]' (0.06700), 'Current characteristic K' (0.00014), 'N' (0), 'ViaCleaner characteristic A' (0.13130), 'B' (-16.66600), and 'C' (493.16000). There are also 'Port name' (ttyO4) and 'Password' (31415) fields, each with a 'Default' button, and a 'Reset settings' button.

Fig. 79: Selecting the value

6. Enter the desired value for the copper-plating rate (in this example **0.14**).

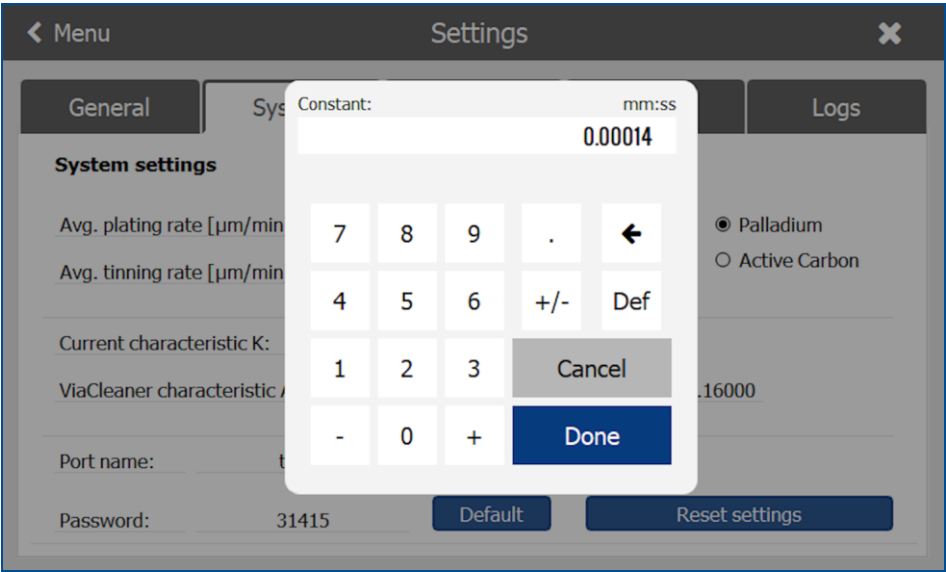


Fig. 80: Entering the value

7. Tap on [Done].
- ☐ The modified value is displayed in the field *Avg. plating rate [μm/min]*.

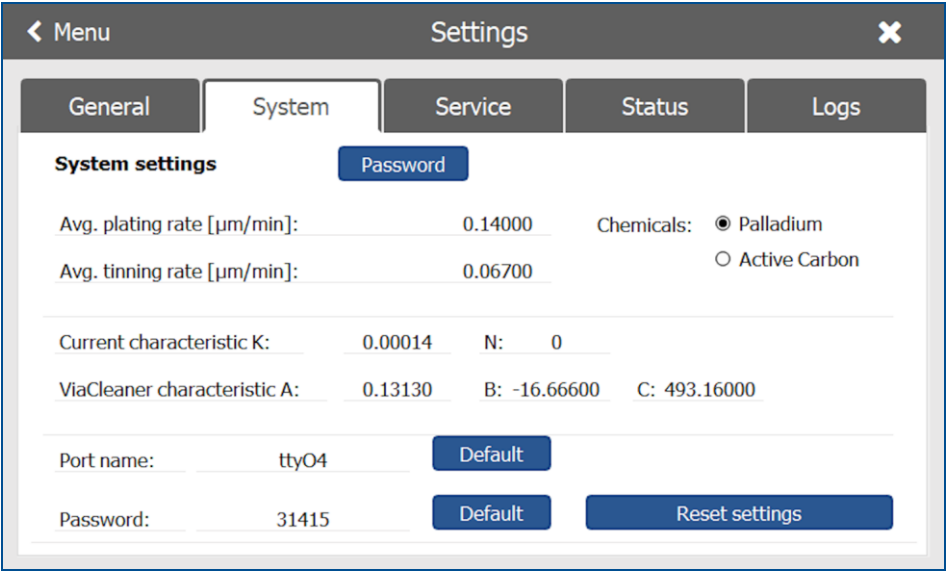


Fig. 81: Value modified

- ☒ The copper-plating rate has been set.

■ Preparing the vacuum table

Ensure that the following spare parts and auxiliaries are available before performing the described tasks:

Spare parts and auxiliary supplies

- Extraction system (not included in the scope of delivery)
- Extraction hose (not included in the scope of delivery)
- Vacuum table (not included in the scope of delivery)
- Nonwoven mat (not included in the scope of delivery)

1. Connect the extraction hose of an extraction system to the vacuum table.
2. Fasten a new nonwoven mat onto the vacuum table if necessary.

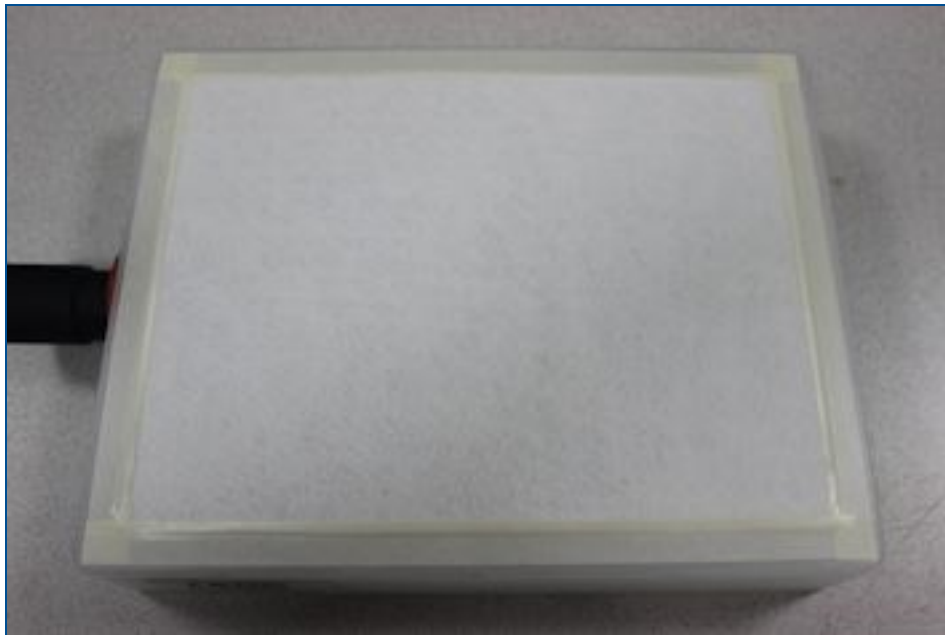


Fig. 82: Vacuum table with nonwoven mat

- ☒ The vacuum table has been prepared.

7 Maintenance

This chapter contains important information on the maintenance of the system.

Proper maintenance and proper handling of the components, e.g. the PCB holders, are basic requirements for flawless functioning of the system.

Maintenance has to be performed and documented regularly according the instructions of the manufacturer.

The system is designed for a service life of 5 years of one-shift operation (10 hours per day). The specific maintenance intervals are valid for one-shift operation at 5 days a week.

7.1 Safety

Follow the safety instructions below for your own protection and for the protection of other persons in the vicinity of the maintenance work. The maintenance personnel must ensure that the described prerequisites for the planned maintenance tasks are fulfilled and they must observe the special warning messages for the individual maintenance tasks.

Contact the LPKF Service for maintenance or repair tasks that go beyond the tasks described in the maintenance schedule for the maintenance personnel of the operator.

DANGER

Danger to life by electrical shock!

Any physical contact to energized components or cables can cause death by electrical shock and/or fire.

- ▶ Disconnect the system from the mains supply before performing maintenance tasks.

WARNING

Health hazard by contact with chemicals!

Contact with the chemicals can cause serious damage to health:

Inhaling can irritate nose, throat and lungs and can cause allergic respiratory problems.

Skin contact can cause chemical burns, allergies, and hypersensitivity.

Eye contact can irritate the eyes and mucous membranes with burning and tears and can cause impaired vision and serious eye damage.

Ingestion can cause chemical burns of the mucous membranes, throat, esophagus, and stomach and can cause gastrointestinal complaints.

- ▶ Read the provided safety data sheets carefully.
- ▶ Work in well-ventilated rooms.
- ▶ Wear your personal protective equipment.
- ▶ Avoid direct contact with the chemicals.
- ▶ Take off contaminated clothes immediately.
- ▶ Wash your hands thoroughly after work.

NOTICE**Property damage by contamination of the activation bath!**

The activation bath is very sensitive to contaminants and can become unusable if even slightly contaminated.

- ▶ Avoid any contamination of the activation bath.
- ▶ Always cover the activation tank when not in use.
- ▶ Never compensate evaporation losses with water. Replenish with DS 400 Catalyst Part A/Pre-Dip up to the mark.

NOTICE**Property damage by spilled liquids!**

Spilling liquids over electrical components can cause a short circuit.

- ▶ Switch the system off and disconnect it from the power supply.
- ▶ Remove the liquid with dry paper towels.
- ▶ If CU 400 D Copper concentrate has been spilled, contact the LPKF Service.
- ▶ Let the system dry at room temperature, at least one day before the next start.

7.2 Personal protective equipment

- Safety shoes (acc. to EN ISO 20345:2022, at least class S1)
- Protective gloves (acc. to EN 388:2016 - at least class 2121X)
- Heat-resistant protective gloves (acc. to EN 407:2020 - at least class 4343XX)

Personal protective equipment for working with hazardous substances and chemicals

- Splash goggles (acc. to EN 166:2001)
 - Chemical-resistant gloves (acc. to EN ISO 374-1:2016)
 - Closed work clothes
- ▶ Always read the safety data sheets before working with hazardous substances and chemicals and always observe the instructions given therein.

7.3 Maintenance schedule

The following table lists the maintenance tasks that are to be performed by personnel trained for these tasks.

Maintenance schedule for the maintenance personnel of the operator

Component/ Assembly	Interval	Task to be performed	Remark
System	Daily to weekly	Clean the system.	Use a sponge and water to clean the housing.
Perforated plate	Daily to weekly	Clean the perforated plate.	Disconnect the system from the power supply. Use a slightly damp cloth for cleaning.
PCB holder	As necessary	Remove the copper layer	Hang the PCB holder (without PCB) into tank 4 for several hours. Note that this process significantly consumes the active-cleaning solution. Alternatively, remove the copper layer by peeling it off.
PCB holder and tank 5	Every week	Clean the contact surface between PCB holder and tank 5	Clean the surface around the knurled screws on the PCB holder. Clean the contact surface on the container of tank 5.
Tank 1 (cleaning)	Every 2 weeks	Check the mark for the fill level of the tank	Refill the tank if the fill level is too low.
Tank 5 (copper-plating)	Every week	Visual check for copper sulphate crystals	Put the crystals back into tank 5.
Tank 5 (copper-plating)	After 100 ampere hours	Replenish Add CU 400 A Additive	See page 98.
Tank 1 (cleaning)	Annually or in case of significant color change	Replace the cleaning solution	Empty the tank completely and refill it.
Tank 2 (conditioning)	Annually or in case of significant color change	Replace the conditioning solution	Empty the tank completely and refill it.
Tank 3 (activation)	Annually and after malfunction of the activation solution	Replace the activation solution	Empty the tank completely and refill it.
Tank 4 (active-cleaning)	When the active-cleaning solution is spent	Replace the active-cleaning solution	The active-cleaning solution is spent after 12 to 15 PCBs of 305 mm × 230 mm form factor. Empty the tank completely and refill it.
Tank 5 (copper-plating)	Annually	Replace the copper-plating solution	Empty the tank completely and refill it.

Component/ Assembly	Interval	Task to be performed	Remark
Tank 6 (tin-plating)	When the tin-plating solution is spent or at least once a year	Replace Electroless Tin Liquid	The tin-plating solution is spent after 8 to 10 PCBs of 305 mm × 230 mm form factor. See page 99.
Tank 6 (tin-plating)	For times of prolonged non-usage	Fill the chemical into a nonmetal jerry can.	This prevents oxidation of the tin-plating solution.
Fuse	As necessary	Replace the fuse	See page 102.

Table 8: Maintenance schedule for the maintenance personnel of the operator

7.4 Maintenance tasks for the maintenance personnel of the operator

This chapter describes in detail the individual maintenance tasks that the maintenance personnel of the operating company may perform.

■ Draining the tank

Prerequisites

- Tank 1 has cooled down (before draining tank 1).
- The system is switched off.

Spare parts and auxiliary supplies

- Tube
- Jerry can (use a non-metal jerry can for draining tank 6)
- Distilled water

1. Remove the cover from the front of the system.

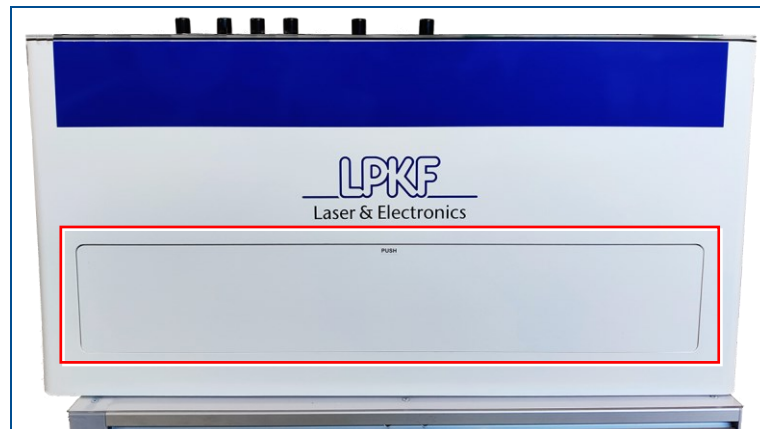


Fig. 83: Cover for drain valves

2. Attach the tube to the relevant drain valve.

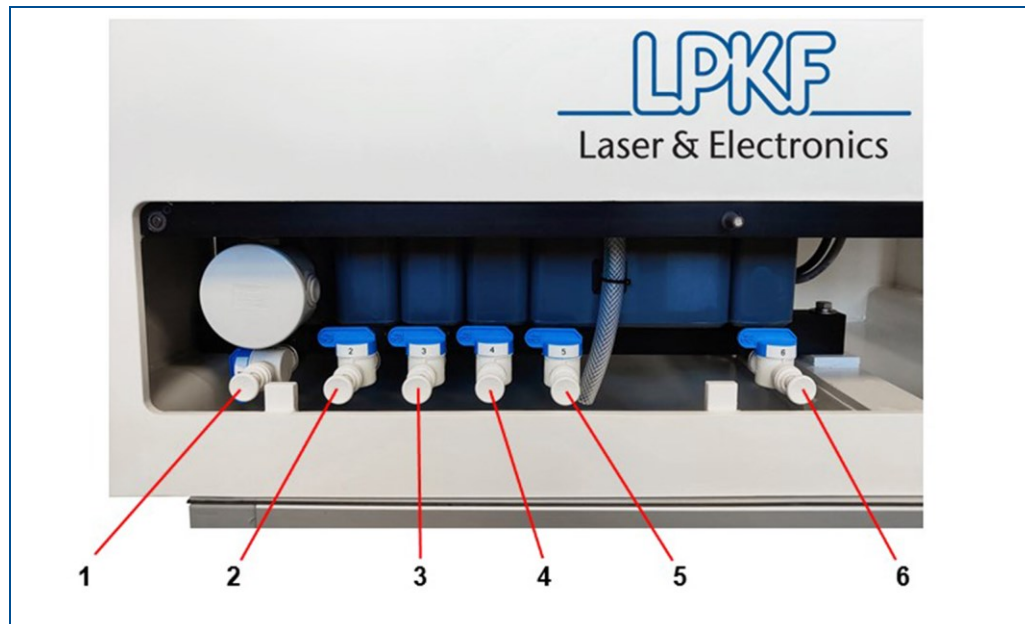


Fig. 84: Drain valves

- | | |
|----------------------------------|-------------------------------------|
| 1 Tank 1 (cleaning solution) | 4 Tank 4 (active-cleaning solution) |
| 2 Tank 2 (conditioning solution) | 5 Tank 5 (copper-plating solution) |
| 3 Tank 3 (activation solution) | 6 Tank 6 (tin-plating solution) |

3. Insert the other end of the tube into a jerry can.



Use the original jerry can if the chemical was delivered in a jerry can.

4. Turn the lever of the valve to the front.



Fig. 85: Turning the lever of the valve

- ☐ The contents of the tank drains into the jerry can.
5. Wait until the liquid has drained completely.
6. Remove the cover of the tank and put it into the holder slot.

7. Rinse the tank with approx. 200 ml distilled water.
- ☐ The contents of the tank drains into the jerry can.
8. Wait until the liquid has drained completely.
9. Place the cover back on the tank.
10. Turn the lever of the valve to the left.



Fig. 86: Closing the valve

11. Push on the ring of the valve and pull out the tube.



Fig. 87: Ring on drain valve

12. Repeat the steps 2 to 11 for all tanks you want to drain.
13. Attach the cover to the front of the system.
- ☒ The tank has been drained.



Resetting the remaining time

After draining the tank, it can be refilled with a fresh solution. After replacing the solution in one tank, perform the following steps in the system software to reset the remaining time:

1. Start the system (see page 59).
2. Tap on
3. Tap on [Settings].
4. Select the tab **Service**:

Menu		Settings		
General	System	Service	Status	Logs
Anode maintenance	11.03.2025	Time left:	343 days	<button>Service</button>
Cleaning solution	0 mm ²	Area left:	100 %	<button>Reset</button>
Conditioning solution	0 mm ²	Area left:	100 %	<button>Reset</button>
Activation solution	0 mm ²	Area left:	100 %	<button>Reset</button>
Active-cleaning solution	0 mm ²	Area left:	100 %	<button>Reset</button>
Plating solution filtered	11.03.2025	Time left:	68 days	<button>Reset</button>
Copper-plating solution	11.03.2025	Time left:	343 days	<button>Service</button>
Additive CU 400 A	0 Ah	Charge left:	100 %	<button>Service</button>
Tin-plating solution	557420 mm ²	Area left:	50 %	<button>Reset</button>

5. In the tab with the relevant tank tap on [Reset].

The remaining time is reset.

■ Replenishing CU 400 A Additive

Prerequisites

- 100 ampere hours have been used since the last replenishment.
- The system is switched on.

Spare parts and auxiliary supplies

- CU 400 A Additive
- Dummy PCB

1. Finish the current plating process with all pending steps.
2. Tap on .
3. Tap on [Settings].
4. Switch to the tab *Service*.

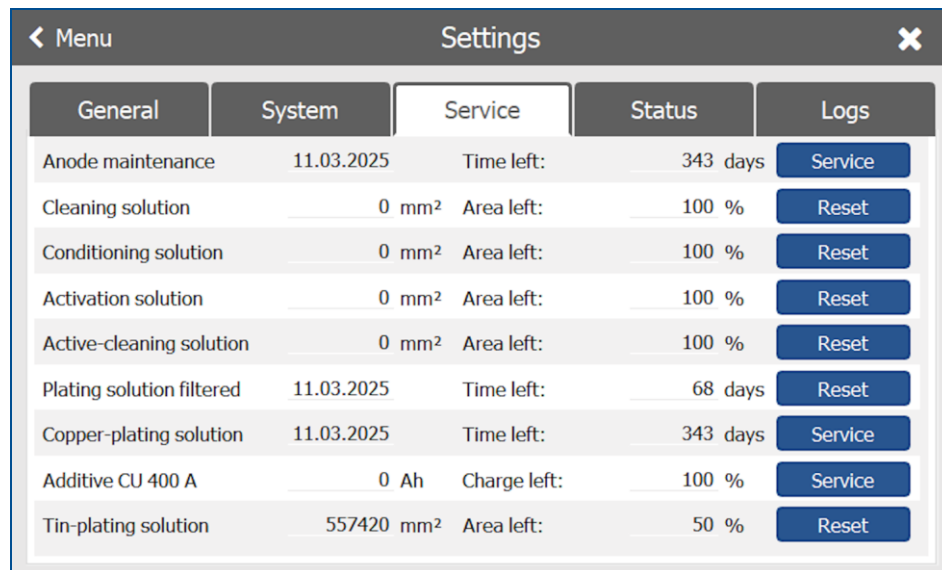


Fig. 88: Settings | Service

5. In the line *Additive CU 400 A* tap on [Service].
 6. Add 17 ml CU 400 A Additive to tank 5.
 7. Re-initialize the system with a dummy PCB (9" x 12"). Use the following parameters:
 - Tank 1: 15 minutes
 - Tank 2: 5 minutes
 - Tank 5: 90 minutes at 10 A; RPP off
- ☐ The remaining time is reset.
- ☒ CU 400 A Additive has been replenished.

■ Replacing Electroless Tin Liquid

Prerequisites

- Tin-plating solution (Electroless Tin Liquid) is spent.

Spare parts and auxiliary supplies

- Electroless Tin Liquid (5 liters)
- Jerry can (non-metal)
- Tube
- De-ionized water

1. Remove the cover from the front of the system.
2. Attach the tube to the drain valve of tank 6.

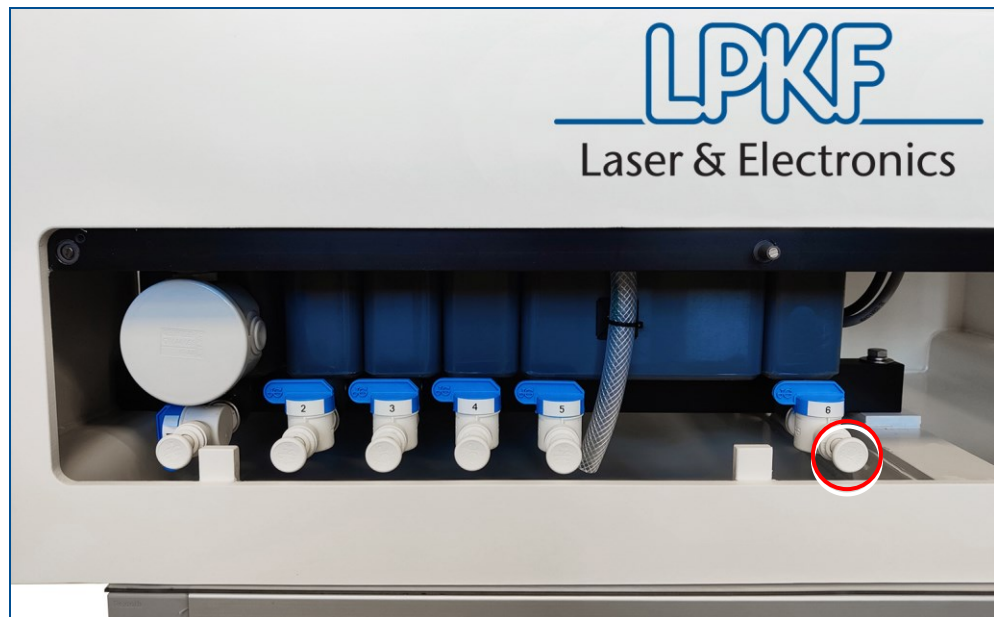


Fig. 89: Drain valve of tank 6

3. Insert the other end of the tube into a clean, dry non-metal jerry can.
4. Turn the lever of the valve to the front.



Fig. 90: Turning the lever of the valve

5. Wait until the liquid has drained completely.
6. Remove the cover of tank 6 and put it into the holder slot.
7. Rinse the tank with approx. 200 ml de-ionized water.

- ☐ The contents of the tank drains into the jerry can.
- 8. Wait until the liquid has drained completely.
- 9. Close the valve.



Fig. 91: Closed valve

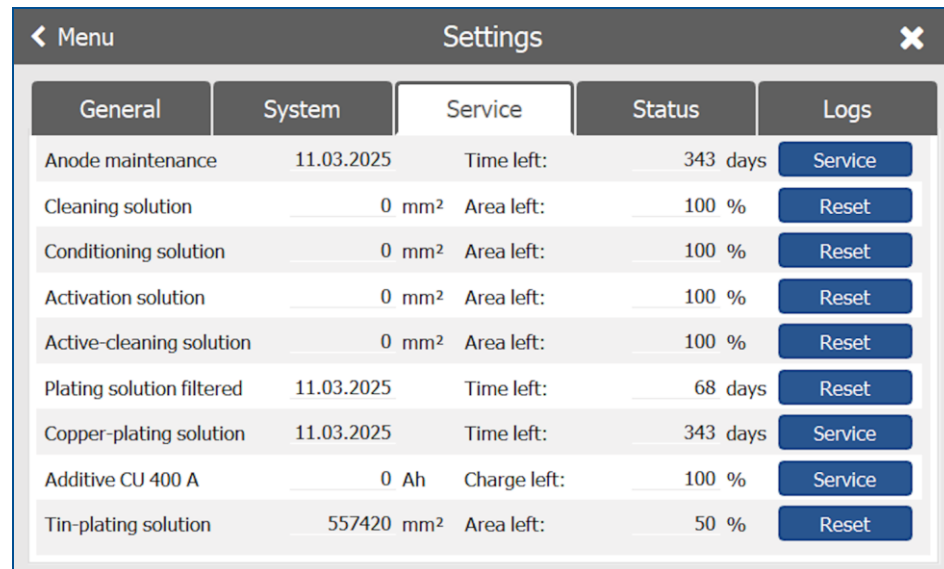
- 10. Push on the ring of the valve and pull out the tube.



Fig. 92: Ring on drain valve

- 11. Attach the cover to the front of the system.
- 12. Fill tank 6 with fresh **Electroless Tin Liquid** up to the mark.

13. Place the cover on tank 6.
14. Start the system (see page 59).
15. Tap on .
16. Tap on [Settings].
17. Select the tab *Service*.



General	System	Service	Status	Logs
Anode maintenance	11.03.2025	Time left:	343 days	<button>Service</button>
Cleaning solution	0 mm ²	Area left:	100 %	<button>Reset</button>
Conditioning solution	0 mm ²	Area left:	100 %	<button>Reset</button>
Activation solution	0 mm ²	Area left:	100 %	<button>Reset</button>
Active-cleaning solution	0 mm ²	Area left:	100 %	<button>Reset</button>
Plating solution filtered	11.03.2025	Time left:	68 days	<button>Reset</button>
Copper-plating solution	11.03.2025	Time left:	343 days	<button>Service</button>
Additive CU 400 A	0 Ah	Charge left:	100 %	<button>Service</button>
Tin-plating solution	557420 mm ²	Area left:	50 %	<button>Reset</button>

Fig. 93: Settings | Service

18. In the line *Tin-plating solution* tap on [Reset].
- ☐ The remaining time is reset.
 - ☒ The Electroless Tin Liquid has been replaced.

■ Replacing the fuse

Prerequisites

- The fuse is damaged.

Spare parts

- Fuse: ESKA UL 522.226
Type: Slow blow fuses
Dimensions: 5 x 20 mm (~0.2 x 0.8 in)
Rated voltage: 250 V AC
Rated current: 8 A

1. Switch the main switch to **O** (off).



Fig. 94: Main switch off

- ☐ The system is switched off.
2. Disconnect the mains cable from the connector of the power supply.
- ☐ The system is disconnected from the power supply.
3. Press the locks of the cap on both sides simultaneously inwards.

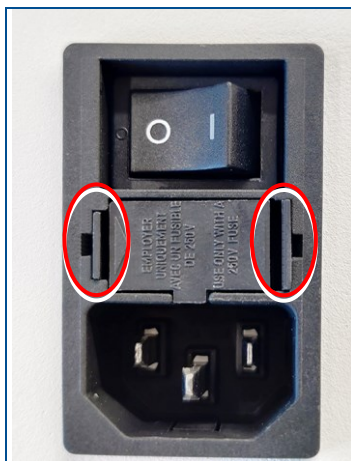


Fig. 95: Pressing the locks together

4. Pull out the cap with the fuse.



Fig. 96: Pulling the cap out

5. Replace the damaged fuse inside the cap with the new fuse.

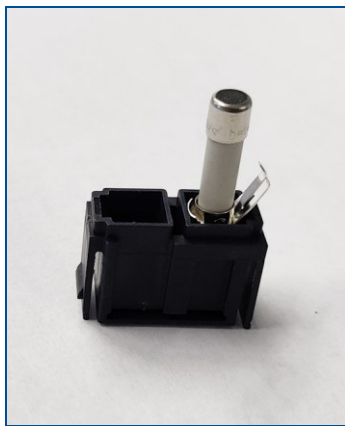


Fig. 97: Fuse

6. Reinsert the cap.
Ensure that the locks are engaged.
 7. Reconnect the mains cable with the connector of the power supply.
- ☒ The fuse has been replaced.



If the problem is not solved after replacing the fuse, contact the LPKF Service.

8 Troubleshooting

This chapter contains an overview of possible faults and measures for troubleshooting.

If faults occur that cannot be eliminated by the following messages contact the LPKF Service.

8.1 Fault display

Errors and pending maintenance tasks are displayed as messages on the user interface.

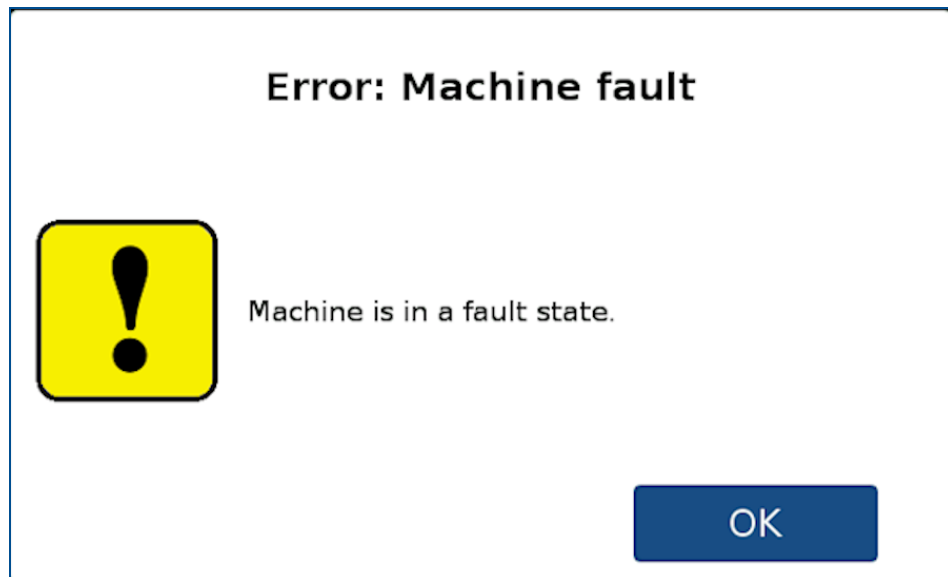


Fig. 98: Error message

Remedy the displayed error and acknowledge the message by tapping on [OK]. If you have any questions contact the LPKF Service.

8.2 Fault table

The following table contains possible faults and proposals how to clear them.

Error	Possible cause Remark	Remedy
Tank 1 remains at room temperature	Immersion heaters or fuse for heaters are defective.	Switch off the system and contact the LPKF Service.
Copper particles on the surface of the PCB	Copper particles are dispersed in the copper-plating solution (tank 5).	Completely drain and clean tank 5 and filter the tank contents (see page 94).
Hot surfaces on the contact surface between the PCB holder and tank 5.	The knurled screws of the PCB holder are not sufficiently tightened.	Tighten the knurled screws of the PCB holder sufficiently.
	The contact surfaces between the PCB holder and tank 5 are dirty.	Clean the contact surface between the PCB holder and tank 5.
The system is in a fault state when starting or during operation (warning messages are displayed).	The fill level of tank 1 is too low.	Refill tank 1.
System cannot be switched on.	No connection to power supply.	Check the mains plug.
	Damaged fuse.	Replace the fuse (see page 102).
	Internal defect	Switch off the system and contact the LPKF Service.

Table 9: Troubleshooting

9 Disassembly and disposal

This chapter describes the disassembly and the disposal of the system.

The following tasks may only be performed by the **maintenance personnel of the operator**.

9.1 Safety

WARNING

Health hazard by contact with chemicals!

Contact with the chemicals can cause serious damage to health:

Inhaling can irritate nose, throat and lungs and can cause allergic respiratory problems.

Skin contact can cause chemical burns, allergies, and hypersensitivity.

Eye contact can irritate the eyes and mucous membranes with burning and tears and can cause impaired vision and serious eye damage.

Ingestion can cause chemical burns of the mucous membranes, throat, esophagus, and stomach and can cause gastrointestinal complaints.

- ▶ Read the provided safety data sheets carefully.
- ▶ Work in well-ventilated rooms.
- ▶ Wear your personal protective equipment.
- ▶ Avoid direct contact with the chemicals.
- ▶ Take off contaminated clothes immediately.
- ▶ Wash your hands thoroughly after work.

NOTICE

Environmental hazard by improper disposal of the system!

Improper disposal of the system can cause hazards to the environment.

- ▶ Dispose of the system properly or contact the LPKF Service.

9.2 Preparations

The system has to be prepared as follows before disassembly and disposal:

- Switch off the system.
- Disconnect the system from the power supply.
- Wait until bath 1 has cooled down.

9.3 Proper disposal of the chemicals

For information on proper disposal of the chemicals refer to the included safety data sheets.

9.4 Uninstalling the system

The system is disassembled as follows:

■ Uninstalling the system

1. Drain the tanks separately (see page 94).
Use the original containers of the chemicals if on hand except for Electroless Tin Liquid. Use a clean, dry, and non-metal canister for Electroless Tin Liquid.
 2. Rinse the tanks thoroughly.
 3. Rinse tank 3 with de-ionized water once more.
 4. Remove the anodes with the anode bags from tank 5.
 5. Remove the anodes from the anode bags.
 6. Rinse the anodes and anode bags.
 7. Brush the anodes with a plastic brush until shiny.
 8. Dry the anodes and anode bags.
The anodes and anode bags may have to be replaced, depending on their condition.
 9. Dry the tanks.
- ☒ The system has been uninstalled.

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10.4 EC Declaration of conformity



EG-Konformitätserklärung nach Maschinenrichtlinie 2006/42/EG, Anhang II A

Der Hersteller: LPKF Laser & Electronics d.o.o.
Polica 33
4202 Naklo
Slowenien

erklärt hiermit, dass folgendes Produkt

Produktbezeichnung: LPKF Contac S4
Fabrikat: Durchkontaktierung-System

den Bestimmungen der oben gekennzeichneten Richtlinie - einschließlich deren zum Zeitpunkt der Erklärung geltenden Änderungen - entspricht.

Diese Erklärung bezieht sich nur auf den Zustand, in dem das Produkt in Verkehr gebracht wurde. Vom Endnutzer nachträglich angebrachte Teile, oder nachträgliche vorgenommene Veränderungen bleiben unberücksichtigt. Die Erklärung verliert ihre Gültigkeit, wenn das Produkt nachträglich verändert wird.

Folgende harmonisierte Normen wurden angewandt:

EN ISO 12100:2010	Sicherheit von Maschinen - Allgemeine Gestaltungsgrundsätze - Risikobeurteilung und Risikominderung
EN 61010-1:2010/ A1/AC:2019	Sicherheitsbestimmungen für elektrische Mess-, Steuer-, Regel- und Laborgeräte - Teil 1: Allgemeine Anforderungen
IEC 61326-1:2020	Elektrische Mess-, Steuer-, Regel- und Laborgeräte - EMV-Anforderungen - Teil 1: Allgemeine Anforderungen

Folgende weitere EU-Richtlinien wurden angewandt:

EMV-Richtlinie 2014/30/EU
RoHS-Richtlinie 2011/65/EU

Die Schutzziele der Niederspannungsrichtlinie 2014/35/EU werden gemäß Anhang I, Nr. 1.5.1 der Maschinenrichtlinie eingehalten.

Name des Dokumentationsbevollmächtigten: Matjaž Samarin

Ort: Naklo (Slowenien)
Datum: 15.01.2025


Sašo Djaip
(Geschäftsführer)



Fig. 99: Declaration of conformity (original)



EC Declaration of conformity according to Machinery Directive 2006/42/EC, Annex II A

The manufacturer/distributor: LPKF Laser & Electronics d.o.o.
Polica 33
4202 Naklo
Slovenia

hereby declares that the following product

Product designation: LPKF Contac S4
Product type: Through-hole plating system

conforms to the requirements of the directive stated above - including the amendments in force at the time of the declaration.

This declaration is only valid for the state of the product at the time of delivery. Any parts added by the user or other later modifications are excluded. The declaration becomes invalid if the product is modified after delivery.

The following harmonized standards have been applied:

EN ISO 12100:2010	Safety of machinery - General principles for design - Risk assessment and risk reduction
EN 61010-1:2010/ A1/AC:2019	Safety requirements for electrical equipment for measurement, control and laboratory use - Part 1: General requirements
IEC 61326-1:2020	Electrical equipment for measurement, control and laboratory use - EMC requirements - Part 1: General requirements

The following additional EC directives have been applied:

EMC directive 2014/30/EU
RoHS directive 2011/65/EU

The safety objectives of the Low Voltage Directive 2014/35/EU are met in accordance with Annex I, No. 1.5.1 of the Machinery Directive.

The party authorised to compile the technical file: Matjaž Samarin

Location: Naklo (Slovenia)
Date: 2025-01-15


Sašo Djaip
(Managing director)



Fig. 100: Declaration of conformity (original)

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