



Manual

Contac-III

English, version 1.1

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Item number 112622

Information on this manual

It is the duty of the system owner to care for and plan these measures as well as to control their execution. The owner especially has to ensure that

- **the system is only used as directed**
- **the system is only operated in perfect and functional condition. Especially the function of the safety appliances has to be checked regularly**
- **the operating manual is kept legible and complete at the place of operation**
- **only sufficiently qualified and authorized personnel operates, maintains and repairs the system**
- **this personnel is regularly instructed in matters of work safety and environmental protection and is informed on the operation manual and especially the safety instructions**
- **all safety and warning notes or signs stay on the system and are legible**

Using this manual

I. Orientation

This manual is divided into the following chapters:

1. Introduction
2. Products supplied
3. Safety regulations
4. Description of the machine
5. The operating menu
6. The process menu
7. Modification menu
8. Setting up
9. Description of operating procedure
10. Maintenance and servicing
11. Waste disposal
12. Appendix

II. Conventions used in this manual

Bold text is used to emphasise important information.

Illustrations are numbered. Example: Fig. 5

- › Prompts for actions are identified with an arrow.

Italic sections are used to indicate the reactions consequent on an action.

Words printed in italics mark proper names

Key inscriptions and menu terms are printed in **BOLD CAPITALS**.

III. Notes on the symbols used



Danger! This symbol is used to highlight danger to life or health.



Caution! This symbol is used to identify hazards which may cause damage.



Note: This symbol is used for notes intended to help you avoid faults in operation or to help you improve your procedures.

IV. Target Group

This manual is written for people with basic knowledge in PCB production, **including the production of multilayer PCBs** for electronics

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1.0 Introduction

Dear Customer

May we congratulate you on your choice of the LPKF *Contac-II* system for through-hole plating in the laboratory.

This is the simplest system for galvanic through-hole plating to use in terms of the number of baths and production steps that we know of on the market. The process requires no specialist knowledge of chemistry or galvanizing.

Nevertheless, as with all galvanizing systems, the instructions in the operating manual must be followed carefully, otherwise there is a significant danger of a bath being damaged to such an extent that it can no longer be used.



In particular we would like to draw on our experience and bring to your attention the following possible errors:



- **! MAKE SURE THAT THE AMBIENT TEMPERATURE DURING THE OPERATION IS BETWEEN 18° - 25°C / 64,4° - 77° F (OVERNIGHT, FOR EXAMPLE) !**
- **Pay particular attention to careful rinsing. Under no circumstances should residues from one bath be allowed to get into the next bath. You must also rinse the circuit board holder carefully after use.**
- **Do not use steel wool or similar to clean circuit boards. Even the tiniest particle of metal is enough to destroy a bath.**
- **Always keep the baths covered, in other words, keep them as clean as humanly possible. This will ensure them a long lifetime.**
- **Ensure that drillings are technically perfect. Please observe the drilling parameters.**
- **Ammonia and chlorine vapours must not be allowed to escape into the room.**
- **An air extraction system can be installed over the machine but there must be no draft created over the baths.**
- **A ventilation system must not be installed over the baths.**
- **We recommend that you receive a basic training from our subject expert. This will provide you with tips and expertise for your entire circuit board production process.**

We are certain that by following these notes and the instructions that follow precisely you will achieve reliable through-hole plating and will be satisfied with the LPKF *Contac-III* system in all respects.

2.0 Products supplied

The following are supplied with the LPKF *Contac-II* in addition to the machine itself:

I.LPKF Contac-III:

- 4 x Phosphorised copper anodes
- 3 x holders (1 with electric connection, 2 without electric connection)
- 5 x covers (for containers 1, 3, 4, 6, 8)
- this manual
- wiping spatula
- spray bottle
- measuring cylinder

II.Chemicals, sufficient for one year's normal operation:

- Through-plating:
 - *CLEANER 110*
 - *CLEANER 210*
 - *ACTIVATOR 310*
 - *COPPER PLATER 400*
 - *SHINE 400*
- Pouring spouts for filling the containers:
 - *red for CLEANER 110 and CLEANER 211*
 - *black for ACTIVATOR 310*
 - *blue for COPPER PLATER 400*



Note: The red and the blue pouring spout must be rinsed with water after each use or when the type of cleaner is to be changed, respectively. After each use of the black pouring spout, rinse it with demineralised water and then let it dry.

Not included in the materials supplied:

- Distilled water
- Container for disposing of spent chemicals



Note: Provide the containers with the delivered chemicals with stickers or do not remove existing stickers, respectively, and store them for filling with the corresponding used chemicals.

3.0 Safety regulations

The user must have read this manual, paying particular attention to the safety instructions printed in bold, to ensure safe working with this system.



- **Never reach into the machine when it is running.**
- **Avoid all contact with the fluids. (If the fluids have contact with the skin or even the eye, immediately rinse thoroughly with water and contact an ophthalmologist.)**
- **Never prepare or eat food while operating the machine.**
- **Wash your hands after operating the machine.**
- **Wear suitable protective clothing when filling or draining the machine. (safety glasses and gloves)**
- **Never drink the fluids.**
- **Do not allow any of the fluids to escape when working on the machine.**
- **Always ensure that there is sufficient fluid in the first container (CLEANER 110) to prevent the heater system running dry. Risk of fire.**
- **Modifications carried out on the machine by you may jeopardize the safety of the machine and are not covered by the terms of the warranty.**
- **Please note that some materials can produce toxic gasses during processing. Obtain information on this from your materials supplier.**
- **Always work in rooms with ventilation or air extraction (operation with opened windows). A danger of air pollution caused by operating a Contac-II system could not be established by internal measurements.**
- **Exchange of air 7 times if possible**
- **Please follow the instructions given on the containers and/or separate safety leaflets when using chemicals.**
- **Only use chemicals for the purposes for which they are intended.**
- **Keep your workplace clear.**
- **Observe safety instructions.**

4.0 Description of the machine

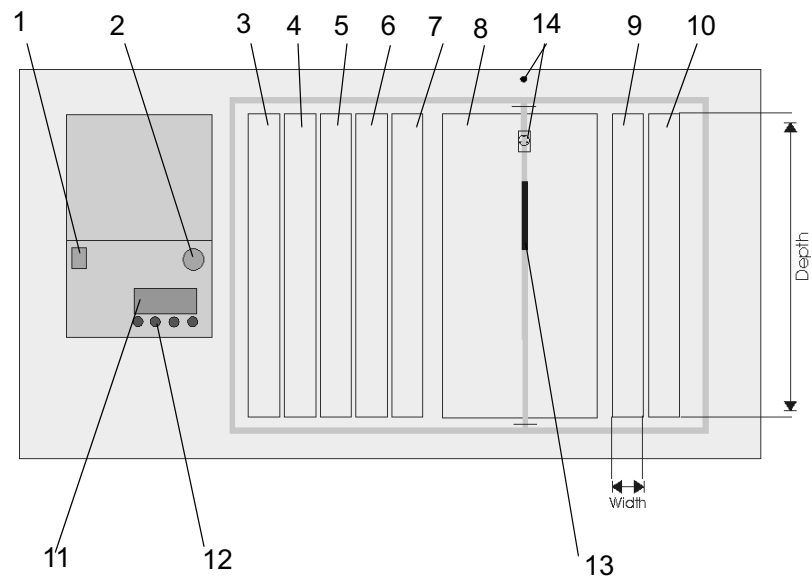
The machine consists of a stable plastic casing and a metal case with working containers for the baths and their associated motion mechanism, the operating unit, the control unit and the circuit board holders.

The operating unit containing the main switch and the control unit is located on the left-hand side.

The water inflow and outflow ports are mounted on the left side.

The dimensions of the machine are: approx. 1200 mm x 1130 mm x 715 mm (W x H x D).

Fig. 1: Contac-III (seen from the top)



- | | |
|----------------------------|---|
| 1- Power switch | 8- Container 6 |
| 2- Emergency stop | 9- Container 7 (Sprincler) |
| 3- Container 1 | 10- Container 8 (Tinning bath (option)) |
| 4- Container 2 (Sprincler) | 11- Display |
| 5- Container 3 | 12- Operating buttons |
| 6- Container 4 | 13- Material holder |
| 7- Container 5 (Drying) | 14- Cathode connections |



Caution! Use the material holder with the electrical connection only for the container with copper plater.

4.1 Option Reverse Pulse Plating

The Reverse Pulse Plating is realized by means of a special LPKF control electronics which monitors the complete through-plating process.

During the standard galvanisation, more material is deposited at the corners of bore holes than within the holes, which is due to the distribution of the flux lines. This formation of a bulge at the edges is called „bone effect“ and occurs especially at a high aspect ratio (see left part in fig. 2 on page 12).

Fig. 2: Bone effect



During Reverse Pulse Plating the workpiece is shortly anodically poled by applying a reverse pulse. This causes a part of the material to be removed again at the bulges so that generally the copper deposition becomes more constant and the aspect ratio is improved.

Fig. 3: Standard galvanisation

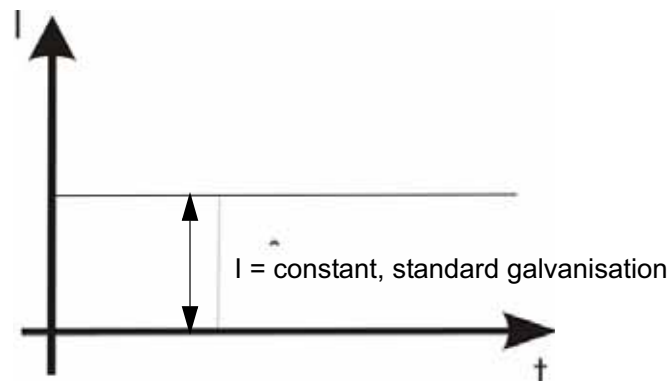
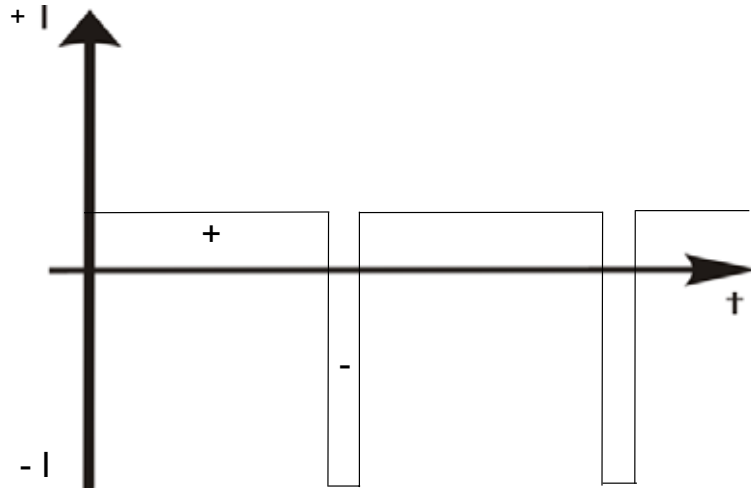


Fig. 4: Galvanisation with reverse pulse plating



4.2 Technical data

The *Contac-III* is a system to be placed on the floor.

Dimensions and power details (approx.):

Width	1200 mm
Depth	715 mm
Height	1130 mm
Weight	125 kg
Voltage	220 V
Power	2000 V



AMBIENT TEMPERATURE 18°-25° C (64,4° F - 77° F)

Max. size of base material: 360 mm x 420 mm
 Max. size of printed circuit board: 270 mm x 330 mm

4.3 Technical surroundings description

For operating the system you will need a freshwater inflow and a sewage effluent. The power supply has to be connected with a fault-current circuit breaker. The user has to provide these connections.

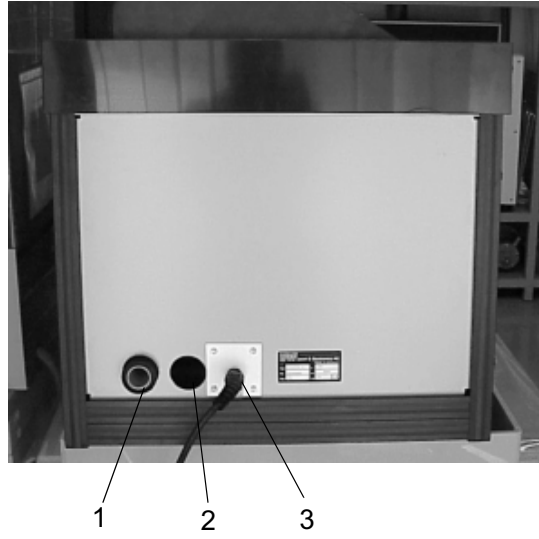
Since water splashes cannot be completely avoided around the system, it is advisable to operate it in surroundings insensitive to water.

The connections for water inflow and outflow as well as the power supply are on the left side of the systems. You can see the exact location and the connection measures in the drawing (fig. 5 on page 14).

For water supply the system is connected with a water pressure hose (approx. 2 m long, connection thread 3/4 inch, within scope of delivery) to the existing shut-off tap. The maximum permissible water pressure is 3 bar.

The power supply is connected via an approx. 2 m long 230 V lead.

Fig. 5:



1- sewage

2- freshwater

3- power supply

Water enters by a $\frac{3}{4}$ " hose and leaves by a DN-40 hose. The drain valves have connection adapters for M" and $\frac{1}{2}$ " PVC hoses.

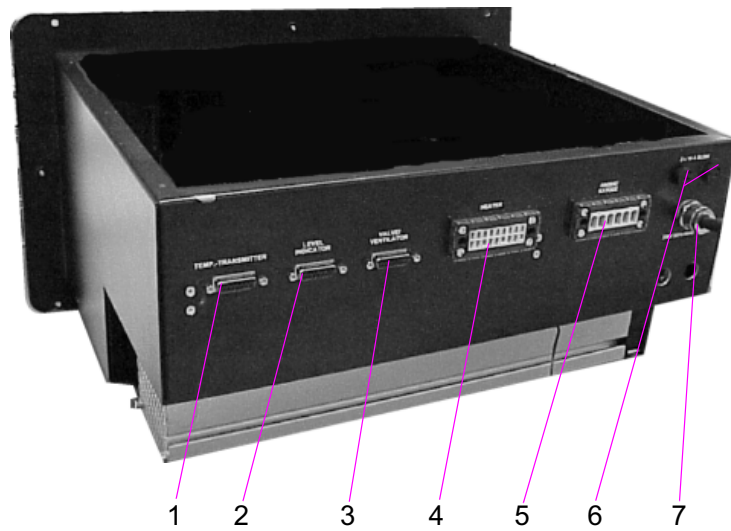
4.4 Electrical connections

The machine can be run on 230 V 50 Hz 1500 VA.

Power is supplied via a power cord with shrouded contacts.

The anodes in container 6 are permanently connected to the rectifier fitted in the control unit via a contact rail while the circuit board holder (circuit board = the cathode) is connected to the cathode connection on the operating unit via the cathode cable.

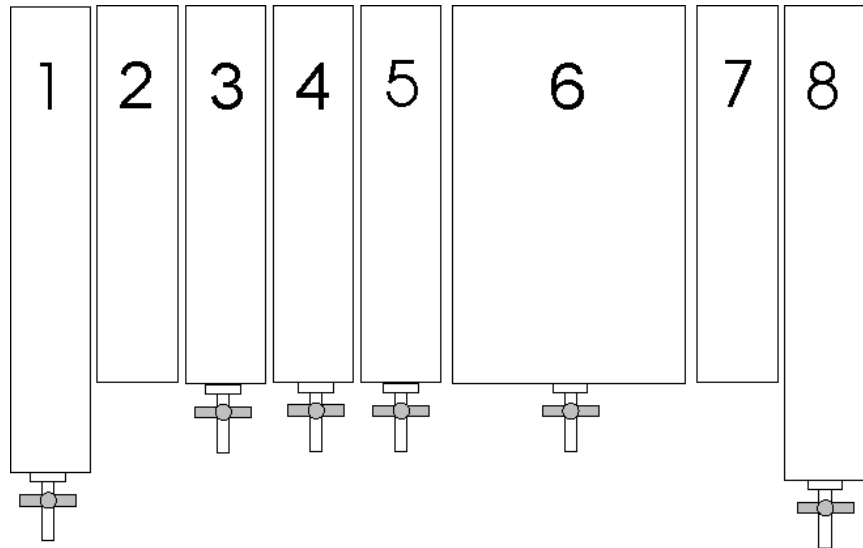
Fig. 6:



- | | |
|-----------------------|----------------------|
| 1- Temp. Transmitter | 5- Anode / Katode |
| 2- Level Indicator | 6- 2 x 10 A Slow |
| 3- Valve / Ventilator | 7- 230 V 50Hz - 60Hz |
| 4- Heater | |

4.5 Description of the individual containers

Fig. 7: schematic view



- | | |
|-------------------|----------------------|
| 1- Cleaner 110 | 5- Drying container |
| 2- Sprinkler bath | 6- Copper Plater 400 |
| 3- Cleaner 210 | 7- Sprinkler bath |
| 4- Activator 310 | 8- Tinning (Option) |

Container 1

Degreasing and drilling preparation

Solution:	CLEANER 110
Dimensions:	approximately 60 mm x 525 mm x 450 mm (W x H x D)
Volume of reagent:	approximately 13 litres
Heating:	approximately 55 °C
Frame motion:	Lift approximately 25 mm
Drainage:	via the outlet valve
Container cover:	yes

Container 2

Sprinkler rinsing

Dimensions:	approximately 60 mm x 425 mm x 450 mm (W x H x D)
Drainage:	into the drain
Container cover:	No

Two sprinkler bars in the shape of drilled tubes are fitted on the right and left at the upper edge for rinsing the circuit board.

Container 3

Preparation

Solution:	CLEANER 210
Dimensions:	approximately 60 mm x 425 mm x 450 mm (W x H x D)
Volume of reagent:	approximately 10 litres
Heating:	none
Frame motion:	Lift approximately 15 mm
Drainage:	via the outlet valve
Container cover:	yes

Container 4

Activation

Solution:	Activator 310
Dimensions:	approximately 60 mm x 425 mm x 450 mm (W x H x D)
Volume of reagent:	approximately 10 litres
Heating:	none
Frame motion:	Lift approximately 15 mm
Drainage:	via the outlet valve
Container cover:	yes

Container 5

Drying container

Solution:	----
Dimensions:	approximately 60 mm x 425 mm x 450 mm (W x H x D)
Heating:	none
Frame motion:	Lift approximately 15 mm
Drainage:	via the outlet valve
Container cover:	yes

Container 6

Copper plating

Solution:	COPPER PLATER 400
Dimensions:	approximately 245 mm x 450 mm x 425 mm (W x H x D)
Volume of reagent:	approximately 40 litres
Heating:	none
Frame motion:	Lift approximately 15 mm
Drainage:	via the outlet valve
Container cover:	yes

Two copper rails are fitted in the container to hold the 4 phosphatized copper anodes.

Container 7

Sprinkler rinsing

Dimensions:	approximately 60 mm x 425 mm x 450 mm (W x H x D)
Drainage:	into the drain
Container cover:	No

Two sprinkler bars in the shape of drilled tubes are fitted on the right and left at the upper edge for rinsing the circuit board.

Container 8 (Option)

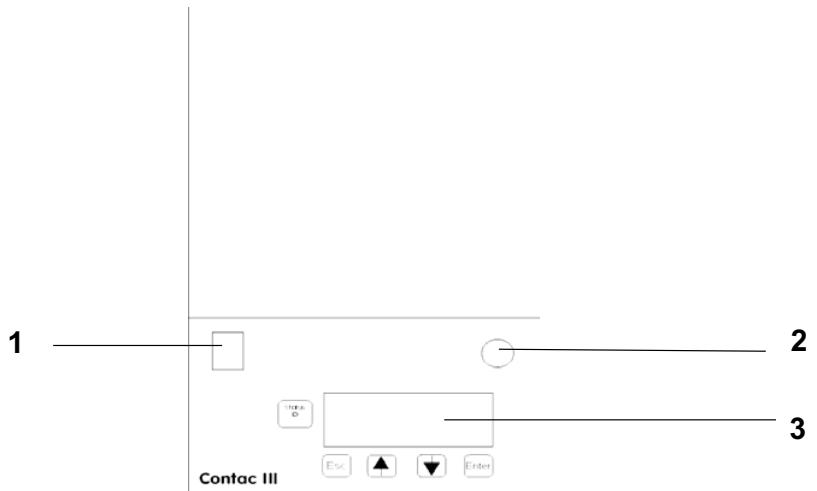
Chemical Tinning (e-less tinning)

Solution:	on request
Dimensions:	approximately 60 mm x 520 mm x 450 mm (W x H x D)
Volume of reagent:	approximately 13 litres
Heating:	yes
Working temperature	30°C to 40 °C
Frame motion	Lift approx. 15 mm.
Drainage	via the outlet valve
Container cover:	yes

The maximum filling height is marked by a triangular sign in each container.

4.6 The operating panel

Fig. 8: Main switch





- 1- Main switch
- 2- Emergency Stop
- 3- Display

The following display appears in the indicator when the unit is switched on:





The unit is now in the heating position.

The following functions can then be carried out with the keys on the press control system:

- ESC:** Change-over to the modification mode
-  Not yet functional
-  Not yet functional
- ENTER:** Change-over to the program selection mode (after heating up)

4.7 Program selection mode

After the heating phase:

Using the keys  and  you can choose between the following programs:

- Through-plating
- Tinning

The selected program is started using the **ENTER** key.



The modification menu is started using the **ESC** key.

The process diagramm shown in fig. 10 on page 23 describes the different possible operating steps for the „through-plating“ program.

5.0 The Operating menu

The operating menu for the control system is displayed once the machine has been switched on (by turning and pulling the main switch).

The version number of the software currently installed in the control unit appears in the first display.

Use the  or  buttons to navigate through the menu items, the **ENTER** button to select a menu item, and the **ESC** button to deselect a menu item and to go up one level.

Use **ENTER** to call up the start menu.

6.0 The Process menu

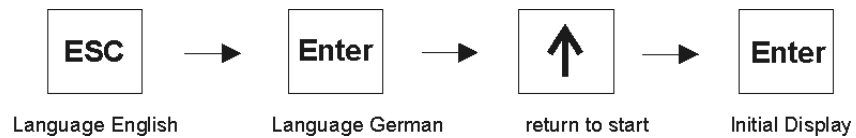
The process menu is a pictorial display of the software. It automatically guides the user through the process. There are only a few settings necessary. These settings depend on the circuit board to be processed.



Note: This menu is the basic configuration for the heating basin.

The software is delivered in English. You can switch to the German language at any time. See the following figure.

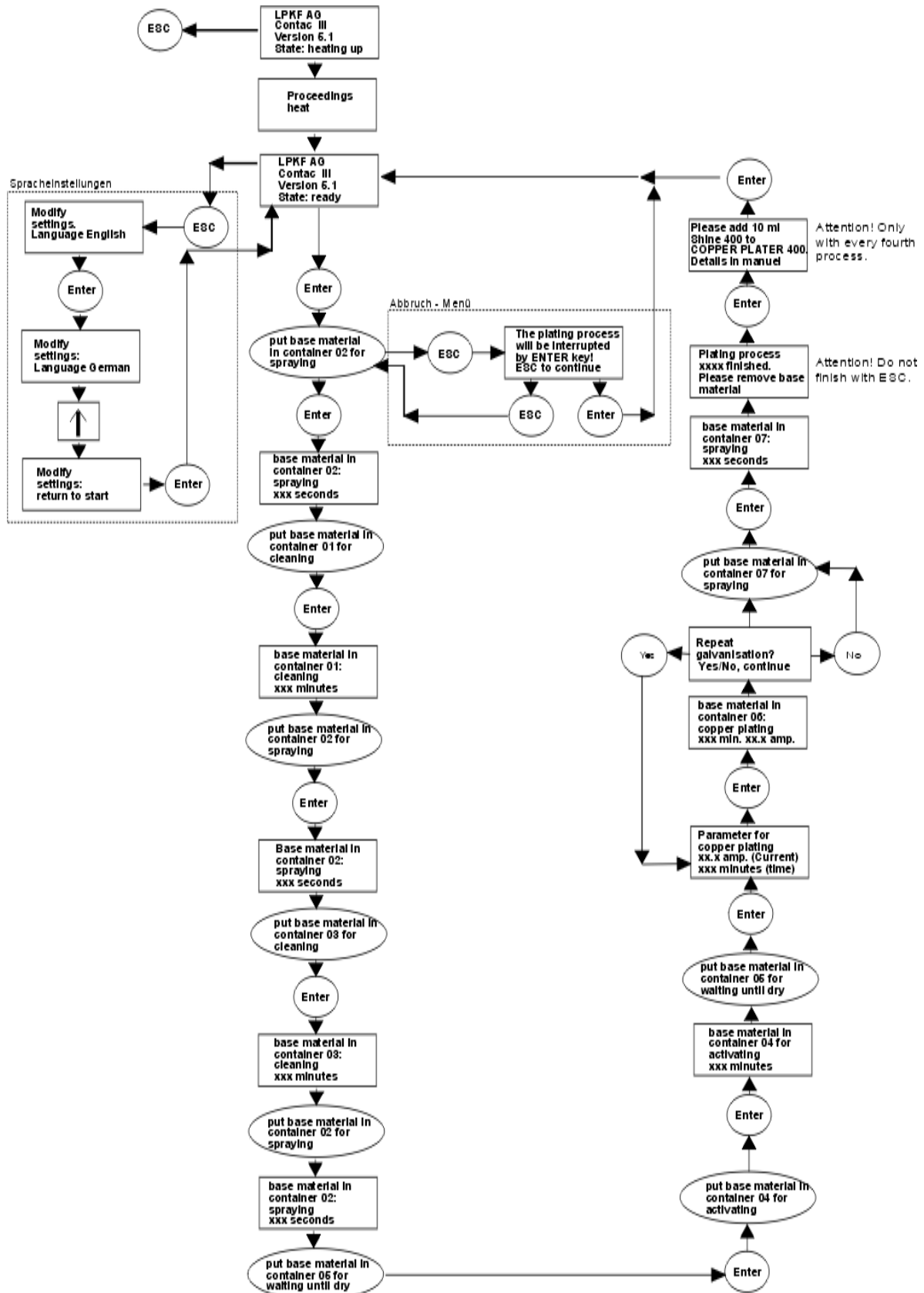
Fig. 9:



By pressing the **ESC** key you will go back to the start menu.

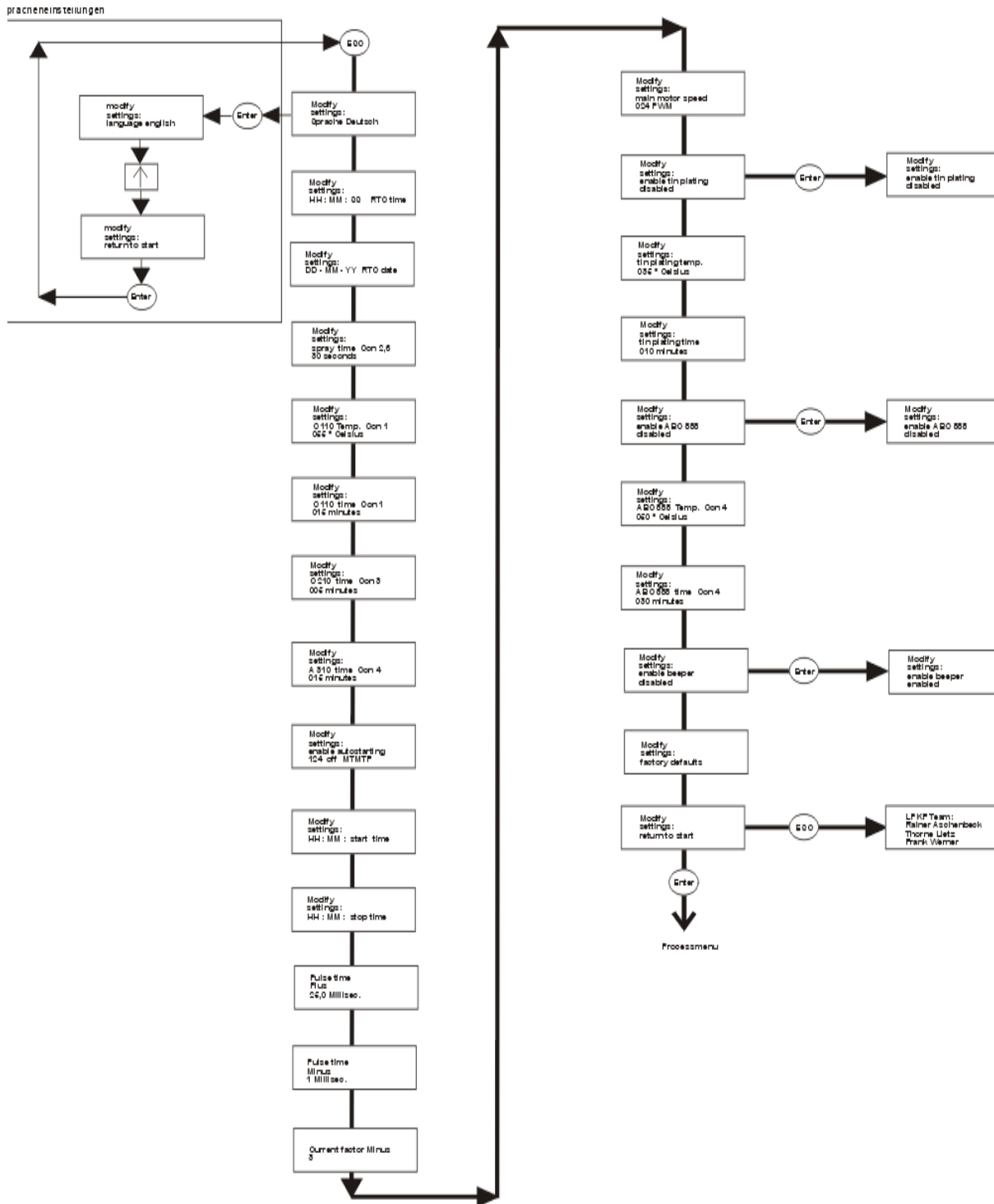
The complete process menu is represented in fig. 10 on page 23.

Fig. 10: process menu



7.0 The Modification menu

Fig. 11:



8.0 Setting up



Caution! Always make sure that the first bath is sufficiently topped up. Top up with distilled water if necessary.

- › Clean any impurities from the anodes completely using acetone, then scrub the anodes using scouring powder and water until they are bright and rinse off thoroughly so that no residue is left on the anodes.

The containers have already been cleaned and rinsed before delivery. You can immediately fill in the through-plating chemical.

The maximum filling height is shown by a triangular marking in each container.

- | | | |
|----------------------------|----|-------------|
| • <i>CLEANER 110</i> | in | Container 1 |
| • <i>CLEANER 210</i> | in | Container 3 |
| • <i>ACTIVATOR 310</i> | in | Container 4 |
| • <i>COPPER PLATER 400</i> | in | Container 6 |



Caution! For the COPPER PLATER 400 you have to add 2 ml of SHINE 400 per liter of bath volume (do this only shortly before putting the bath into operation).

The container 4 of the AKTIVATOR 310 has to be absolutely dry before filling.

- › When all baths are filled, you must run a complete procedure with a test board. Then the baths are ready for operation.
- › The chemicals must have been in the *Contac-III* container for a minimum of 24 hours before commencing through-hole plating.



Caution! It is imperative that you observe instructions in the safety data sheets for CLEANER 110, CLEANER 210, Activator 310, COPPER PLATER 400 and Shine 400!

These must be fixed to the machine so that they are clearly visible.

9.0 Description of operating procedure

Circuit boards must only be drilled with hard-metal drills suitable for drilling board material. They should fall within the drilling parameters which you can obtain from the machine manuals or the tool libraries in *BoardMaster*.

You may only use FR4 material as the board material. Ideally you should use FR4 with a 5 mm or 9 µm copper coating (depending on availability). This material only needs rinsing to clean the drillings as it is protected by a copper film. You will need to deburr the circuit board after drilling and brush or scrub the surface with, for example, artificial fleece (not with steel wool) if you are using a board material without a protective film, for example 18/18µm FR4. Rinse the circuit board thoroughly with water, paying particular attention to the drillings.



Caution! Never blast clean with oil-containing compressed air. Any oil residues could destroy the chemicals or have a negative influence on the quality of the through plating.

- › Fix the board in the holder, then rinse it in container 2 (spray rinsing). Start the spraying process by pressing **ENTER**.
- › Set the temperature of the first bath in the operating menu (Setup).
Temperature = 55° C
Start the process menu and set the resting time for bath1.
Resting time = 15 minutes.
- › Clamp the circuit board in the holder and send the circuit board into **Container 1 (CLEANER 110)**. The frame motion is switched on by pressing **ENTER** in the programm menu and the holding time is shown beneath this.
- › Rinse off the circuit board thoroughly in **Container 2** (sprinkler rinsing). Press **ENTER** to start up the sprinkler system. The circuit board must be rinsed off immediately it has been treated in the *CLEANER 110* bath to ensure that the degreasing chemicals do not harden. To do this, move the circuit board up and down about 15 times or at least 30 sec.



Caution! Please make sure also to rinse the board holder to minimise spreading the chemicals.

- › Once the circuit board has been thoroughly rinsed, send it to **Container 3 (CLEANER 210)**. The holding time for bath 2 should be set for this under the parameter menu: Holding time = approximately 3-5 minutes, (temperature = approx. 20°C) and the sequence is continued by pressing **ENTER**. After a dwell time of approx. 3-5 minutes, rinse the board in container 2. Now take the board out and intensively spray it completely from both sides including the drill holes using the enclosed spray bottle with demineralized water. This will rinse off harmful tap water components. Now blow off the board with oil-free compressed air. This is to prevent water remaining in the drill holes.

Afterwards the circuit board are dried with warm air.



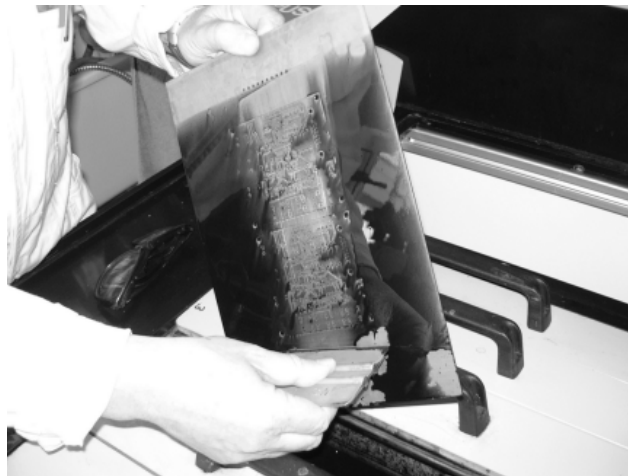
Note: Steer the ACTIVATOR 310 before you put the circuit board into the bath. When the filling level is too low, do only refill with ACTIVATOR 310.

- › Afterwards put into the **Container 4 (ACTIVATOR 310)**. The holding time for bath 3 should be set for this under the parameter menu: Holding time = approximately 10-15 minutes, (temperature = approx. 20 °C) and then restarted by pressing **ENTER**. The circuit boards need to be moved to rinse out the drillings.

The menu prompts you to dry the circuit board when the holding time expires.

- › Take out the board.
- › Wipe the activator off the surface of both sides with the wiping spatula so that the remaining liquid will drop back into container 4 (see fig. 12 on page 27).

Fig. 12:



- › Let the board **dry thoroughly**.



Caution! Never blast clean with oil-containing compressed air. Any oil residues could destroy the chemicals.

You can dry the AKTIVATOR in the drying cabinet < 55° C or using a hair drier (temperture < 55° C). You can also wait for the corresponding time. Make sure the drill holes are free of chemical residues.

- › Remove the copper film if you are using FR4 material with copper film.
- › If you use base material without protective foil, please dab it very carefully with a fibre-free cloth to prevent the ACTIVATOR being washed out of the drill holes / Drill hole edge.
- › Now set the current level for the copper plating in the configuration menu.

Change of time and current

Fig. 13:

Parameter for copper-plating xx.x Ampere (current) xxx Minutes (time)
--

- › Press the **ENTER** key.

The cursor will go the number to be changed.

With the keys  and  you can change the time.

- › Press the **ENTER** key again.

Repeat the process.



Attention: Please note that you must calculate the area of the circuit board which is being immersed in the COPPER PLATER 400 bath.

The current level is calculated as follows:

A current level of 1 ampere per 100 cm² surface area is required.

Example:

Boardmaterial of size A4: 200 mm x 300 mm = 60,000 mm² = 600 cm²

Surface area = front side plus reverse side = 600 cm² x 2 = 1,200 cm²
 1200 cm² -10% (untill -20%) = approx. 10 A

Current to be set = 10 A

Maximum current to be adjusted = 50 A





Note: We recommend 10% to 15% reduced electricity. This will ensure a more even surface.

9.1 Menu Copper plating / RPP (Reverse Pulse Plating)

In the galvanisation menu you can choose between standard copper plating or RPP (reverse pulse plating) copper plating.

During standard galvanisation the display shows **COPPER PLATING (+)**, during Reverse Pulse Plating the display shows **COPPER PLATING (+, -)**.

Use the keys  and  to choose the required type of galvanisation.

For RPP, the duration of the pulse in positive and negative direction as well as the factor for current can be set in the modification menu. The current factor can be chosen to be between 1 and 4, default setting is 3. The default settings have proven to give the best through-plating results.

The last value chosen for current remains active, so that it may be necessary to change the current, depending on the size of the PCB.

- › The circuit board holder must be connected to the cathode cable (negative) before sending the circuit board to **Container 6**.
- › Only now can you immerse the circuit board immediately into **Container 6 (COPPER PLATER 400)**. The process time is set under the parameter menu. Start then by pressing **ENTER**. The control unit will detect if a circuit board has not been immersed in the bath because there will be no current flowing. The *Contac-III* will be reset to start menu.
- › The circuit board should be removed after 20 minutes and checked to see that all the drillings have been copper plated. To do this press **ESC** again and **ESC** again after you have checked the circuit board and put it back in the container. Always keep the cathode cable connected to the holder when doing this. Leave for a further 60-90 minutes plating.
- › The rules of electrochemistry lead to a fluctuating coating thickness of the separated copper layer. Should you require a lower fluctuation, you can press **ESC** after half the set time which will interrupt the electroplating. Now take the board with the holder out of the bath, turn it upside down and place it into the bath again (wear safety goggles and gloves!). Press **ESC** again and the coating will continue.





Note: When the filling level is too low, do only refill with COPPER PLATER 400.

Copper will be deposited at a rate of approximately 0.2-0.3 μm per minute depending on the temperature of the bath, the current level, the size of the circuit board and the quality of the chemicals used. Thus approximately 12-18 μm of copper will form in sixty minutes.

Please note that the values given for the potential copper thickness are the approximate values that can be deposited using a machine such as the LPKF *Contac-III* under laboratory conditions. You will have to through-hole plate several test circuit boards and use micrographs to determine the actual wall thickness if you need to obtain precise data on the thickness of copper deposited in the drillings. You can begin through-hole plating the circuit boards themselves once you have determined the parameters for the wall thickness you require. We recommend that you use the parameters specified by us to obtain satisfactory through-hole plating.

The galvanisation process can be repeated as often as you choose, and the type of galvanisation (standard or RPP) can be freely selected before each process.

At the end of the galvanisation you are asked **Repeat galvanisation? Yes/No, continue**

- › Use the keys  and  to select the desired answer and confirm with **ENTER**.

If you want to repeat galvanisation, the copper plating parameters are again on display.

In order to finish the process, proceed as follows.

- › Always allow the circuit board to drip off completely over the bath.

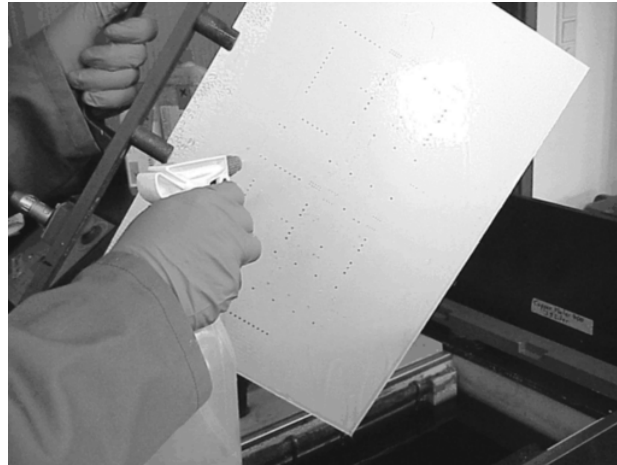
By letting the PCB drip off over bath 6 (COPPER PLATER 400) you can save chemicals and at the same time act environmentally friendly.

Fig. 14: Removing the PCB from the bath



- › Take the PCB with its holder out of bath 6 (see fig. 14 on page 30)

Fig. 15: Spraying the board



- › Use the supplied spray bottle to spray the PCB on both sides with distilled or demineralized water (see fig. 15 on page 31).
- › Let this water run back into the COPPER PLATER 400 bath, as it then compensates for any loss due to spreading or evaporation of chemicals.

Through-hole plating is terminated using **ENTER** and the sprinkler system in **Container 7** is started up. The sprinkler system always runs for 30 seconds. It cannot be shut off until this time has elapsed.

In case the waste water should be more diluted to achieve lower concentrations than stated in the „Inspection report 1“ on page 42, you can prolong the spray time.

- › To do this, choose the modification menu and there the menu item **Modify settings, spray time**.



- › Press the **ENTER** key.

Use the  and  key to select the time.

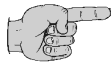
Values from 5 to 60 seconds can be selected. Choose 60 seconds to double the spray time.



Danger!
Do not choose values below the preselected spray time of 30 seconds as the operator may then come in contact with any acid residue on the board. Moreover, due to the danger of water pollution the waste water may then no longer be disposed of in the sewerage.

- › Move the circuit board back and forth in the sprinkler system (**Container 7**) approximately fifteen times, or rinse the circuit board at least until the flow of water stops.
- › Pressing the **ENTER** button once more terminates the through-hole plating process.
- › Now dry the circuit board, preferably in hot air. This should be carried out as quickly as possible to prevent oxidation of the copper in the drillings.

The water used for rinsing is neutral to slightly alkaline and can be disposed of via the normal sewerage system (see "Inspection report 3" on page 48.).



Note: The quality of the surface finish on the circuit board may be poor and the life of the chemicals will be reduced if too high a current is used.

10.0 Maintenance and servicing

Machine

The machine itself is maintenance-free.

It is important that you cover up the baths immediately work is completed to prevent contamination.

The machine must be carefully cleaned from time to time and must be kept clean.

Baths



Caution: The red and the blue pouring spout must be rinsed with water after each use or when the type of cleaner is to be changed, respectively. After each use of the black pouring spout, rinse it with demineralised water and then let it dry.

Container 1 **Degreasing** :Product: **CLEANER 110**

Cover the container during breaks in working.
Fluid lost through evaporation can be replaced with distilled water.
(Change the chemicals after 3 months).



Note: Avoid unnecessary heating, this will affect the chemical life.

Container 2 + 7 **Sprinkler rinsing :**

Clean limescale deposits from the nozzles at regular intervals.

Container 3 **Preparation** :Product: **CLEANER 210**

Cover the container during breaks in working.
Fid lost through evaporation can be replaced with distilled water.
(Change the chemicals after 3 months).

Container 4 **Activation** :Product: **ACTIVATOR 310**

Cover the container during breaks in working.
The bath is very sensitive and requires careful working procedures.

The tiniest amount of contamination, such as drops of *CLEANER 110*, *CLEANER 310*, *Copper Plater 400*, ferrous metal chips, or similar, will eventually cause the bath to fail. It is irrelevant whether the bath is used or not.

The contents of the bath should be thoroughly mixed every 3-4 days at the latest if the bath is not being used.

Please only put completely dry PCBs into the *ACTIVATOR 310* bath. Other liquids like water are not allowed to get into the bath. So please blow off the PCB with oil-free compressed air to guarantee it being free from oil and water. Afterwards dry with warm air (dryer) < 55°C.



Note: Filling only with ACTIVATOR.

After taking the PCB out of the *AKTIVATOR* bath, the surplus *AKTIVATOR* liquid has to be wiped off the surface into the bath with the scraper.

Afterwards the drill holes are dried and blown free which is followed by a visual controll.

Place the PCB for 20 minutes in a drying cupboard < 55°C before you put it into the *CopperPlater* bath.



Note: After work breaks (longer than one day) thoroughly stirr the bath with a glass fibre stick or similar for 2-3 minutes.

Fluid lost can be topped up with *ACTIVATOR 310*.



Caution! Do never add water to the *ACTIVATOR 310* otherwise the through-hole plating will be out of order

The bath must be made up anew after a maximum of one year. Make sure that the dispersion is thoroughly mixed when doing this.



Caution! Chemicals which have splashed onto the machine should be removed with soft cloths, not with abrasive materials. Otherwise the machine's plastic surface will be roughened, making it harder still to remove the chemicals.

Container 6	Copper plating	Product	COPPER PLATER 400
-------------	-----------------------	---------	--------------------------

Cover the container during breaks in working.

Filter the chemicals from time to time (preferably using several coffee filter one inside the other).

Empty the bath into a canister to do this.

Do not rinse the black coating off the anodes as it important for their function.

However, you must make sure that particles of the black coating do not break loose and get into the bath.

Any such particles must be filtered out.

Fluid lost should be topped up with *COPPER PLATER 400*.

If the *COPPER PLATER 400* bath is still working satisfactorily but the copper plate appears dull or coarsely crystalline, this can be corrected by the addition of *SHINE 400*.

The chemical admix *SHINE 400* is used up in dependence on the throughput. 10ml *SHINE 400* must be added after 4 process cycles (note on display).

Ampere-hours/circuit board=
Adjusted electricity x time in bath – then add up all circuit boards.

Take records of the through-hole plating.



Note: The service life of the bath is approximately one year. These figures are only approximate and may vary as the life expectancy is influenced by such factors as careful working procedures and local levels of air pollution.

There can therefore be no warranty of the chemicals' function after a certain period.



Caution! The machine should be started up again by producing a test circuit board if the baths have been changed or *SHINE 400* has been added.

A danger of air pollution caused by operating a Contac-III system could not be established by internal measurements.

11.0 Waste disposal

- Do not allow spilt chemicals to enter waterways or the sewerage system.
- The rinsing water generated by working processes can be disposed of via the sewerage system without concern (see the investigation report in the Appendix).
- Never empty chemicals into the drain. Instead drain them into the containers provided for disposal and dispose of them at an authorized chemical processing plant.
- The appropriate method of disposal (neutralization, hazardous waste disposal, chemical-physical treatment) can be found in the safety data sheets provided by the chemical manufacturer.
- You must always check and comply with local and regional regulations governing the on-site and off-site disposal of waste.
- Local and state regulations will always take precedence in the event of any conflict with our recommendations.

12.0 Appendix

12.1 Error codes and troubleshooting

List of errors

- binary value -

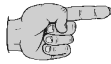
Error discription	7	6	5	4	3	2	1	0	Display value (decimal)
Filling level too low	0	0	0	0	0	0	0	1	001
Temp. sensor short circuited	0	0	0	0	0	0	1	0	002
Temp. sensor (open or out of range)	0	0	0	0	0	1	0	0	004
Frame motor supply short circuited	0	0	0	0	1	0	0	0	008
Galvanic voltage interrupted (open)	0	0	0	1	0	0	0	0	016
Galvanic current supply short circuited	0	0	1	0	0	0	0	0	032
Galvanic regulator minimum	0	1	0	0	0	0	0	0	064
Galvanic regulator maximum	1	0	0	0	0	0	0	0	128

The are all combinations of errors between 1 and 255 possible. For example if two errors are occuring together the sum of both errors will be displayed!

Example:

Filling level (1) + Frame motor (8) = Display shows (9)

12.2 Starting the production steps separately



Note: LPKF firmware software version 4.0 or higher required!










Attention: If you apply the operating options described in the following, you do so at your own risk. Any liability is excluded.



Attention: To be able to start individual production steps separately, the indicated operating steps must be executed step by step according to the following table, at the end the individual

production steps can be selected using the  key or  key

Key/Button	Display on screen
Power on	<div style="border: 1px solid black; padding: 5px; width: fit-content; margin: auto;"> LPKF AG Contac III Version 5.1 state: ready </div>
ESC	<div style="border: 1px solid black; padding: 5px; width: fit-content; margin: auto;"> Modify settings. Language English </div>
	<div style="border: 1px solid black; padding: 5px; width: fit-content; margin: auto;"> Modify settings: return to start </div>
ESC	<div style="border: 1px solid black; padding: 5px; width: fit-content; margin: auto;"> LPKF Team : Rainer Aschenbeck Thorne Lietz Frank Werner </div>
	<div style="border: 1px solid black; padding: 5px; width: fit-content; margin: auto;"> LPKF Team : Rainer Aschenbeck Thorne Lietz Frank Werner </div>

Key/Button	Display on screen
	<div style="border: 1px solid black; padding: 5px; width: fit-content;">LPKF Team : Rainer Aschenbeck Thorne Lietz Frank Werner</div>
	<div style="border: 1px solid black; padding: 5px; width: fit-content;">LPKF Team : Rainer Aschenbeck Thorne Lietz Frank Werner</div>
	<div style="border: 1px solid black; padding: 5px; width: fit-content;">LPKF Team : Rainer Aschenbeck Thorne Lietz Frank Werner</div>
ESC	<div style="border: 1px solid black; padding: 5px; width: fit-content;">Modify settings: return to start</div>
Enter	<div style="border: 1px solid black; padding: 5px; width: fit-content;">LPKF AG Contac III Version 5.1 state: ready</div>
Enter	<div style="border: 1px solid black; padding: 5px; width: fit-content;">Put base material in container 02 for spraying</div>
 	Select and jump to requested production step <div style="border: 1px solid black; padding: 5px; width: fit-content; margin-top: 10px;">Put base material in container 04 for activating</div> <div style="border: 1px solid black; padding: 5px; width: fit-content; margin-top: 10px;">Parameter for copper plating xx.x amp. (Current) xxx minutes (time)</div>



Attention: After switching off power and restarting the system by switching power on, the Contac III will start again in default mode.

12.3 Through-hole plating record

Keeping this record up-to-date allows you to determine, monitor and analyse the service lives of the chemicals.

Please keep carefully.

				Chemical replaced / topped up	
Date	Board material size W x L (mm)	Current	Time	Chemical	Quantity

Copy as required and keep by the machine

12.4 Inspection report 1

Seite 2/3
vom 30.04.2003
Prüfauftrags-Nr. 30514-P2C



CHEMISCHES LABOR
DR. WIRTS+PARTNER
SACHVERSTÄNDIGEN GMBH

Prüfergebnisse

Probenkennzeichnung:	Spülwasser Conbac II / Mini Contac II				
Labor-Nr.:	3 0514 / 1				
Aussehen:	farblos ohne ohne schwach unspezifisch ca. 750 ml				
Farbe:					
Trübung:					
Bodensatz:					
Geruch:					
Probemenge:					
PARAMETER	PRÜFVERFAHREN:	PRÜFDATUM:	EINHEIT:	PRÜFERGEBNIS:	
pH - Wert	DIN 38404 / 5 a	25.04.03		8,1	
Meßtemperatur		25.04.03	°C	14,7	
elektrische Leitfähigkeit ber. auf 25 °C	DIN EN 27888 a	29.04.03	µS/cm	816	
Chlorid	EN ISO 10304-1 a	10.03.03	mg/l	4,21	
Sulfat	EN ISO 10304-1 a	10.03.03	mg/l	10,0	
Chrom	EN ISO 11885 a	11.03.03	mg/l	< 0,02	
Chrom VI	DIN 38405 / 24 a	11.03.03	mg/l	< 0,03	
Kupfer	EN ISO 11885 a	28.04.03	mg/l	0,47	
Nickel	EN ISO 11885 a	11.03.03	mg/l	< 0,04	
Zink	EN ISO 11885 a	11.03.03	mg/l	0,086	
Blei	EN ISO 11885 a	11.03.03	mg/l	< 0,1	
Cadmium	EN ISO 11885 a	11.03.03	mg/l	< 0,01	
Zinn	EN ISO 11885 a	13.03.03	mg/l	< 0,5	
DOC - Gehalt	DIN 38409 / 3/1 a	06.03.03	mg/l	1,39	

Zeichenerklärung:

u.B. = unter der verfahrensbedingten Bestimmungsgrenze
i.A. = in Anlehnung an
a = Akkreditiertes Verfahren
u = Unterauftrag

Schwermetalle wurden nach Aufschluß mit H₂O₂ / HNO₃ gemessen

12.5 Translation of Inspection report 1

page 2/3
of June 18, 2003
Test order No. 30514- P2C



CHEMISCHES LABOR
DR. WIRTS+PARTNER
SACHVERSTÄNDIGEN GMBH

Test Results

Sample identification.:	flushing water Conbac // / Mini Contac II			
Laboratory No.:	3 0514 / 1			
<u>Appearance:</u>				
colour:	colourless			
turbidity:	none			
sediments:	none			
smell:	weakly non-specific			
sample quantity:	0,75 ltr			
PARAMETER	TEST METHOD	TEST DATE	UNIT	TEST RESULT
pH - value	DIN 38404 / 5	April 25, 2003		8,1
measurement temperature		April 25, 2003	°C	14,7
electric conductivity calculated at 25° C	DIN EN 27888	April 29, 2003	µS / cm	816
chloride	EN ISO 10304-1	a March 10, 2003	mg / ltr	4,21
sulphate	EN ISO 10304-1	a March 10, 2003	mg / ltr	10,0
chromium	EN ISO 11885	a March 11, 2003	mg / ltr	< 0,02
chromium IV	DIN 38405	a March 11, 2003	mg / ltr	< 0,03
copper	EN ISO 11885	a April 28, 2003	mg / ltr	0,47
nickel	EN ISO 11885	a March 11, 2003	mg / ltr	< 0,04
zinc	EN ISO 11885	a March 11, 2003	mg / ltr	0,086
lead	EN ISO 11885	a March 11, 2003	mg / ltr	< 0,1
cadmium	EN ISO 11885	a March 11, 2003	mg / ltr	< 0,01
tin	EN ISO 11885	a March 13, 2003	mg / ltr	< 0,5
DOC contents	DIN 38409 / 3 / 1	a March 06, 2003	mg / ltr	1,39

Note:

a = accredited method

The samples were analysed after H₂O₂ / HNO₃ digestion

12.6 Inspection report 2

Seite 2/2
vom 03.07.2003
Prüfauftrags-Nr. 31490-P1C



CHEMISCHES LABOR
DR. WIRTS+PARTNER
SACHVERSTÄNDIGEN GMBH

Prüfergebnisse

Probenkennzeichnung:	Trinkwasser			
Labor-Nr.:	3 1 490 / 1			
Aussehen: Farbe: Trübung: Bodensatz: Geruch: Probemenge:	farblos ohne ohne schwach unspezifisch ca. 1000 ml			
PARAMETER	PRÜFVERFAHREN:	PRÜFDATUM:	EINHEIT:	PRÜFERGEBNIS:
pH - Wert	DIN 38404 / 5 a	01.07.2003	°C	8,0
Meßtemperatur				14,6
elektrische Leitfähigkeit ber. auf 25 °C	DIN EN 27888 a		µS/cm	852
Kupfer	EN ISO 11885 a	01.07.2003	mg/l	0,023

Zeichenerklärung:
u.B. = unter der verfahrensbedingten Bestimmungsgrenze
i.A. = in Anlehnung an
a = Akkreditiertes Verfahren
u = Unterauftrag

12.7 Translation of Inspection report 2

page 2/2
of July 29, 2003
Test order No. 31490-P2C



CHEMISCHES LABOR
DR. WIRTS+PARTNER
SACHVERSTÄNDIGEN GMBH

Test Results

Sample identification:	drinking water			
Laboratory No.:	3 1490 / 1			
Appearance:				
colour:	colourless			
turbidity:	none			
sediments:	none			
smell:	weakly non-specific			
sample quantity:	1,0 ltr			
PARAMETER	TEST METHOD	TEST DATE	UNIT	TEST RESULT
pH - value	DIN 38404 / 5 a			8,0
measurement temperature		July 1, 2003	°C	14,6
electric conductivity calculated at 25 °C	DIN EN 27888 a	July 1, 2003	µS/cm	852
copper	EN ISO 11885 a	July 1, 2003	mg/ltr	0,023

Note:

a = accredited method

12.8 Inspection report

Seite 3/3
vom 30.04.2003
Prüfauftrags-Nr. 3 0514-P2C



CHEMISCHES LABOR
DR. WIRTS + PARTNER
SACHVERSTÄNDIGEN GMBH

Zusammenfassende gutachterliche Stellungnahme zum Prüfbericht Auftrags- Nr. 3 0514-P2C

Die Auftraggeberin vertreibt eine Kontaktierungsanlage.

Bei dem Betrieb dieser Kontaktierungsanlage Mini Conbac / Contac fällt Wasser zur Entsorgung an.

Zur Klärung, ob das anfallende Spülwasser in die öffentliche Abwasser- Kanalisation eingeleitet werden kann, wurde dem hiesigen Labor eine Abwasserprobe übergeben.

Das Untersuchungsprogramm wurde auf allgemeine Parameter, Säurereste und Schwermetalle abgestellt.

Die im einzelnen erhaltenen Meßergebnisse sind vorstehend aufgeführt.

Die Spülwasserprobe war farblos und klar war. Der pH- Wert lag im neutralen Bereich und die elektrischen Leitfähigkeit war gering. Alle weiteren geprüften Parameter lagen in einer für Abwasser normalen Größenordnung.

Unter Bezug auf die ATV- DVWK- Regelwert A115 „Einleiten von nicht häuslichem Abwasser in eine öffentliche Abwasseranlage“ entsprach das Spülwasser den Abwasser- Anforderungen.

Nach Vorlage dieses Prüfberichtes erteilt die zuständige Behörde die Genehmigung zur Einleitung in den Regen- oder Schmutzwasserkanal.

12.9 Translation of Inspection report

page 3/3
of June 18, 2003
Test order No. 30514- P2C



CHEMISCHES LABOR
DR. WIRTS+PARTNER
SACHVERSTÄNDIGEN GMBH

Summarised expert comments re. Test Report Order No.3 O514-P2C

The Principal is distributor of a contacting plant.

The operation of this contacting plant Mini Conbac/Contac involves the accrual of water which is to be disposed of.

To clarify whether this accruing flushing water can be discharged into the public sewage system, a wastewater sample was handed to the undersigning laboratory.

The analysis programme was aimed at general parameters, residual acids and heavy metals.

The measuring results obtained in detail are itemized hereabove.

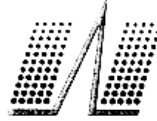
The flushing water sample was colourless and clear. The pH-value was in the neutral range and the electric conductivity was low. All the other parameters tested were in a magnitude normal for wastewater.

The flushing water sample met the sewage water requirements, with reference to ATV-DVWK-Regelwert A 115 "Einleiten von nicht häuslichem Abwasser in eine öffentliche Abwasseranlage" (discharge of non-domestic wastewater into a public sewage plant).

On presentation of this Test Report, the authority in charge will grant approval to this discharge into the public rainwater system or drainage system.

12.10 Inspection report 3

Seite 2/4
vom 08.06.2000
Auftrags-Nr. 0 1218-P2C



CHEMISCHES LABOR
DR. WIRTS + PARTNER
SACHVERSTÄNDIGEN GMBH

Probenkennzeichnung:	Cleaner 110, Probe 1			
Labor-Nr.:	0 1218/ 1			
Aussehen:				
Farbe:	farblos			
Trübung:	klar			
Bodensatz:	ohne			
Geruch:	schwach, unspezifisch			
Folgende Ergebnisse beziehen sich auf die homogenisierte Wasserprobe incl. Bodensatz				
PARAMETER	PRÜFMETHODE:	ANALYSEN-DATUM:	EINHEIT:	PRÜFERGEBNIS:
pH - Wert	DIN 38404/ 5	24.05.00		9,4
Meßtemperatur		24.05.00	°C	13,9
elektrische Leitfähigkeit ber. auf 25 °C	DIN 38404/ 8	24.05.00	µS/cm	57,4
Chrom, gesamt	DIN 38406/ 22	30.05.00	mg/l	< 0,02
Chrom VI	DIN 38405/ 24	30.05.00	mg/l	< 0,03
Kupfer	DIN 38406/ 22	30.05.00	mg/l	0,028
Nickel	DIN 38406/ 22	30.05.00	mg/l	< 0,04
Zink	DIN 38406/ 22	30.05.00	mg/l	< 0,02
Blei	DIN 38406/ 22	30.05.00	mg/l	< 0,1
Cadmium	DIN 38406/ 22	30.05.00	mg/l	< 0,01
Quecksilber	DIN 38406 / 12	07.06.00	mg/l	< 0,0005
Arsen	Graphitrohr-AAS	05.06.00	mg/l	< 0,005
AOX - Gehalt	DIN 38409/ 14	31.05.00	mg/l	< 0,010
TOC - Gehalt	DIN 38409/ 3/1	29.05.00	mg/l	2,42
Mineralöl-Kohlenwasserstoffe	DIN 38409/ 18	26.05.00	mg/l	< 1,6

Zeichenerklärung:

u.B. = unter der verfahrensbedingten Bestimmungsgrenze
i.A. = in Anlehnung an
(Die 16 PAK - Einzelsubstanzen sind nachstehend aufgeführt.)

12.11 Translation of Inspection report 3

page 2/4
of June 8, 2000
order No. 0 1218-P2C



CHEMISCHES LABOR
DR. WIRTS-PARTNER
SACHVERSTÄNDIGEN GMBH

sample identification:	Cleaner 110, sample 1			
laboratory No.	0 1218/ 1			
appearance colour turbidity: sediment: smell:	colourless none without slightly non-specific			
The results itemized herbelow are relating to the homogenized water sample incl. sediment.				
PARAMETER	TEST METHOD	ANALYSIS DAY	UNIT	TEST RESULT
pH value measuring temperature electric conductivity at 25°C	DIN 38404/ 5	24.05.00		9,4
		24.05.00	°C	13,9
	DIN 38404/ 8	24.05.00	µS/cm	57,4
chromium, total	DIN 38406/ 22	30.05.00	mg/l	< 0,02
chromium VI	DIN 38405/ 24	30.05.00	mg/l	< 0,03
copper	DIN 38406/ 22	30.05.00	mg/l	0,028
nickel	DIN 38406/ 22	30.05.00	mg/l	< 0,04
zinc	DIN 38406/ 22	30.05.00	mg/l	< 0,02
lead	DIN 38406/ 22	30.05.00	mg/l	< 0,1
cadmium	DIN 38406/ 22	30.05.00	mg/l	< 0,01
mercury	DIN 38406 / 12	07.06.00	mg/l	< 0,0005
arsenic	Graphitrohr-AA5	05.06.00	mg/l	< 0,005
AOX - content	DIN 38409/ 14	31.05.00	mg/l	< 0,010
TOC - content	DIN 38408/ 3/1	29.05.00	mg/l	2,42
mineral oil hydrocarbons	DIN 38409/ 18	26.05.00	mg/l	< 1,6

Zeichenerklärung:

u.B. = below determinability limit set by analysis process
i. A. = leaning on

12.12 Inspection report 4

Seite 3/4
vom 08.06.2000
Auftrags-Nr. 0 1218-P2C



CHEMISCHES LABOR
DR. WIRTS+PARTNER
SACHVERSTÄNDIGEN GMBH

Probenkennzeichnung:	Cleaner 210, Probe 2			
Labor-Nr.:	0 1218/ 2			
Aussehen:				
Farbe:	farblos			
Trübung:	klar			
Bodensatz:	ohne			
Geruch:	schwach, unspezifisch			
Folgende Ergebnisse beziehen sich auf die homogenisierte Wasserprobe incl. Bodensatz				
PARAMETER	PRÜFMETHODE:	ANALYSEN-DATUM:	EINHEIT:	PRÜFERGEBNIS:
pH - Wert	DIN 38404/ 5	24.05.00		8,2
Meßtemperatur		24.05.00	°C	13,1
elektrische Leitfähigkeit ber. auf 25 °C	DIN 38404/ 8	24.05.00	µS/cm	28,2
Chrom, gesamt	DIN 38406/ 22	30.05.00	mg/l	< 0,02
Chrom VI	DIN 38405/ 24	30.05.00	mg/l	< 0,03
Kupfer	DIN 38406/ 22	30.05.00	mg/l	< 0,106
Nickel	DIN 38406/ 22	30.05.00	mg/l	< 0,04
Zink	DIN 38406/ 22	30.05.00	mg/l	< 0,02
Blei	DIN 38406/ 22	30.05.00	mg/l	< 0,1
Cadmium	DIN 38406/ 22	30.05.00	mg/l	< 0,01
Quecksilber	DIN 38406 / 12	07.06.00	mg/l	< 0,0005
Arsen	Graphitrohr-AAS	05.06.00	mg/l	< 0,005
AOX - Gehalt	DIN 38409/ 14	31.05.00	mg/l	< 0,010
TOC - Gehalt	DIN 38409/ 3/1	29.05.00	mg/l	7,85
Mineralöl-Kohlenwasserstoffe	DIN 38409/ 18	26.05.00	mg/l	< 1,8

Zeichenerklärung:

u.B. = unter der verfahrensbedingten Bestimmungsgrenze
i.A. = in Anlehnung an
(Die 18 PAK - Einzelsubstanzen sind nachstehend aufgeführt.)

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of June 8, 2000
order No. 0 1218-P2C



CHEMISCHES LABOR
DR. WIRTS+PARTNER
SACHVERSTÄNDIGEN GMBH

sample identification:	Cleaner 210, sample 2			
laboratory No.	0 1218/ 2			
appearance colour turbidity: sediment: smell:	colourless none without slightly non-specific			
The results itemized herebelow are relating to the homogenized water sample incl. sediment.				
PARAMETER	TEST METHOD	ANALYSIS DAY	UNIT	TEST RESULT
pH value	DIN 38404/ 5	24.05.00		8,2
measuring temperature		24.05.00	°C	13,1
electric conductivity at 25°C	DIN 38404/ 8	24.05.00	µS/cm	28,2
chromium, total	DIN 38406/ 22	30.05.00	mg/l	< 0,02
chromium VI	DIN 38406/ 24	30.05.00	mg/l	< 0,03
copper	DIN 38406/ 22	30.05.00	mg/l	0,106
nickel	DIN 38406/ 22	30.05.00	mg/l	< 0,04
zinc	DIN 38406/ 22	30.05.00	mg/l	< 0,02
lead	DIN 38406/ 22	30.05.00	mg/l	< 0,1
cadmium	DIN 38406/ 22	30.05.00	mg/l	< 0,01
mercury	DIN 38406 / 12	07.06.00	mg/l	< 0,0005
arsenic	Graphitrohr-AAS	05.06.00	mg/l	< 0,005
AOX - content	DIN 38409/ 14	31.05.00	mg/l	< 0,010
TOC - content	DIN 38408/ 3/1	29.05.00	mg/l	7,65
mineral oil hydrocarbons	DIN 38409/ 18	28.05.00	mg/l	< 1,6

Zeichenerklärung:

u.B. = below determinability limit set by analysis process
i. A. = leaning on

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vom 08.06.2000
Auftrags-Nr. 0 1218-P2C



Gutachterliche Stellungnahme zum Prüfbericht, Auftrags-Nr. 0 1218-P1C

Bei dem Betrieb einer Kontaktierungsanlage der Auftraggeberin fällt Waschwasser zur Entsorgung bzw. Verwertung an.

Zur Klärung, ob das Waschwasser in eine öffentliche Abwasserkanalisation eingeleitet werden kann, wurden dem hiesigen Labor zwei Proben zur chemischen Untersuchung übergeben.

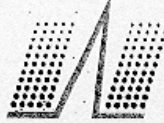
Die Proben wurden neben allgemeinen Parametern auf Schwermetalle und organische Summenparameter geprüft.

Die im einzelnen erhaltenen Meßergebnisse sind vorstehend aufgeführt.

Bei Auswertung der Meßergebnisse war festzustellen, daß die Waschwasserproben, Labor-Nr. 0 1218/ 1 und 2 (Cleaner 110 und 210), einen leicht alkalischen pH-Wert aufwiesen. Die Schwermetallübersichtsuntersuchung ergab jeweils nur geringe, unkritische Gehalte. Auch die geprüften organischen Summenparameter wiesen nur geringe Werte auf.

Unter Bezug auf das ATV-Regelwerk, Arbeitsblatt A 115 "Einleiten von nicht häuslichem Abwasser in eine öffentliche Abwasseranlage" entsprachen die Proben, Labor-Nr. 0 1218/ 1+2 (Cleaner 110 und 210), den Abwasseranforderungen, so daß eine Einleitung in eine öffentliche Abwasserkanalisation möglich wäre.

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page of order No.	4/4 June 8, 2000 0 1218-P2C		CHEMISCHES LABOR DR. WIRTS+PARTNER SACHVERSTÄNDIGEN GMBH
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Expert comments re.: Test Report, Order No. 0 1218-P1C

On operation of a Contact Bed Plant of Mandator's, wash water is produced which is either put to waste disposal, or is utilised.

To clarify whether the wash water can be introduced into a Public Sewerage System, two samples were handed over for chemical analysis to the undersigning laboratory.

The samples were analysed – further to general parameters – for heavy metals and for organic summation parameters.

The measuring results obtained in detail are itemised hereabove.

The evaluation of the measuring results proved that the wash water samples, Labor No. 0 1218/ 1 and /2 (Cleaner 110 and 210) had a slightly alkaline pH value. The heavy metals general analysis brought, in each case, no more than slightly non critical contents. The organic summation parameters showed, on examination, no more than slight values.

With reference to the ATV-Regelwerk, Arbeitsblatt A 115 "Einleiten von nicht häuslichem Abwasser in eine öffentliche Abwasseranlage" "(Discharge from non-domestic sewage in a public sewage plant) , the samples, Labor-No. 0 1218/ 1+2 (Cleaner 110 and 210) met the waste water requirements, so that an introduction into a Public Sewerage System might be possible.

12.16 Declaration of conformity (German)

1. Hersteller der mit LPKF „*Contac-III*“ bezeichneten Maschine ist die Firma:

LPKF
Laser & Electronics AG
Osteriede 7

D-30827 Garbsen
2. Bei der mit LPKF *Contac-III* bezeichneten Maschine handelt es sich um eine Durchkontaktierungsanlage, die zum Erstellen von Durchkontaktierungen in Mehrlagenleiterplatten (Multilayern) geeignet ist. Die Seriennummer der vorstehenden Maschine ist 1F.....(siehe linke, untere Seitenwand). Weitere Angaben zur LPKF *Contac-III* sind dem beiliegenden Handbuch zu entnehmen.
3. Die LPKF *Contac-III* entspricht den Bestimmungen der EG-Maschinenrichtlinie 93 / 44 vom 14. Juni 93 (siehe auch Anhang I der Richtlinie).
4. Bei der Erstellung der LPKF *Contac-III* fanden auch bestehende DIN- Vorschriften Anwendung.
5. Bevollmächtigter Unterzeichner dieser Erklärung ist

Herr Bernd Hackmann
Vorstand LPKF AG
Osteriede 7

D-30827 Garbsen



Bernd Hackmann

12.17 Declaration of conformity

1. Manufacturer of the machine designated LPKF *Contac III* is company:

LPKF
Laser & Electronics AG
Osteriede 7
D-30827 Garbsen
Germany

2. The machine designated as LPKF LPKF *Contac III* is a through-plating system, suitable for the production of through-hole platings in multilayer circuit boards. The series number of the above-mentioned machine is 1T..... (see bottom of left machine side). Further details of the LPKF LPKF *Contac III* can be seen in the enclosed manual.

3. The LPKF LPKF *Contac III* corresponds to the provisions of the EC recommendation 93/44 dated June 14, 1993 (see also Appendix of the recommendation).

4. Existing DIN regulations have also been applied for the production of the LPKF *Contac III* .

5 Authorized to sign this declaration is

Mr. Bernd Hackmann
Board of Directors LPKF
Osteriede 7
D-30827 Garbsen/Germany



Bernd Hackmann

12.18 Safety Data Sheet

CLEANER 110

CLEANER 210

ACTIVATOR 310

COPPER PLATER 400

SHINE 400