Vapor Phase Soldering Machine
Vapor Phase Two

Instruction manual

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Please read this manual before operating the Vapor Phase Two and follow the instructions when operating. Keep these instructions near the machine.

Thank you for purchasing a Vapor Phase Two.

This document shows you how to use the vapor phase soldering system properly. Please read this document and the enclosed safety instructions before using the vapor phase soldering system. If you have any questions, please do not hesitate to contact us at the e-mail address given below.

The information in this document corresponds to the software version of delivery. PCB Arts may make improvements and changes in this documentation and software at any time without notice.

For an up-to-date version, visit our blog at www.blog.pcb-arts.com.
There you will also find tutorials and tricks.

Enjoy using your new vapor phase soldering system!

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1. Before operation

1.1 Scope of delivery

- Vapor Phase Two
- Power cable EU / US
- SD card
- USB SD card adapter
- Injection syringe for emptying the medium
- Brush for cleaning
- One pair of cotton gloves (for touch screen applications)
- Funnel for filling the water tank
- Torx© T20 key for opening the hose cover
- Four Torx© T20 replacement screws for the hose cover

1.2 Intended use

The vapor phase soldering system is to be used for soldering printed circuit boards with assembled components . Temperatures up to a maximum of 240°C are intended. Other uses of the equipment are not permitted. The limit values specified in this document must not be exceeded under any circumstances. The operational safety of the equipment supplied is only guaranteed if it is used as intended.

1.3 Process description

Vapor phase soldering uses a similar physical principle to a heat pipe. A heat source causes a liquid to boil, i.e. vaporize. This vapor transports the energy of the heat source to the heat sink - the assembly. The vapor condenses first at the particularly cool points and thus releases the greatest amount of energy at these points. In the vapor phase soldering system, a specially developed inert medium is used, which boils between 230°C and 240°C depending on the type of medium. The condensing vapor gently heats the assembly to the maximum boiling temperature. Meanwhile, the solder on the assembly liquefies. When the assembly is removed from the vapor layer, the solder solidifies.

1.4 Process description

First, the soldering chamber is opened by operating the touch panel. After the assembled component is placed in the soldering chamber on the soldering grid, it can be closed again with the help of the touch screen. After the soldering chamber is securely closed, it is possible to start the soldering process via touch panel input.
The heating element brings the soldering medium to its boiling temperature, while the soldering grid with the assembled component moves along the specified soldering profile. When the boiling temperature of the soldering medium has been reached, a vapor layer is

formed. This then has an identical temperature to the boiling temperature of the inert medium. This vapor layer thus also defines a large part of the soldering zone. When the specified temperature profile provides for the soldering temperatures, the assembled assembly is moved into the vapor layer. The vapor condenses on the surface of the solder as this is lower than the boiling temperature. The condensation process is finished as soon as the soldering material has reached the temperature of the steam.

The soldering grid with the soldering material is moved upwards in the process chamber, and the cooling process of the process chamber begins. The process chamber is cooled down with the help of fans, which ensures almost complete condensation of the remaining medium vapor. Once a certain temperature of the medium has been reached, the process chamber is released for opening. The user can now open the process chamber via touch panel and remove the still warm or hot solder with cotton gloves.

A process run takes about 30 - 35 minutes, depending on the Galden© filling level and profile selection.

1.5 The heat transfer medium

PCB Arts uses the process medium of the company "Solvay Solexis" with the brand name "Galden®". This is perfluoropolyether, which is composed exclusively of carbon, fluorine and oxygen atoms. The advantages of Galden© are:

- Dielectric properties
- High material compatibility
- No flash point
- High heat transfer coefficient
- Not a hazardous substance in the sense of occupational health and safety

1.6 Footprint

The "Vapor Phase Two" must be set up with at least 20cm of protrusion all around. Thus, an installation area of 1050mm (width) x 1050mm (depth) x 900mm (height) is required. The installation surface must be horizontal and temperature resistant (at least 150°C). Ideally, the soldering machine should be placed near a window to prevent odors from developing. The temperature of the operating room must not exceed 35°C. Also, the humidity of the air must not exceed 70%. **Make sure that the vapor phase soldering system has enough space above the lid so that there is no danger of crushing.**

- The soldering unit must not be installed near fire detectors or sprinkler systems.
- The soldering system must not be operated in potentially explosive atmospheres.
- With the **mains plug disconnected, the** cooling water reservoir is to be filled up to the specified level with distilled water only.

- The process medium reservoir must be filled up to the specified level with the **power plug disconnected**; the heating coils at the bottom of the solder pot must **always be** covered.
- The soldering equipment **must not be put** into operation in places **above 2000 meters** above sea level.

1.6.1 Filling quantities

Medium: At least 1100ml process medium.

⚠

Caution: During installation, make sure that the heating tube in the process vessel is always covered with medium!

Cooling water: Pour approx. 1500ml liters of **distilled water** into the cooling circuit.

1.7 Initial startup

1. Make sure that the installation surface has been selected correctly.
2. Initialize the SD card as described in 2.3.3
3. First fill the water tank initially with water as described in 1.10.1
4. Set the voltage of the vapor phase correctly as described in 1.12
5. Then plug in the mains plug of the vapor phase soldering system.
6. Turn on the main switch of the vapor phase soldering system so that it starts and calibrates.
7. You can now swipe to the left and right on the touchscreen to change the operating views. On the first operating view, you will see the "Open Lid" button. Press this button and the process lid opens automatically. Now carefully fill the soldering medium into the process vat so that the filling quantity is between the minimum and maximum of the dipstick.

1.8 Description of the vapor phase two

The system is intended for reflow soldering of small quantities, prototypes and individual pieces. Continuous operation of the system is not intended. The maximum working speed is limited by the soldering profile, the corresponding cooling speed and the opening temperature of the process chamber.

1.9 Safety devices

1.9.1 Monitoring of the cover

The travel speed is limited by the hardware with regard to operating voltage and transmission ratio. There are various current limitations of the motor current as well as overcurrent shutdowns. When an overcurrent event is registered, the lid automatically moves up to prevent crushing between the process vat and the lid.

1.9.2 Housing

All contactable edges are rounded by design. No sharp-edged parts are installed. The hexagons on the housing can lead to chafing, these should be touched with care.

1.9.3 Dimensioning of the heating

The heater is dimensioned so that a maximum energy of 3.125W/cm² is achieved. Thus, the maximum power, which is specified for Galden©, is not reached.

1.9.4 Limitation of the steam ceiling height

The steam ceiling is limited in the process vessel by cooling blocks, which are mounted at a certain height on the outer wall of the process vessel. These cooling blocks are part of an actively cooled water circuit. Thus, the steam ceiling height is physically limited via these.

1.9.5 Monitoring the cooling circuit temperature

The water circuit, which is used to limit the vapor ceiling height, is monitored with a temperature sensor. If the water temperature rises above 60°C / 140°F the Vapor Phase Two will not allow soldering.

1.9.6 Heating temperature monitoring

In addition to the correct dimensioning of the heating, it is monitored and controlled by software. Should the software control fail to function for inexplicable reasons, dedicated evaluation electronics ensure an emergency shutdown in the event of overtemperature.

1.9.7 Monitoring the process chamber temperature

The process chamber can open when the temperature of the galde is below a user-adjustable temperature. This setting can be adjusted in the display ("Eco", "Standard" or "Fast").

1.9.8 Trial Chamber

The lid of the process chamber cannot be moved manually, this is controlled by a self-locking motor.

1.10 Cooling system

⚠ **Caution:** Never fill water into the cooling system while the vapor phase soldering system is connected to the socket!
Attention: Only distilled water may be used for cooling. Damage to the unit due to calcification is excluded from the warranty.

The water is circulated throughout and cooled down by two radiators. For this purpose, the fans of the radiators must always be able to push through enough air volume - accordingly, care must be taken to ensure that the supply and exhaust air of the vapor phase soldering system is free of obstructions. The cooling system is necessary for the height limitation of the vapor phase and is consequently a central component of the functionality.

1.10.1 Initial filling of the vapor phase soldering system with distilled water

Step 1:

Take the enclosed funnel and fill the system initially with **distilled water** up to the marked maximum at the filler neck, which is located on the back of the Vapor Phase Two above the hose ⊻. When filling the cooling medium, loosen the level plastic hose of the upper elbow to allow for pressure equalization. After the system has been filled to the maximum, reinsert the hose into the plastic bracket.

Figure 1: Filling - nozzle

Step 2:

After the first soldering with the vapor phase, fill the water level to the maximum once again. Repeat step 1. Water is also stored in the radiators, which is why the water reservoir must be refilled after initial use.

1.10.2 Draining the cooling medium

To drain the water from the water reservoir, you must pull the top end of the level hose off the plastic elbow and then drain it into a dedicated water container. The distilled water should be changed **quarterly.** There is always some cooling medium in the radiators or cooling system, this is normal and can be neglected.

1.11 Transport damage

Please check the vapor phase soldering system directly for visible transport damage. These are to be noted directly upon delivery and reported to the manufacturer and shipping company. Transport damage that is discovered later but was not visible must also be reported directly. If the system shows visible damage, it must not be put into operation before the manufacturer has given his approval.

Please check also in the process chamber if 4x temperature sensors are fixed to the heater and 1x temperature sensor is turned away from the heater and hangs in the air. You can compare this with the following figure:

Figure 2: Heater - temperature sensor

1.11.1 Transport of the vapor phase

The unit may only be transported when cold. For longer transports, the water must also be completely drained from the water reservoir; this does not happen when draining via the discharge option. For this purpose, contact the manufacturer so that he can assist you with the correct emptying of the water reservoir. For local transport of a few meters, grab the vapor phase soldering system left and right from the bottom. Since the vapor phase soldering system weighs about 35kg, make sure that you carry the system with at least two people wearing protective work shoes. Note that no pressure is exerted on the protective grid, but on the housing webs between the protective grids.

1.12 Power connection

A 230V Schuko socket is required to operate the system. The soldering system must be fused and connected in accordance with the applicable local regulations and country-specific installation regulations. The circuit must be protected by a residual current device (RCD). A fuse holder is located above the cold appliance box, in which two 10A-carrying 230V fine-wire fuses (5x20mm) must be inserted. In case of a short circuit, check them and replace them if necessary.

2. Operation of the vapor phase

2.1 Technical data

Permissible mains voltage	AC 220-240V (50-60 Hz)
Power connection	IEC-60320 C20
Input current (max.)	9.6A (230V)
Inrush current (typ.)	60A (230V)
Maximum power	2200W
Dimensions	627mm x 650mm x 700mm (W x D x H)
Weight	approx. 35Kg
Process temperature	55°C - 240°C
Process cooling	6x fan
Cooling Vapor phase limitation	Water cooling
Permissible ambient temperature	15°C - 35°C (In operation)
Permissible storage temperature	5°C - 35°C
Permissible humidity	Max. 70%, non-condensing

2.2 Part designations

Figure 3: Front view of vapor phase soldering system

Figure 4: Rear view of vapor phase soldering system

Figure 5: Top view of vapor phase soldering system

2.3 General operation

A typical vapor phase soldering process is as follows:

1. Insert the SD card with the solder profile
2. Switch on the machine
3. Check the galden & the coolant level
4. Open the process chamber by "Open Lid" on the touch panel
5. Place your assembled assembly into the process chamber
6. Install the PCB probe next to the assembly, suspended in the air. The probe must be above the highest component to be soldered.
7. Close the process chamber with "Close Lid" on the touch panel
8. Check the selected soldering profile
9. Start the soldering profile via the "Start Reflow" button.
10. The assembly now moves in the process chamber on the basis of the soldering profile, and live data is displayed every second in the graphic display.
11. After the soldering profile is finished, the "Open Lid" button remains grayed out until the Galden has reached the set "Open Temperature" in the Settings Page.
12. You can now press "Open Lid" and remove the soldering material
13. Close the lid again with "Close Lid" so that the process chamber is not contaminated.

⚠ **Caution:** Only use the soldering material with the enclosed gloves, as the soldering material is still hot.

2.3.1 Touch panel operation

General:

The operation of the vapor phase soldering system is mainly mapped via the touch panel.

The menu consists of three views: **Process control**, **Graphic display** and **Settings**.

Figure 6: "Process control

Figure 7: "Graphical representation

Figure 8: "Settings

Navigation between these views is done by swiping the touch screen. The following actions can be performed via the touch screen:

- Starting the reflow process
- Stopping the reflow process
- Opening the process chamber
- Closing the process chamber
- Converting the temperature - units from °C / °F
- Setting the opening temperature of the process chamber
- Selecting a soldering profile

The following information is displayed on the touch panel:

- The TARGET and ACTUAL soldering profile
- The warmest temperature of the cooling system
- The temperature of the soldering medium

2.3.2 Operation of the Vapor Phase Two

Open the process chamber by operating the touch panel. You must press the "Open Lid" button. Then place the assembled module in the open process chamber and position it centrally. For optimum results, attach the temperature sensor provided for this purpose to

the module as described in 2.4 The reference temperature is measured at the board and not at the ambient air.
After attaching the temperature sensor to the board (or freely suspended in the air), you can automatically close the process chamber via "Close Lid". Never try to force the process chamber closed - make sure that you do not have any limbs or objects in the process path of the electric lid lift.
Check that you have selected the correct profile. You can see this in the graphical view or in the Settings page under "Solder profile". Also select an "Open temperature" before starting the soldering process. This determines below which galden temperature the process tank can be opened again. This setting can be made by the user, as he can decide whether the speed of the soldering process is in the foreground or the consumption of the process medium.

Fashion	**Galden temperature**
Eco	< 70°C / 158°F
Standard	< 80°C / 176°F
Fast	< 90°C / 194°F

Afterwards the button "Start Reflow" can be pressed, from this moment on the Vapor Phase Two operates completely autonomous and the soldering process starts. Through the viewing window you can look into the process chamber and follow the soldering of your assembly. After the solder profile is completed, the Quick Cool of the Vapor Phase Two switches on, which ensures a faster cooling of the process chamber. The board is then held at 120°C / 248°F so that no solder is left on the board and the board comes directly out of the process chamber "dry". As soon as the temperature of the galden is cool enough, the grayed out "Open Lid" button is colored and can be pressed from this point on.

⚠ **Caution:** Only use the soldering material with the enclosed gloves, as the soldering material is still hot.

2.3.3 SD card

Remove the SD card from the packaging and insert it into your PC. Navigate to the Github repository of PCB Arts: https://github.com/PCB-Arts/vaporphaseX and download the initial soldering profiles. Load these soldering profiles (CSV files) under a folder named "profiles" on the SD card. Attention: The "profiles" folder must be located in the root directory of the SD card. The file name is shown in the display of the vapor phase soldering system. When you perform a Selftest, a "Selftest.log" is created.

```
SD Card/
├─ profiles/
│ ├─ GC10.csv
│ ├─ RTS.csv
│ ├─ custom.csv
```

The SD card is automatically initialized during the boot process. If you insert or remove the SD card during operation, press the Mount or Unmount button in the display first.

2.4 Attaching the temperature sensor

Place the temperature sensor close to your assembly so that the local temperature can be measured as well as possible. The vapor phase is controlled to this temperature. This is the blue line (actual temperature), which is shown in the display. The temperature sensor should not have any thermal mass, otherwise the vapor phase control could start oscillating. The sensor must be placed higher than the highest component next to the assembly.

2.5 Creation of your own soldering profile

A soldering profile can be self-generated by following a CSV (Comma Separated Values) format with semicolon "; " as separator. The absolute time in seconds and the corresponding temperature in °C must always be specified. The soldering profile is structured as follows. The fields marked in red can be changed. The profile may have a maximum length of 600 seconds. Example profiles are supplied initially or can be downloaded from our website www.pcb-arts.com. Always test new soldering profiles without a module so that you can check whether it works as desired. Place the profile in the SD card in a folder with the name "profiles".

custom.csv

```
### VPO;
Name;Custom
Boiling Temperature;230
ACT;110
### Profile;
Absolute Time in S;Temp
0;95
40;95
80;95
120;120
160;140
200;140
240;180
280;225
320;230
350;230
400;160
440;130
480;0
```

The name of the .csv file is shown in the display. The Boiling Temperature gives the Vapor Phase Two the information which boiling point the soldering medium (Galden) has. The ACT

(Anti Condensation Temperature) is the temperature that is reached after the actual soldering process. This prevents larger amounts of Galden's from remaining on the board.

Start of the profile:
The profile must start with the "0" second (Absolute Time column in S), here you write a temperature value behind it, which should be approached before the soldering profile starts. Before the profile starts in the vapor phase soldering system, the vapor phase soldering system will try to regulate the assembly to this temperature.

During the profile:
You can now set the correct time in seconds and the desired temperature value behind it. The vapor phase soldering system interpolates linearly between the temperature values to create a profile. Spreadsheet programs with the functionality to display graphs (such as Microsoft Excel©) are helpful for creating a profile.

Exit the profile:
The profile ends automatically when you write a "0" in the temperature column. The Quick Cool of the vapor phase oven begins. Then the "Anti Condensation Temperature" phase begins. The vapor phase soldering system tries to keep the assembly at 120°C to avoid leaving Galden© residues on the board. The lift with the assembly moves up when the "Open Lid" Temperature has been reached.

2.6 Checking the Galden filling level

It is important that the Galden completely covers the heating coils. The maximum level is reached when the bars are completely covered, the minimum level is reached when the Galden only just covers the heaters (red marked tubes in the picture).

3. Maintenance

Apart from a regular check of the electrical and mechanical systems for function or damage and cleaning of the interior, no maintenance work is required.

⚠ **Caution:** Maintenance work may only be carried out by qualified personnel and personnel approved by the manufacturer.
Caution: Cleaning of the machine may only take place when the process chamber is open, the vapor phase soldering system is not connected to the power supply and the system is in a cold state.

3.1 Removing Galden

If you want to remove the Galden from the process chamber, first open the Lid System. Switch off the unit with the lid open and take the supplied syringe out of the box. The syringe has an extra attachment in the handle - please put this onto the syringe - this will prevent the Galden from flowing back out of the syringe.

Now move the lift mechanism slightly to the side, then you can use the syringe at the bottom of the process vat to remove the gallden.

For the best result, place one foot of the Vapor Phase Two on an elevation, e.g. a square wood, so that the calden flows into a corner and can be conveniently removed from the system.

3.2 Cleaning the machine

The machine should be cleaned from the outside with a dampened cloth. Make sure that the cloth is not wet in order to avoid unwanted liquids in the vapor phase soldering system. If various liquids get into the vapor phase soldering system, disconnect it from the power supply and allow it to dry in a warm room.

3.3 Cleaning the process chamber

During the soldering process, solvents or other residues are often mixed with the galde in the process chamber, and this gradually settles. Accordingly, the process chamber should be cleaned regularly. For this purpose, you need suitable solvents such as isopropyl alcohol or methylated spirit - never use aggressive cleaning agents.

First open the process chamber via the control panel and then switch off the vapor phase soldering system. Be sure to also remove the power plug.
Always use a brush to clean the temperature sensors and clean them carefully. Do not bend the temperature sensors or apply any mechanical force to them. The temperature sensors are welded to the heater and can detach from the heater if force is applied.

You can clean the sides of the vat with a paper or cotton cloth, again be careful of the temperature sensors and do not pull on their cables.
After cleaning with isopropyl alcohol or methylated spirits, leave the vapor phase soldering system open so that the explosive vapors produced can escape.

3.4 Temperature sensors disconnected from heater

To guarantee ideal and safe conditions of temperature control, the temperature sensors in the process chamber must be in direct contact with the heater. The manufacturer welds them to the heater to provide the best thermal contact. If a temperature sensor no longer has direct contact with the heater because the welding point is broken, safe operating conditions are no longer guaranteed. In this case, inform the manufacturer.

In this case, a spring is attached to the temperature sensor leads. You can then carefully pull this over the tip of the temperature sensor that there is a safe thermal contact between thermocouple and heater.

3.5 Installing software updates

The Vapor Phase Two will receive various software updates over time to constantly improve the operation but also the soldering results. For this purpose you will receive the current firmware on www.pcb-arts.com. There are three different files "VPO_DISP.BIN", "VPO_DISP_ASSETS.BIN" and "VPO_CORE.BIN", which you have to copy to a SD card in the root directory (without subfolders). You must then insert this SD card into the SD card slot of the vapor phase soldering system.

On the back of the vapor phase soldering unit you will find two buttons. Switch on the unit with the main switch while pressing the upper of these two buttons.

This takes you to the bootloader of the Vapor Phase Two (black background). Confirm the update of the vapor phase soldering system once again with the upper button. This starts the update, please do not switch off the device in this phase!

3.6 Running the self-test

The Selftest is mainly available for troubleshooting. There are two buttons on the back of the vapor phase soldering system, the button marked "II" is available for the self-test. When you press this, the display will ask you if you want to perform a self-test. This takes about 5 minutes. During this time, all actuators are moved or switched on and an exact logging is performed. The data is stored on the SD card. The self-test may only be performed when the vapor phase soldering system is initialized.

Figure 9: Software update button

4. Malfunctions

The Vapor Phase soldering system has many safety features to protect the user. Sometimes these are not immediately apparent and in some cases are not shown by the Vapor Phase Two. In the following, typical malfunctions are shown. If you have any further problems, please contact support via email at mail@pcb-arts.com.

4.1 Vapor phase cannot be started

Please check whether the two fuses on the back of the unit are functional. Also check that the power plug is plugged in and that the main switch is turned on.

4.2 Heating does not work

Overtemperature shutdown heating / overtemperature cooling system
If the heating fails in the middle of the soldering profile, please check the level of the electrode and top up the electrode when the vapor phase soldering system has cooled down. Also check the cooling water level and top up with water if necessary.
Undertemperature cooling system
From 13°C / 55.4°F the undertemperature shutdown of the vapor phase soldering system takes effect. Please increase the temperature of the room.
Heating can not reach high temperatures
Check that the voltage on the voltage selector switch is set correctly.
Thermocouple broken / defective
If it is visible that a thermocouple has become detached from the heaters, please contact the manufacturer.

4.3 Lid does not travel

Overcurrent shutdown
Make sure that no heavy objects are lying on the lid. For safety reasons, the lid has an overcurrent shutdown installed, which takes effect if the load is too high. If the overcurrent shutdown has become active, you must restart the entire vapor phase soldering system. To do this, actuate the main switch.
Lid not in limit switch
In the event of heavy wear, the limit switch may also wear out. This must be pressed so that the lid can move. In this case, contact the manufacturer.

4.4 Lift does not move

Lid - lid not closed
Make sure that the lid is closed, otherwise the lift will not move for safety reasons.

4.5 Profile does not start

No soldering profile selected
The "Start Reflow" button is grayed out if no solder profile has been loaded from the SD card into the vapor phase.
Lid - lid not closed

Make sure that the lid is closed, otherwise the soldering profile cannot start.

Cooling water temperature too high

The temperature of the cooling water can prevent the soldering profile from starting. To remedy this, allow the vapor phase to cool down slightly. If this situation occurs consistently, you can bring cooler air into the vapor phase air inlet. To do this, the air intake is under the vapor phase soldering unit on the side of the display.

4.6 Cooling water overtemperature

The cooling water temperature of the system is monitored at its hottest point, here there is a hardware shutdown and a software shutdown. The software shutdown prevents the start of a profile, the hardware shutdown only takes effect in dangerous situations. For example, it can happen that during the soldering profile the overtemperature takes effect and the heating of the vapor phase soldering system switches itself off. **In this case, do not switch off the vapor phase soldering system.**

4.7 Fluctuation of the ACTUAL temperature in the soldering profile

Check if the thermocouple is free-standing in the air or if the tip of the thermocouple is in contact with metal or the circuit board. If the thermocouple has a thermal mass, then the detection of the ambient temperature is delayed and leads to oscillation.

5. Operation tips

5.1 Soldering defects

5.1.1 Tombstone effect

The tombstone effect (or "straightening effect") means that small two-pole components (SMD capacitors and resistors) straighten up under certain circumstances when the solder paste melts unevenly and the surface tension of the solder now acts on one side.
The main reasons for building elements to stand up are:

- The layout of the PCB is not or only poorly adapted to the component geometry.
- A poor or unsuitable solder paste is used
- The solder paste print is uneven and/or poorly positioned
- The solder paste thickness is too low. (optimal approx. 0.15 mm thickness)
- The stencil size is not reduced (optimal 10 to 20% reduction)
- The placement offset is too large
- The metallization of the components and or the connection pads is insufficient

It can also happen that the solvent in the solder paste evaporates abruptly due to insufficient drying or incorrect storage. Accordingly, components can be thrown up.

5.1.2 Wicking effect

The wicking effect describes the rising of the molten solder on the component legs. This does not result in a proper solder connection with the underlying connection pad. The likelihood of this effect occurring can be minimized by the amount of solder paste, the contact force when mounting the components and by adjusting the temperature profile.

5.1.3 Solder beads

Solder beads are small balls of tin that can move loose on the assembly, causing short circuits on the assembly. There can be several causes for this:

- The temperature gradient is too high, so that the solvent in the paste evaporates abruptly and rips solder balls out of the paste
- The paste pressure is too high and is on the solder resist - good results can be expected with approx. 10 - 15% reduced paste pressure
- The press-in pressure of the components into the paste is too high
- The solder paste stencil is not clean, so that paste residues get onto the assembly
- The solder paste is old or of poor quality
- Due to the poor wettability of the pad or component, complete wetting does not occur

5.1.4 Solder paste does not melt

Check your soldering profile again and check the temperature values achieved in the log, which is automatically saved on the SD card after each soldering process. In case of very high thermal masses, it may happen that the melting point of the soldering material was not reached based on the soldering profile. Adjust your soldering profile accordingly.

Check the solder paste and its melting point, if this melting point is higher than the maximum temperature of the solder profile, the solder paste will not be liquid.

5.2 Solder paste selection

The melting point of the solder paste used must be below the boiling temperature of the process medium used. When selecting the solder pastes, mildest activated pastes or NoClean can be used due to the ideal soldering conditions (0 ppm oxygen). In general, all commercially available pastes can be used.

5.3 Double sided boards

The processing of double-sided PCBs is identical to that of classic soldering methods. Your board must be placed on the solder grid with spacers - never place a double-sided board directly on the solder grid.
The heavy components, which have an unfavorable ground-solder surface ratio, should be fixed with SMD glue. If the heavy components were already taken into account during layout creation and these were placed on the top side of the board, gluing may not be necessary.
If your assembly allows it, you can also assemble and solder one side of the assembly first. Afterwards you assemble the other side and do another soldering process.

5.4 Cleaning of printed circuit boards

By using no-clean pastes, cleaning of the assemblies can be dispensed with in most cases. However, in the case of vapor phase soldered assemblies, the flux residues can be easily removed using the common cleaning methods, since the flux residues are not burned onto the board. In general, the surfaces of vapor phase brazed products are only extremely slightly contaminated. In contrast to convection systems, in which volatile flux and solvent components are distributed on the surface with the air flow, the soldering material in vapor phase soldering is located within a high-purity distillation column. This means that there is no additional contamination of the solder during the heating process.

6. Warranty

6.1 Warranty and guarantee

The warranty for the soldering unit is 12 months after delivery. The warranty expires if the equipment is not operated with distilled water, without process medium or with the manufacturer's own and unsigned software or if changes are made to the equipment, setting values or accessories without the written consent of the manufacturer.

The warranty also expires if software is played on the Vapor Phase which does not originate from PCB Arts GmbH.

6.2 Disclaimer

We, PCB Arts GmbH, expressly declare that claims for damages are limited to the repair and the current market value of the vapor phase soldering system. Damage to assembled PCBs, produced products, downtimes or similar will not be recognized.