

# VAPOR*flow*



VAPORFLOW USER MANUAL

USER MANUAL FOR VAPOUR PHASE REFLOW OVEN

Manual v1.3





# USER MANUAL

We recommend that all users of the Vaporflow read this guide. Store this quick guide close to the machine, so that it is available for users at all times.

We recommend to download the latest version of this manual from [www.vaporflow.eu](http://www.vaporflow.eu).



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# 01

## SAFETY PRECAUTIONS



*These are the original safety precautions. Translations can be found at the last pages of this manual.*

- Do not start the soldering process without vapour phase fluid in the container.
- Use the Vaporflow only in a well ventilated room. If there is not sufficient ventilation present in the room, use a stand-alone fume extractor to filter the vapours which are released during the soldering process.
- Never lift the lid from the container while the container is still hot. Let the Vaporflow machine finish the soldering process before you open the lid.
- Switch the machine off with the button on the back when the machine is not in use.
- The outside of the Vaporflow does get hot and it needs space to ventilate. Place it on a solid, horizontal surface with plenty of free space around it.
- Make sure the correct profile is selected for the PFPE fluid in the container.
- Do not set a temperature setpoint higher than the boiling point of the PFPE fluid.
- Do not touch the lid of the Vaporflow while the warning "LID IS HOT" is being displayed.
- Do not tape the lid to the machine or place any objects on it.
- Do not leave the machine unattended while it is switched on.
- The Vaporflow has been designed for prototyping purposes. It is recommended that the vaporflow is not being used for continuous mass manufacturing of PCBs.

# 02

## INCLUDED PARTS

- Vaporflow machine
- Lid
- Mains cable
- Level gauge
- PCB rack
- A syringe
- 400g LS230 Galden for Vaporflow 275
- 900g LS230 Galden for Vaporflow 480
- User manual

With the Vaporflow 480 a K-type thermocouple is included, to measure the temperature on the PCB for logging and profile tuning.

An SD-card is not included. An SD-card is not required for usage, it is only used to log the temperature in the oven.

# 03

## PRINCIPLE OF VAPOUR PHASE SOLDERING

The PCB with components and solder paste is placed in a container above a layer of PFPE fluid. PFPE fluid is a Perfluoropolyether Fluid. The most commonly used PFPE fluid for soldering is Galden. The PFPE fluid is engineered such that it has a predetermined and exact boiling point. Galden LS230 is used to solder lead-free PCBs and has a boiling point of 230°C.

After the PCB is placed above the fluid, the container is closed, so no vapour can escape and the soldering process can be started. Then the liquid is heated by the Vaporflow controller until the liquid boils and a vapour of exactly 230°C arises. The PCB is now enclosed in a vapour of 230°C and the heat is being transferred to the PCB and soldering joints.

The heating has stopped and the vapour will condense. The Vaporflow controller will start cooling the container, such that all vapour has condensed and it is safe to open the container.

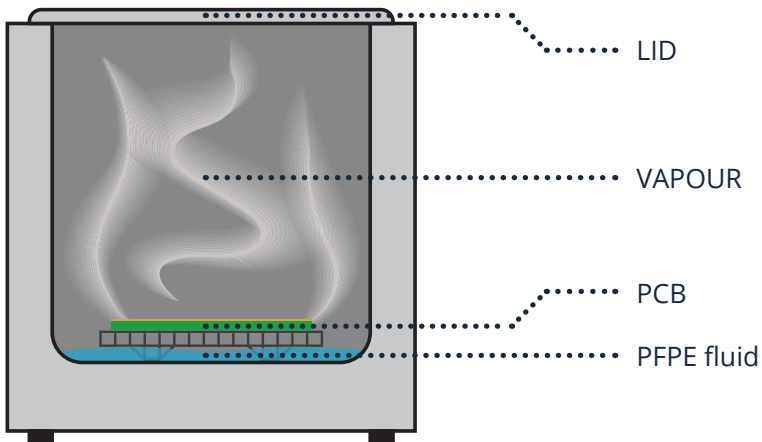


Figure 1. Simplistic frontview dissection of Vaporflow. Schematic representation.

# 04

## SETUP OF THE VAPORFLOW

Unpack the vaporflow and place it on a solid surface. Use the adjustable feet under the Vaporflow to level the machine.



Check whether the inside of the container is free from dust and contamination. There could be brown discoloration at the bottom of the container, don't worry, this is the result of the factory test.

Unpack the lid and close the container. Make sure the Vaporflow is turned off with the switch on the back and connect it to mains. The mains connection is at the back of the machine.

There is a round black magnet on one of the lid's corners. This magnet is detected by the lid sensor in the machine. Make sure the lid is oriented in such a way that the magnet is closest to the display (see Figure 2).

Now the Vaporflow is ready to be filled with PFPE fluid. Make sure you have a paper towel at hand, to clean up any spillage.

Get the fluid level gauge and inspect it to get an idea of the level of fluid you need to fill the container with. You can also use an accurate scale. You should pour about 290 grams of liquid into the container when using Vaporflow 275 and about 750 grams when using the Vaporflow 480.

To fill the container using the level gauge, pour a small amount of liquid in the container and place the gauge vertically in the center of the container. Check whether the level of the liquid is already between the two indicators on the gauge (see Figure 3). Wipe the gauge clean with a paper towel between measurements. Keep adding small amounts of liquid until the level is between the two indicators of the gauge.



*Figure 2. The lid needs to be oriented in such a way that the magnet is on the corner closest to the display.*

After you have poured the correct amount of PFPE liquid into the container, you can place the PCB rack in the container. Now the Vaporflow can be turned on with the switch on the back.



Figure 3. At the bottom of the level gauge there are two lines. The level of the liquid in the container needs to be within these two lines.

## 05

# USING THE VAPORFLOW

After setup the Vaporflow is ready to be used. Place the prepared PCB in the container on the rack and close the lid.

The Vaporflow will show the home screen which allows you to enter various menus. Press the soldering button to go into the soldering menu. The other menus are explained in later chapters of this manual.

*Tip: The display uses resistive touch technology and shows the best response when you use your nails to touch it.*

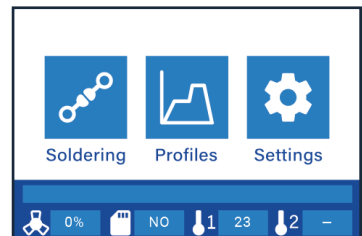


Figure 4. Home screen.

The central button shows the currently selected soldering profile. Various profiles can be selected by pressing the button. The default profile is LS230, this profile is suitable for Galden LS230 liquid.

Press start to start the soldering process. The process will immediately start after you press this button.

**WARNING:** *When using the machine for the first time, some smoke will be released. There are residues of the manufacturing processes on various metal parts. At first usage some of these residues burn off.*

The soldering status screen will be displayed. A graph shows the setpoint temperature and actual temperature over time.

You can immediately stop the soldering process by pressing the STOP button. Stopping the process doesn't cool down the container, so if the container is still hot, you need to run a manual cooling cycle. Do not open the container while it is still hot. Finish the cycle, or run a cooling cycle.

You might have noticed that there is always a status bar visible on the screen. The first icon shows whether the vaporflow is either heating or cooling. The percentage next to the icon indicates the duty cycle. YES/ NO next to the SD-Card shows whether an SD-Card is detected. The temperature next to 1 shows the measured temperature in the oven. If an auxiliary temperature sensor is present, this measured temperature is shown next to number 2.

After the soldering process has finished, you can open the lid and take the PCB from the container. Be careful when lifting the lid, there is probably some fluid at the underside of the lid. The PCB will feel warm.

If any liquid remains on the circuit board, you can remove it with some IPA and an ESD safe brush.

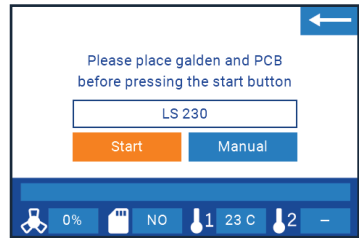


Figure 5. Profile screen.

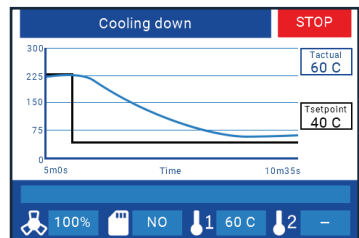


Figure 6. Soldering status screen.



# 06

## MANUAL HEATING OR COOLING

You can manually set a heating or a cooling setpoint by going to the soldering menu and pressing the “manual” button.

You will see the manual setpoint setup menu. Here you can set the oven to cooling or heating and you can set a setpoint.

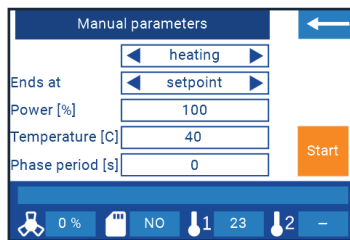


Figure 7. Manual parameters screen.

The following settings can be adjusted:

- Ends at: Either after a setpoint is reached or after a fixed period of time has passed.
- Power [%] : The amount of heating or cooling power
- Temperature [C] : The temperature at which the process will stop
- Phase period [s] : The period after which the process will stop

# 07

## RECORDING DATA TO THE SD-CARD

The Vaporflow provides an SD-Card slot on the right side of the machine. Enter an SD-Card to record the machine status. The SD-Card will stick out more than you would expect.



Figure 8. Orientation of the SD card.



Figure 9. The SD card placed in the machine.

If you have entered a FAT32 formatted SD-Card, the SD-Card icon in the status bar will light up and the Vaporflow will record the data of each soldering session automatically to the card.

If the card is not recognised or no recordings are created, you can format the card in the machine by going to the home menu, then settings, then Format SD card.

One measurement per second is stored. The following data is stored:

Measurement	Description
Time [ms]	Time measurement since start of logging
Tact [°C]	Measured temperature
Tset [°C]	Temperature setpoint
Taux [°C]	Auxiliary temperature sensor (only on Vaporflow 480)
DutyFan [%]	Duty cycle of the cooling fans
DutyHeater [%]	Duty cycle of the heater
Ifan [mA]	Approximation of the current through the fans

Table 1. Data stored on SD card.

# 08

## Handling PFPE fluid

PFPE fluid is a sticky fluid. Spills can be cleaned up with a paper towel. Don't flush the fluid down the drain, but make sure it is disposed of properly. The included syringe can be used to empty the Vaporflow container.

# 09

## CREATING CUSTOM SOLDERING PROFILES

When you go into the profiles menu, the available profiles on the Vaporflow are being shown. From this menu you can create new profiles.

The profiles with a lock in front of the profile name are factory installed and cannot be edited or removed. You can create a new profile by pressing the + button on the right.

After entering the profile name, you will be shown the screen below. With the + buttons on the left, you can add phases to the profile. A phase is either a cooling or a heating phase and is similar to starting the manual mode which is explained in chapter 06.

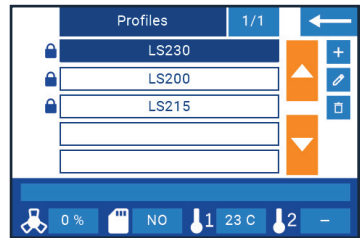


Figure 10. (Custom) profiles menu.

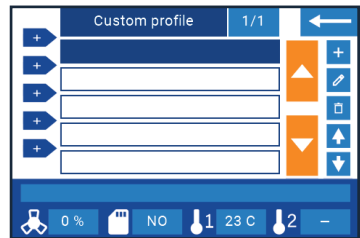


Figure 11. Edit a profile.

# 10

## Self test

A self test can be performed from the Settings menu. It starts by heating at 50%, and it takes about 2 minutes before any heat up will be registered. Both heating and cooling are being tested during the self test. The Vaporflow needs to be filled with the correct amount of Galden for the self test to succeed.

# 11

## UPDATING THE FIRMWARE

In the Settings menu press the Device info button to check the installed software version, the hardware version and the serial number. If you press generate QR you will be shown a QR code which is a link to a web page which will show whether a new firmware version for this specific Vaporflow is available and it will show installation instructions. Visit the QR code with your mobile phone to continue.

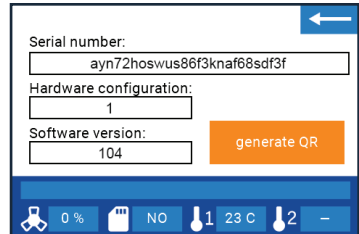


Figure 12. Device info screen.

# 12

## TROUBLESHOOTING

### Possible issues

Issue	Resolution
The display doesn't turn on.	Check whether the light on the back of the machine is lit. Check whether the switch is in the correct position. Check whether the fuse is intact with a multimeter. Check the mains cable.

Table 2. Possible issues.

### Displayed errors and possible resolutions

Issue	Cause	Resolution
The lid is not closed properly.	The magnet on the lid is not detected by the system.	Locate the lid such that the magnet is located near the display.
A thermal runaway event has been prevented.	Insufficient heat up is detected while the heater is on. This could be a sensor issue or caused by insufficient liquid.	Contact support to discuss the issue.

Table 3. Displayed errors.

If you are unable to solve an issue, please contact the support department of your supplier. Provide them detailed information about your setup and issue.

# 13

## TRANSLATED SAFETY PRECAUTIONS



*Dies sind übersetzte Sicherheitshinweise. Im Zweifelsfall sollten Sie die englischen Sicherheitshinweise lesen.*

- Starten Sie den Lötprozess nicht ohne Dampfphasenflüssigkeit im Behälter.
- Verwenden Sie das Vaporflow nur in einem gut belüfteten Raum. Wenn der Raum nicht ausreichend belüftet ist, verwenden Sie einen eigenständigen Rauchabzug, um die Dämpfe zu filtern, die während des Lötvorgangs freigesetzt werden.
- Heben Sie niemals den Deckel des Behälters ab, solange dieser noch heiß ist. Lassen Sie die Vaporflow-Maschine den Lötvorgang beenden, bevor Sie den Deckel öffnen.
- Schalten Sie das Gerät mit dem Knopf auf der Rückseite aus, wenn es nicht benutzt wird.
- Die Außenseite des Vaporflow wird heiß und braucht Platz zum Lüften. Stellen Sie das Gerät auf eine feste, waagerechte Fläche mit viel freiem Raum um das Gerät herum.
- Stellen Sie sicher, dass das richtige Profil für die PFPE-Flüssigkeit im Behälter gewählt ist.
- Stellen Sie keinen höheren Temperatursollwert als den Siedepunkt der PFPE-Flüssigkeit ein.
- Berühren Sie den Deckel des Vaporflow nicht, solange die Warnung "LID IS HOT" angezeigt wird.
- Kleben Sie den Deckel nicht mit Klebeband am Gerät fest und legen Sie keine Gegenstände darauf.
- Lassen Sie das Gerät nicht unbeaufsichtigt, während es eingeschaltet ist.
- Der Vaporflow wurde für Prototyping-Zwecke entwickelt. Es wird empfohlen, den Vaporflow nicht für die kontinuierliche Massenproduktion von Leiterplatten zu verwenden.



- Ne commencez pas le processus de soudage sans fluide en phase vapeur dans le récipient.
- Utilisez le Vaporflow uniquement dans une pièce bien ventilée. Si la pièce n'est pas suffisamment ventilée, utilisez un extracteur de fumée autonome pour filtrer les vapeurs qui se dégagent pendant le processus de soudage.
- Ne soulevez jamais le couvercle du récipient lorsque celui-ci est encore chaud. Laissez la machine Vaporflow terminer le processus de soudage avant d'ouvrir le couvercle.
- Eteignez la machine à l'aide du bouton situé à l'arrière lorsque vous ne l'utilisez pas.
- L'extérieur du Vaporflow devient chaud et il a besoin d'espace pour se ventiler. Placez-le sur une surface solide et horizontale avec beaucoup d'espace libre autour de lui.
- Assurez-vous que le profil correct est sélectionné pour le fluide PFPE dans le récipient.
- Ne définissez pas un point de consigne de température supérieur au point d'ébullition du fluide PFPE.
- Ne touchez pas le couvercle du Vaporflow pendant l'affichage de l'avertissement « LID IS HOT ».
- Ne collez pas le couvercle à la machine et ne placez pas d'objets dessus.
- Ne laissez pas la machine sans surveillance lorsqu'elle est allumée.
- Le Vaporflow a été conçu à des fins de prototypage. Il est recommandé de ne pas utiliser le Vaporflow pour la fabrication en masse de circuits imprimés.



- Start het soldeerproces niet zonder galdenvloeistof in de container.
- Gebruik de Vaporflow alleen in een goed eventileerde ruimte. Als er niet voldoende ventilatie in de ruimte aanwezig is, gebruik dan een zelfstandige dampafzuiger om de dampen die tijdens het soldeerproces vrijkomen te filteren.
- Haal het deksel nooit van de container als deze nog heet is. Laat de Vaporflow machine het soldeerproces beëindigen voordat u het deksel opent.
- Schakel het apparaat uit met de knop aan de achterkant als deze niet in gebruik is.
- De buitenkant van de Vaporflow wordt heet en heeft ruimte nodig om te ventileren. Plaats hem op een stevige, horizontale ondergrond met voldoende vrije ruimte eromheen.
- Zorg ervoor dat het juiste profiel is geselecteerd voor de PFPE vloeistof in de container.
- Stel geen hogere temperatuur in dan het kookpunt van de PFPE-vloeistof.
- Raak het deksel van de Vaporflow niet aan zolang de waarschuwing "LID IS HOT" wordt weergegeven.
- Plak het deksel niet vast op het apparaat en plaats geen voorwerpen op het deksel.
- Laat het apparaat niet onbeheerd achter terwijl het is ingeschakeld.
- De Vaporflow is ontworpen voor prototyping doeleinden. Het wordt aanbevolen de Vaporflow niet te gebruiken voor continue massaproductie van printplaten.



Detta är översatta säkerhetsåtgärder. I tveksamma fall ska du kontrollera de engelska säkerhetsföreskrifterna.

- Starta inte lödprocessen utan ångfasvätska i behållaren.
- Använd Vaporflow endast i ett väl ventilerat rum. Om det inte finns tillräcklig ventilation i rummet, använd en fristående rökgasavskiljare för att filtrera de ångor som frigörs under lödprocessen.
- Lyft aldrig på locket från behållaren medan behållaren fortfarande är varm. Låt Vaporflow-maskinen avsluta lödprocessen innan du öppnar locket.
- Stäng av maskinen med knappen på baksidan när maskinen inte används.
- Vaporflow-maskinens utsida blir varm och den behöver utrymme för att ventileras. Placera den på en fast, horisontell yta med gott om fritt utrymme runt omkring.
- Se till att rätt profil är vald för PFPE-vätskan i behållaren.
- Ställ inte in ett temperaturinställningsvärde som är högre än PFPE-vätskans kokpunkt.
- Rör inte locket på Vaporflow medan varningen "LID IS HOT" visas.
- Tejpa inte fast locket på maskinen och placera inga föremål på det.
- lämna inte maskinen obevakad medan den är påslagen.
- Vaporflow har utformats för prototyper. Det rekommenderas att Vaporflow inte används för kontinuerlig massstillverkning av kretskort.



Nämä ovat käännettyjä turvatoimia. Kun olet epävarma, tarkista englanninkieliset turvallisuusohjeet.

- Älä aloita juotosprosessia ilman säiliössä olevaa höyryfaasineestettä.
- Käytä Vaporflowta vain hyvin ilmastoidussa tilassa. Jos huoneessa ei ole riittävää ilmanvaihtoa, käytä erillistä savunpoistolaitetta juotosprosessin aikana vapautuvien höyryjen suodattamiseen.
- Älä koskaan nosta kantta säiliöstä, kun säiliö on vielä kuuma. Anna Vaporflow-koneen juotosprosessin päättyä, ennen kuin avaat kannen.
- Kytke kone pois päältä takana olevalla painikkeella, kun konetta ei käytetä.
- Vaporflow-koneen ulkopuoli kuumenee ja se tarvitsee tilaa tuulettumiseen. Aseta se kiinteälle, vaakasuoralle pinnalle, jonka ympärillä on runsaasti vapaata tilaa.
- Varmista, että säiliössä olevalle PFPE-nesteelle on valittu oikea profiili.
- Älä aseta lämpötilan asetusravoa korkeammaksi kuin PFPE-nesteen kiehumispiste.
- Älä koske Vaporflow-laitteen kanteen, kun varoitus "LID IS HOT" (Kansi on kuuma) on näkyvässä.
- Älä teippaa kantta kiinni koneeseen tai aseta mitään esineitä sen päälle.
- Älä jätä konetta valvomatta, kun se on kytketty päälle.
- Vaporflow on suunniteltu prototyyppitarkoituksiin. On suositeltavaa, että Vaporflowta ei käytetä piirilevyjen jatkuvaan massavalmistukseen.



Dette er oversatte sikkerhedsforanstaltninger. Hvis du er i tvivl, skal du tjekke de engelske sikkerhedsanvisninger.

- Start ikke loddeprocessen uden dampfasevæske i beholderen.
- Brug kun Vaporflow i et godt ventileret rum. Hvis der ikke er tilstrækkelig ventilation til stede i rummet, skal du bruge en selvstændig røgudsuger til at filtrere de dampe, der frigives under lodningsprocessen.
- Løft aldrig låget af beholderen, mens beholderen stadig er varm. Lad Vaporflow-maskinen afslutte lodningsprocessen, før du åbner låget.
- Sluk maskinen med knappen på bagsiden, når maskinen ikke er i brug.
- Vaporflow-maskinens yderside bliver varm, og den har brug for plads til at ventilere. Placer den på en fast, vandret overflade med masser af fri plads omkring den.
- Sørg for, at den korrekte profil er valgt til PFPE-væskens i beholderen.
- Indstil ikke et temperaturindstillingspunkt højere end PFPE-væskens kogepunkt.
- Rør ikke ved låget på Vaporflow, mens advarslen "LID IS HOT" vises.
- Du må ikke tape låget fast til maskinen eller placere nogen genstande på det.
- Efterlad ikke maskinen uden opsyn, mens den er tændt.
- Vaporflow er designet til prototypeformål. Det anbefales, at Vaporflow ikke anvendes til kontinuerlig massefremstilling af PCB'er.



VAPOR*flow*

[www.vaporflow.eu](http://www.vaporflow.eu)