



User Guide : Sublym™ Kit

Compact Hot Embossing Machine

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Sublym™

DESCRIPTION

The Sublym™ embossing machine allows fast and easy molding of Flexdym™ polymer sheets. The machine is compact, measuring 33 x 34 x 11 cm³, allowing molding to be performed anywhere. The machine enables plug & play, and does not require a pressure source. It is adjustable to up to 180°C and suitable for molds up to 4 inches. The Sublym™ allows Flexdym™ molding to be accomplished within a few minutes.

SAFETY NOTES

The aim of this quick start guide is to illustrate how to use the Sublym™ system, to easily and rapidly create Flexdym™ chips. Please, always consult the safety notes or procedures that may be related to your specific heat press system prior to use.

As in all laboratory activities, gloves and lab coats should be worn at all times during the process. It is the user's responsibility to consult the manufacturer's recommendation for the chemicals used and if required to ensure adequate ventilation/extraction (e.g., via a fume hood) prior to proceeding.

The biggest risk for the user during the process is burning themselves. The equipment is hot and one must always wear heat resistant gloves while operating. As for all technical equipment the heat press has to be used only by a trained person to prevent any injury to the user or damage to the equipment.

LIST OF BUTTONS



POWER



RUN



PROGRAM 1



HEATING



TEMPERATURE SETTING



PROGRAM 2



VACCUM



TIME SETTING

EQUIPMENTS REQUIRED

PROCESS PARAMETERS	QUANTITY
SUBLYM™ EMBOSSING MACHINE	1
SCREW SPACERS	4
COUNTER MOLD TO CREATE SMOOTH SURFACE OPP FLEXDYM™	1
FLEXDYM™ SHEET	1
PROTECTIVE PTFE SHEET	1
SCISSORS	1
TWEEZERS	1
ISOPROPANOL	1
HEAT RESISTANT GLOVES	1

EQUIPMENTS INCLUDED IN THE KIT

- COUNTER MOLD
- HEAT-RESISTANCE GLOVES (S, M, OR L)
- SPACERS & WASHERS
- ANTI-STICKING SILICON SPRAY
- REPLACEMENT MEMBRANE
- 1 M FEP PROTECTIVE SHEET

Process.


OPERATING INSTRUCTIONS



Plug in the Sublym™ & switch the machine on 

Heating the machine

Close the machine and pre-heat the mold chamber for a few minutes.

Press  for 5 s to adjust & set the temperature

Press  to start heating.

When pre-heating is complete, the machine beeps.

Press any button to turn off sound & stop pumping.

Tip: To change the temperature units between °C and °F, press "+" and "-" buttons at the same time. To monitor processing capacity (i.e. countdown of the number of runs), press 2s on "+" button and then press "-" button.

Note: The temperature & time of molding will depend on several parameters, e.g. sheet thickness, desired thickness, and channel resolution.





Optional: Set up a Program

Optional: Set up pre-heating of molding chamber


Before you begin molding, it is important to pre-heat the mold, to ensure it is at the molding temperature.

To set up a program press  or 


To set an automatic pre-heating step delay (up to 2min long), press  for 5 s.

To set a pre-heating temperature, press  for 5 s. To change the temperature, you press the heat button off. Change the temperature & turn it back on.

Press  to adjust the temperature.

Press again  to set the temperature.

Press  to adjust the time.

Press again  to set the temperature.



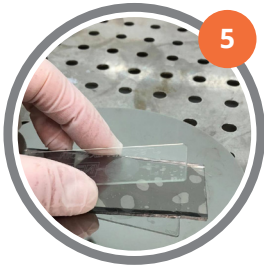
In a ductless fume hood, cut the Flexdym™ sheet using scissors, according to the size of your mold.

Note: Keep protective sheets to cover Flexdym™ after molding process.



Remove one protective sheet from the Flexdym™ and place the Flexdym™ on the counter mold using tweezers.

Note: The counter mold can be treated with silicone spray to improve releasing (of large mold surfaces). Use isopropanol or ethanol to clean the counter mold beforehand.



Remove the second protective sheet from other side of Flexdym™. Place the mold face down on the Flexdym™ sheet.

Note: The mold in the image is made of SU-8 on glass. However, Flexdym is compatible with other molds, e.g. SU-8 on silicon or epoxy molds.



Open the Sublym™ & check the inner deformable membrane is attached correctly.



Using protective gloves & tweezers, place Mold-Flexdym-Counter mold sandwich in Sublym™ molding chamber.

Tip: Final thickness of Flexdym™ can be adjusted using different spacers.

An estimate calculation:


$$\text{Final Thickness} = \text{Spacer size} - \text{Mold Thickness} - 4\text{mm}$$




Ensure a thin protective sheet (red) is placed on top of the sandwich to avoid sticking to inside of the metal cover.



Close the molding chamber & the Sublym™.

Press  to start pumping & molding.

This process usually only takes a few minutes. Once done, the vacuum pump will automatically stop, and the machine will beep.

Press  to turn off sound.

Note: Pressure inside chamber should stabilize between 0.08-0.06 MPa



Once molding is complete, remove the Mold-Flexdym-Counter mold sandwich from the Sublym™ molding chamber. (Isothermal Process)
Allow to cool down at room temperature for 1-2 minutes.

Note: To speed up the process, you may use an air gun.



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Unmolding

Remove Mold-Flexdym ensemble from counter mold very gently, using tweezers and isopropanol.

Note: Unmold while the Mold-Flexdym ensemble is warm to the touch.



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Gently remove the molded Flexdym™ from the mold.



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Cover both sides of the Flexdym™ with the protective sheets. Cut neatly around the molded design.



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Optional: Use metal hole punch pliers to create inlet/outlet holes in the design.

ADVANCED SUBLYM FEATURES

There are additional advanced features in the Sublym™ system:

To set an automatic pre-heating step delay (up to 2min long), press  for 5 s.

To set a pre-heating temperature, press  for 5 s.

To change the temperature unit of the machine between °C and °F, press the “+” and “-” buttons at the same time.

To monitor the processing capacity (countdown of the number of runs), press the “+” button for 2 s, then press the “-” button.

WHICH SPACER SHOULD YOU USE

1. Select initial Flexdym sheet thickness minimum 20% larger than final thickness.

2. Then use the formula:

$$\text{Final Thickness} = \text{Spacer size} - \text{Mold Thickness} - 4\text{mm}$$

3. For 1mm mold thickness...

FINAL FLEXDYM THICKNESS(mm)	SPACERS & WASHERS TOTAL (mm)
0.2	5.2
0.4	5.4
0.6	5.6
0.8	5.8
1	6
1.2	6.2
1.4	6.4
1.6	6.6

MOLD TEMPERATURE & TIME SETTINGS

These parameters serve as a general guidelines. Further calibrations may be required depending on your specific setup.

MOLD TYPE	PRE - HEAT	TEMPERATURE	TIME
GLASS MICROSCOPY SLIDE	NO	167°C	180s
EPOXYM RESING MOLD	YES(10min)	165°C	15min
SU-8 & SILLICON WAFER	NO	167°C	360s

MACHINE MAINTENANCE

The Sublym™ system requires very little cleaning and maintenance. If Flexdym™ flows out of the molding chamber or sticks to the chamber lid, make sure you clean it as soon as possible using isopropanol.

For any additional questions, please do not hesitate in contacting us at support@eden-microfluidics.com.

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Registered Address: 83 Avenue Philippe Auguste, 75011 Paris, France | Client Facing Address: 172 Rue de Charonne, 75011 Paris, France
T: + (33) 1 88 327 405 E: contact@eden-microfluidics.com W: www.eden-microfluidics.com