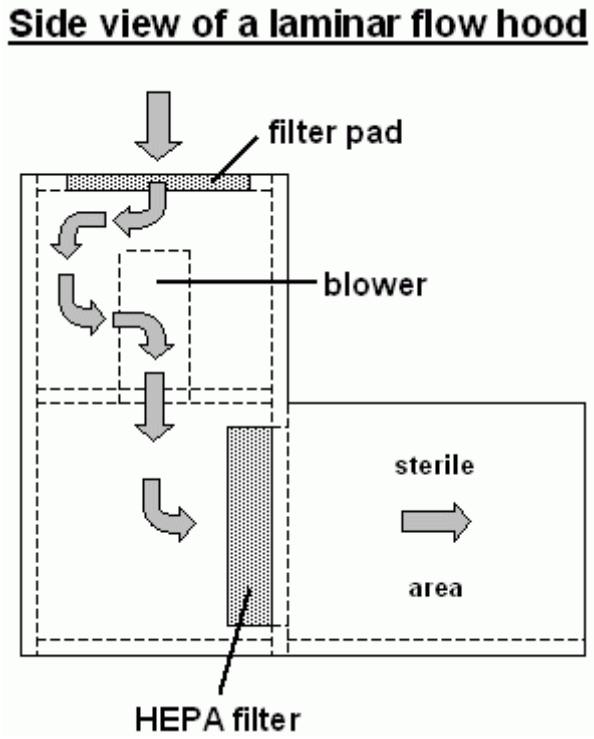
How a laminar flow hood functions

In a laminar flow hood the air is passed through a HEPA (High Efficiency Particulates Air) filter which removes all airborne contamination to maintain sterile conditions.



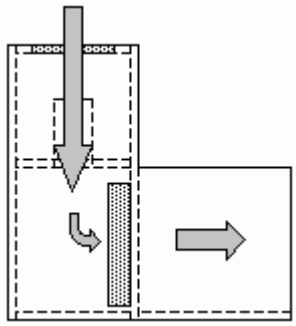
A laminar flow hood consists of a filter pad, a fan and a HEPA (High Efficiency Particulates Air) filter. The fan sucks the air through the filter pad where dust is trapped. After that the prefiltered air has to pass the HEPA filter where contaminating fungi, bacteria, dust etc are removed. Now the sterile air flows into the working (flasking) area where you can do all your flasking work without risk of contamination.

Important parameters to make sure that the hood works efficiently:

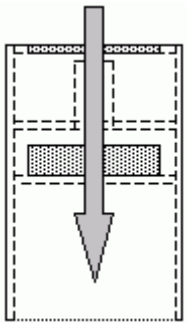
- the HEPA filter has to remove all airborne materials
- the air speed in the working area has to be about 0,5 m/s

The two types of laminar flow hoods

Before you start building your flow hood you have to decide if you prefer a vertical or horizontal air flow in the flasking area. In a vertical flow the air moves from the top of the working area to the bottom and leaves the flasking area through holes in the base. When you use a flow hood with horizontal air flow the air moves from the back of the working area to the front.



horizontal air flow



vertical air flow

Why should I build a laminar flow hood

Many growers will be a little be confused why we built a laminar flow hood although the steam method works fine for us. In the list below you can find the adavantages and disadvantages of both sterile methods.

Steam method

advantages	*disadvantages*
• you can do it in almost every kitchen • does not require a lot of space • low costs	• limited space in the sterile area • limited view because of the steam • plant material can not stay in the sterile area because they become too hot • the contamination rate increases rapidly when using flasks with wide lids because of limited space in the sterile area

Laminar flow hood

advantages	*disadvantages*
• enough space in the sterile area • plant material can stay for longer time in the sterile area because it does not become hot • it´s easier to use bigger flasks with wide lids	• more expensive • the laminar flow hood needs more space than a pot

We practiced both methods and now we can say that the steam method is good enough if you want to propagate your own plants. If you are interested in producing a high number of plants or if you want to do special tissue culture (e.g. cutting meristems) we recommend you build a laminar flow hood.

Choosing the right blower and filter

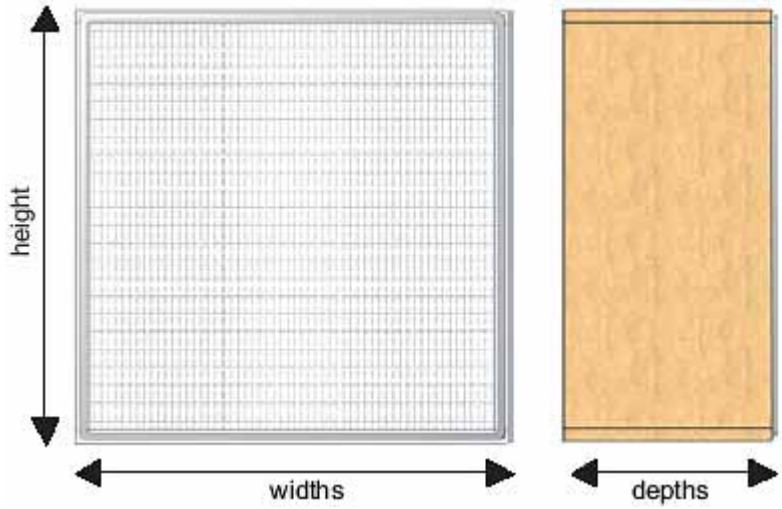
When we had the choice between a vertical and a horizontal air flow we decided to use a horizontal air flow. Before we started building the hood we had to choose the right filters and blower.

Choosing the filters

To prefilter the air the company Luftfilterbau recommended us the filter pad HS-E/360. To choose the HEPA filte you have to keep in mind the following things:

- the HEPA filter has to remove all (99,9 %) airborne material (filterclass H 14 according to EN 1822)
- the HEPA filter should be big enough to have enough space available in the flasking area

We ordered the HEPA Filter HS-Mikro SF (30,5 cm width, 61 cm height and 7,8 cm depth).



On the website of Luftfilterbau at "Info" you can find a very good guideline how to choose the right filter and how filters function.

Choosing the blower

When choosing the blower we have to make sure that it is able to transport the required quantity of air through the filter pad and the HEPA filter. We know the dimension of the HEPA filter and the required air speed in the working area (0,5 m/s) so we then can calculate the airflow per hour.

width of the HEPA filter: 0,305 m
height of the HEPA filter: 0,61 m
required air speed: 0,5 m/s

airflow = width * height * air speed =
= 0,305 m * 0,61 m * 0,5 m/s =
= 0,093025 m³/s

When we multiply this result by 3600 seconds (60 * 60) we get the airflow in m³/h.

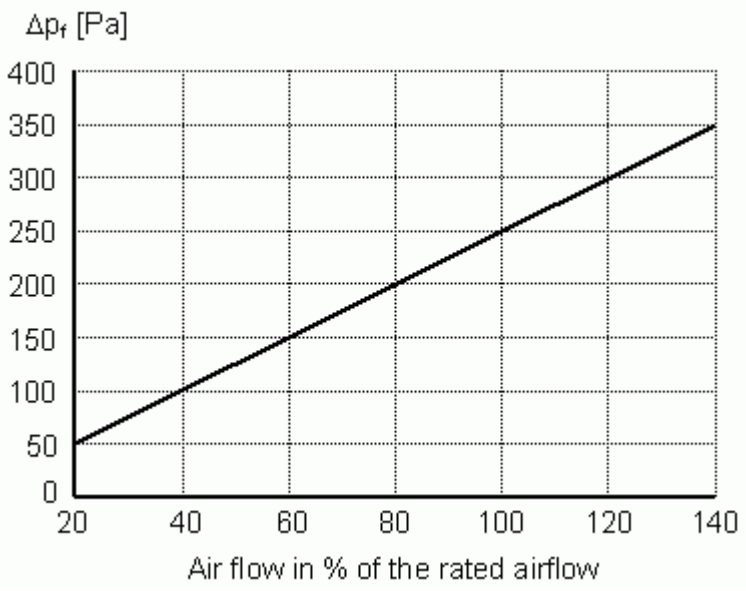
airflow = 0,093025 m³/s * 3600 = 334,89 m³/h

On many english websites you´ll find the airflow in Cubic Foot per Minute (CFM) and not in cubic meters per hour (m³/h). One ft (foot) is 0.3048 m so one cubic foot is 0,0283 m³ (0,3048 m * 0,3048 m * 0,3048 m).

1 m³/h	=	0,5886 CFM
1 CFM	=	1,6990 m³/h

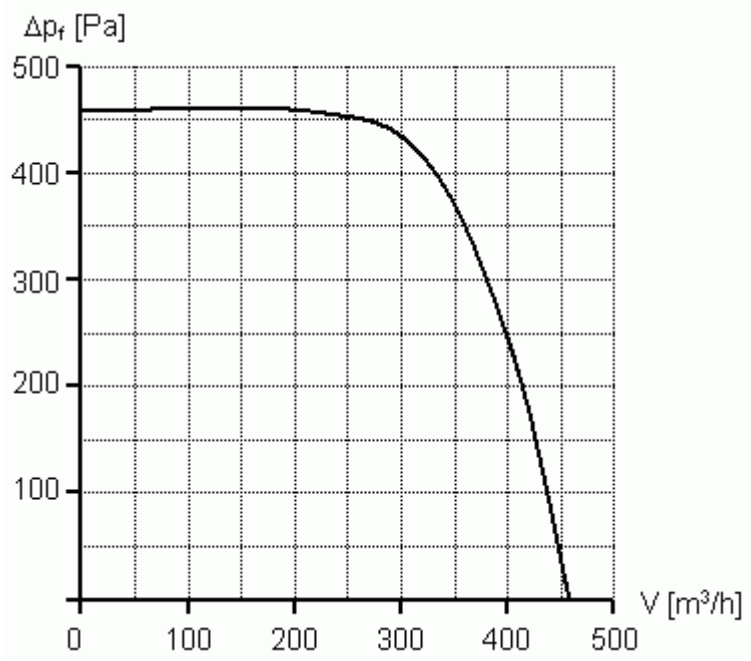
In the next step we have to read from the diagram below how much pressure is necessary to transport 334,89 m³/h air through the HEPA Filter. An airflow of 334,89 m³/h is about 60% of the nominal airflow so the required pressure is 150 Pa.

Diagram of the HEPA filter



Now we have all necessary data to choose a blower (334,89 m³/h at 150 Pa). In the picture below you can see the diagram of our blower (centrifugal blower G2E140-AI28-01) which we bought from Ziehl-ebm GmbH.

Diagram of the blower

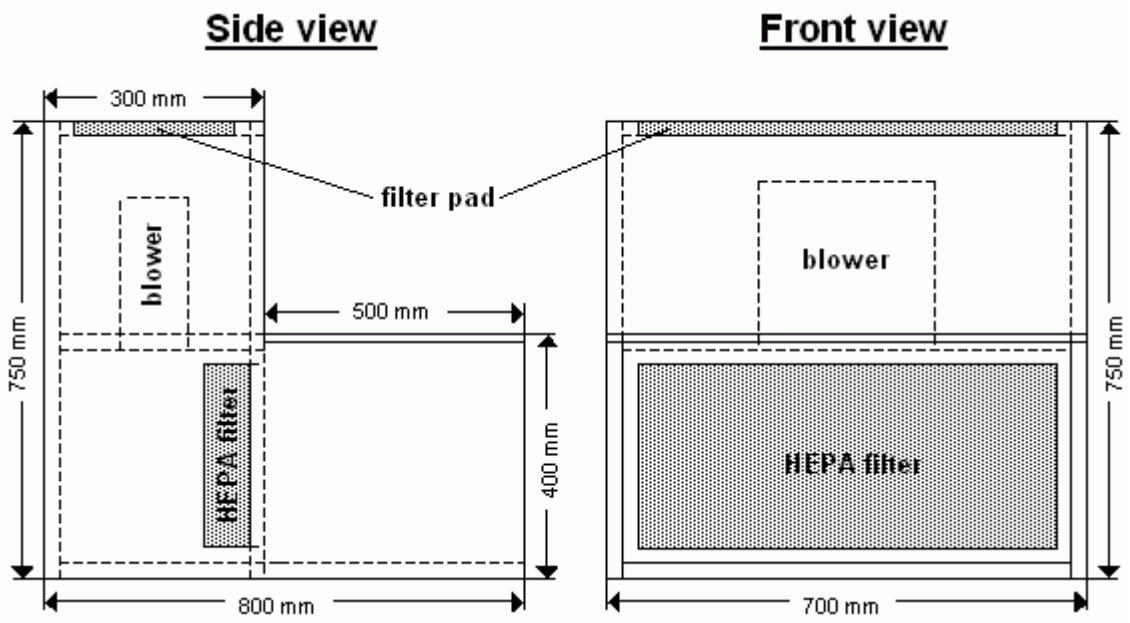


As you can see, the blower is a little bit stronger than required because of the following reasons.

- the filter pad slows down the airflow slightly
- after a while the filters become dirty and we need more power to transport the same quantity of air through them
- it is easier to regulate and reduce the blower slightly than buying a stronger one

Construction manual

In the picture below you can see the plan of our laminar flow hood which we built of 19 mm press boards. It is recommended to use a board made of transparent plexiglas for the top of the sterile flasking area to let as much light in as possible.



Side view of the laminar flow hood with open filter unit

Installing the blower

Installing the HEPA filter

Complete laminar flow hood

Cost listing:

Blower (G2E140-AI28-01):	114,30 €
Filter pad (E360):	15,08 €
HEPA filter (HS Mikro SF 305 x 610 x 78 mm):	131,08 €
press boards:	23,91 €
small parts (screws ...):	20,00 €
Total:	304,37 €

How to use a laminar flow hood

Before you start flasking in your laminar flow hood you should do the following actions.

- Turn on the blower and wipe out the sterile area with an alcohol soaked piece of kitchen paper.
- Let the blower run continuously for 30 minutes. When this time has passed repeat the wipe out of the sterile area with an alcohol soaked piece of kitchen paper.

The picture below show the sterile area of our laminar flow hood. For cutting plants we use a petri dish (made of glass) which we clean (sterilize) with an alcohol soaked piece of kitchen paper.