Leybold Optics LAB 600H

To avoid delamination and flakes generation, the evaporation of **Si/MgF2/SiO2/Al2O3 and more generally oxides is allowed only the week before the monthly cleaning** of the chamber (Subject to exceptions – Please ask CMi staff).

Contents

I. Introduction

The LAB 600 H is an equipment allowing the deposition of metallic or dielectric layers on **100 mm or 150 mm wafers** by evaporation.

This method involves evaporating a material placed either in **a crucible**

heated up by an electron beam or a boat heated up by Joule effect.

The LAB 600 H is especially designed for:

> **Lift-Off processes requiring a material deposition closed to the normal of the sample.**
> **The deposition of dense dielectric films requiring ionic source assistance.**

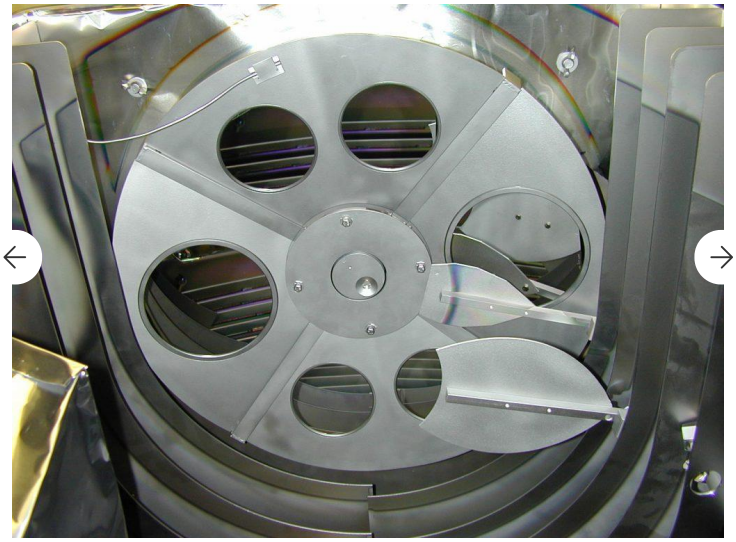
II . Equipement description

Dimensions and capabilities

The maximum working distance (distance source – substrate) in the LAB 600H is **1010 mm**. Such distance allows to minimize the angle between the normal on the edge of a wafer and the incident flux of evaporated material.

Volume of the chamber : ~ 640 l.

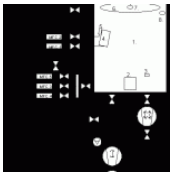
The substate holder is composed of **4 segments. Each segment** can receive **2 x 100 mm wafers or 1 x 150 mm wafer**.



LAB600H – Substrate holders 1/4

LAB600H – Substr...

LAB600H – Cham...



LAB600H – Diagra...

LAB600H – Backsi...

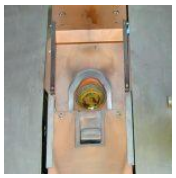
Evaporation systems

Historically, LAB 600 H was equipped with:

> Electron gun evaporation: *Ferrotec EV M-8 ; 10 kW , 6 pockets*

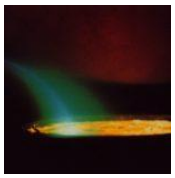
Joule-Effect evaporation : *1 boat (maximum currect : 400A)* – *Remark: This system has been removed from the chamber.*

LAB600H – E-gun 1/5


LAB600H – E-gun


LAB600H – Joule-...


LAB600H – Evapo...


LAB600H – E-gun ...


LAI

Film thickness measurement

The film thickness is determined by following the change in frequency of a quartz crystal. This change is due to the growing mass of material on top of its surface. Thanks to some calibrations, the variation can be related to the thickness of the film deposited.

Deposition controller : Inficon IC/5.
1 x carousel with 6 quartz crystals QSK 621 at the center of the substrate holder.
2 x Quartz crystals on the side of the chamber.

Pumping

To reach high vacuum, the system is equipped with **a cryogenic pump**.

Primary dry pump *Ecodry L (Leybold)* – Pumping speed = 40 m^3h^{-1} ;
Roots pump *Ruvac WSU 501 (Leybold)* – Pumping speed max. = 500 m^3h^{-1}.
Cryogenic pump *Cryopump CTI OnBoard 400*.
Pumping capabilities:

- N_2 = 6000 l/s
- H_2O = 17 500 l/s

Pressure

The pressure in the system is measured by:

2 x Gauges Pirani *PSG 100-SP* : Primary vacuum control (10^{+3} à 10^{-3} mbar).
1 x Gauge Bayard-Alpert *BAG 100-SP* : Secondary vacuum control (10^{-1} à 2.10^{-10} mbar).

Typical vacuum levels are:

~ 1.5 10^{-6} mbar in normal use conditions.
1.0 10^{-7} mbar with a clean chamber and after 8h under vacuum.

See details for pumping speed.

Ion Source

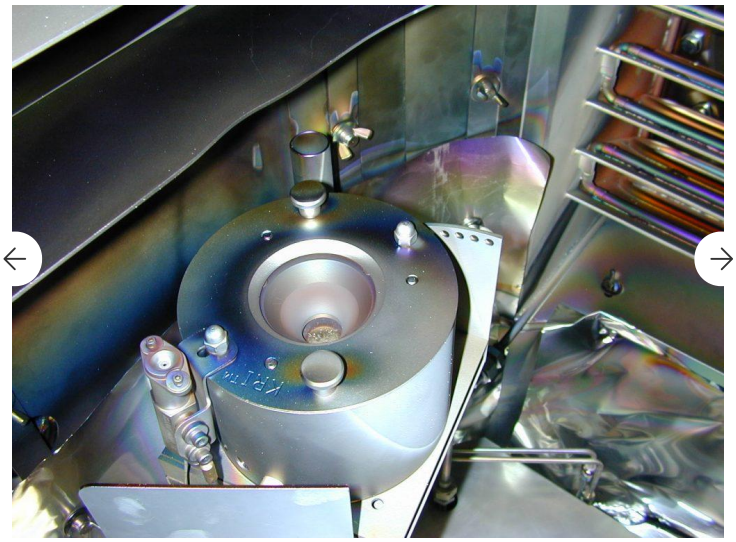
The **ion source used to densify the dielectric films** is Kaufmann & Robinson type, *Inc. KRI ™ EH1000 (End-Hall Ion Source).* It is equipped with a hollow cathode electron source *KRI SHC-1000.* The ion bombardment during the deposition improves the film properties in terms of density, hardness, refractive index, better resistance to the environment and better control of internal stress.

The **ion source can also be used to clean wafers** before the deposition:

The contamination targeted is the water vapor absorbed by surface and the hydrocarbon coming from the environment (Ion dose = ~1 mA.s.cm^{-2} enough to get ride of it). Both can reduce the adhesion of the film on the surface of the sample.
The native oxide can be also targeted but the ion dose has to be much more important.

The efficiency of the ion source depends on the ion flow and the energy of these ions.

More details about the ion source



LAB600H – Ion source (Assembly) 1/2

Heating

Two heaters placed on the door can be used to heat up samples.

2 x ceramic radiants (1,8 kW each)
Deposition temperature max. = **190°C**

LAB600H – Heaters

III. Standard recipes ↕

Only thicknesses (for each layer) can be changed. For recipe creation, please contact responsibles of the tool.

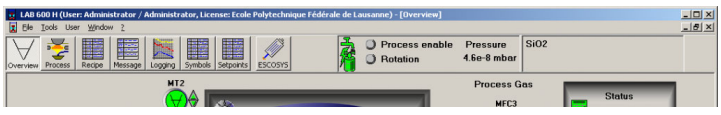
LAB600H Recettes Want to download?

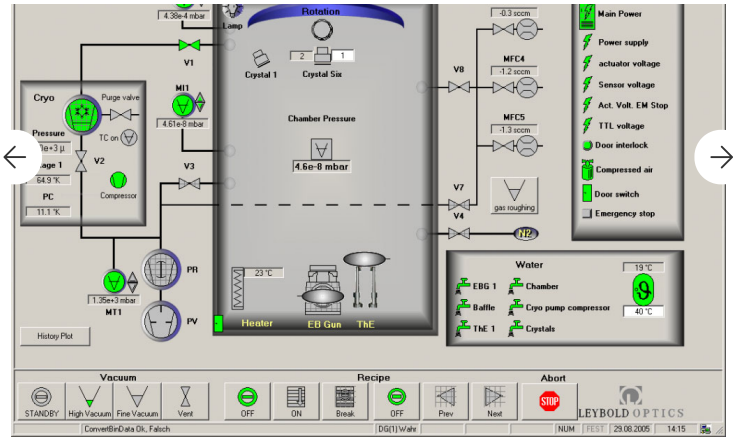
LAB600H Categories Want to download?

Available targets

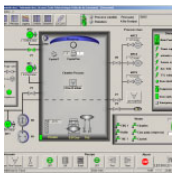
For details concerning precious material billing, see Processing fees page.

IV. How to use the system ↕

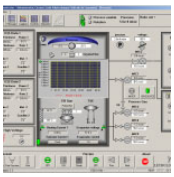




LAB600H – GUI (1) 1/2



LAB600H – GUI (1)



LAB600H – GUI (2)

All the actions to operate the system are detailed in the user manual.

LAB600H User Manual Want to download?

V. Restrictions & Precautions

Allowed substrates are Silicon, Sapphire, Glass (Quartz, Pyrex, Float). For any other substrates please confirm with CMi staff.

For all processes at high temperature, two consecutive slots are required to complete the process properly. Please adjust your reservations accordingly.

To obtain a reproducibility of the refractive index obtained for transparents films, it is necessary to use the heater & the ion source and to work with a clean chamber. Actually, the ion bombardment used to densify films causes the heating up and the sputtering of the surfaces closed to the source. The sputtered elements may contaminate the film during the evaporation.

VI. References

"FerroTec – EV M-8 Operation Manual"

"EH1000 Ion Source Manual HCES version", Kaufmann & Robinson Inc.

In the same section