

# Eucalyptus Model

Double 8" wafer carriers dryer

[www.spm-semiconductor.it](http://www.spm-semiconductor.it)

SPM produces dryer since long time for integration into full automatic wet benches or for standalone applications.

Our dryers follow customer's request and year by year we added features to reach the objective of: reducing timing, N<sub>2</sub> consumption and reduce particle added.

Before creating this new design our technology for process wafer was to adopt an SS316L home-made **inline N<sub>2</sub> heater**. With just the HOT nitrogen flow we are able to dry perfectly 50 wafers into a low profile carrier in about 30 minutes.

The long time for drying wafers and carriers push us to think on a new design to speed up this process (also for reducing N<sub>2</sub> consumption).

Looking at different opportunity at the end we found the solution to add 4 heaters that, like an oven, heat up the tank.

The dryer tank is realized in SS316L in order to permit the perfect distribution of the heat.

To avoid problems of corrosion of the stainless steel, the tank is fully coated with a special PFA layer of 100µm.



Features	Performance (MIN)
Time for drying	<7min



## Front-end DRYER

10 February 2016



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# Double 8" wafer carriers dryer



The PFA coating protect stainless steel from corrosion and also improve the cleanliness of the entire tank.

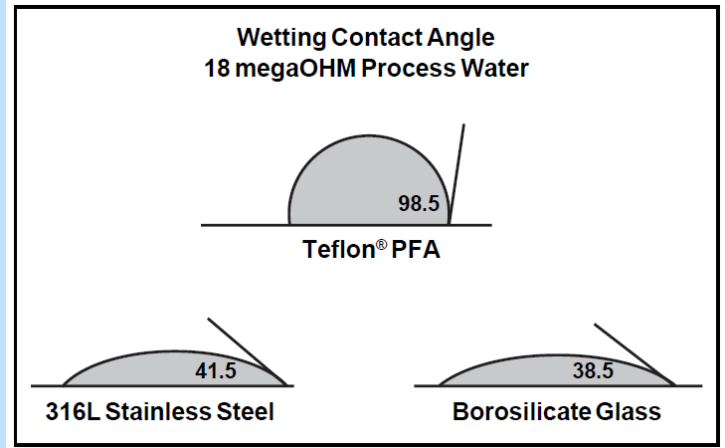
Drops of water can be drained faster while they are sliding into a low friction material like PFA coating.

The layer of coating is very thin in order to not aggravate the heat propagation.

The hydrophobic nature of the surface of PFA coating is further complimented by low friction, stick-slip character for fluid flow in piping systems having such a wetted surface. The benefit of this combination of properties is that we can dry faster and with lower particles added comparing with our previous dryer.

Fully fluorinated fluoropolymers, such as PFA and PTFE are electrochemically, biochemically, enzymatically, and **chemically virtually inert.**

PFA Coating can sustain high temperature service, up to 260 °C.



The data of table in the end of page indicate that PFA coating is more than 156% less wettable than glass, and more than 137% less wettable than electropolished 316L stainless steel.

The picture below suggest that water molecules roll on the surface of PFA much like one would picture solid spheres rolling down a tube (this "rolling" can be readily experienced by observing a drop of water "bead up" on a surface of PFA). The differences in wettability between PFA, glass, and stainless steel reflect the polarity differences between these materials. Stainless steel and glass are very polar materials whereas PFA is a non-polar fluoropolymer. **This virtual lack of polarity in PFA resists the polar water molecule.**

**For more info:** [http://www2.dupont.com/Teflon\\_Industrial/en\\_US/assets/downloads/h88813.pdf](http://www2.dupont.com/Teflon_Industrial/en_US/assets/downloads/h88813.pdf)

**Comparison of 18 megaOhm Process Water Wetting Contact Angle for 316L Stainless Steel, Borosilicate Glass, PFA Fluoropolymer Resin**

	Stainless Steel*	Glass*	Teflon® PFA*
Degrees	41.5	38.5	98.5
Source: Hyde, et. al., ibid.			
*AFM Rms, Nm	41.74	7.42	24.35



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## HEATING

The dryer is controlled by a specific thermo regulator that constantly control the temperature inside the tank.

When no carrier are processing the temperature inside is kept in order to gain time for next process, but N<sub>2</sub> is reduce to save consumption.

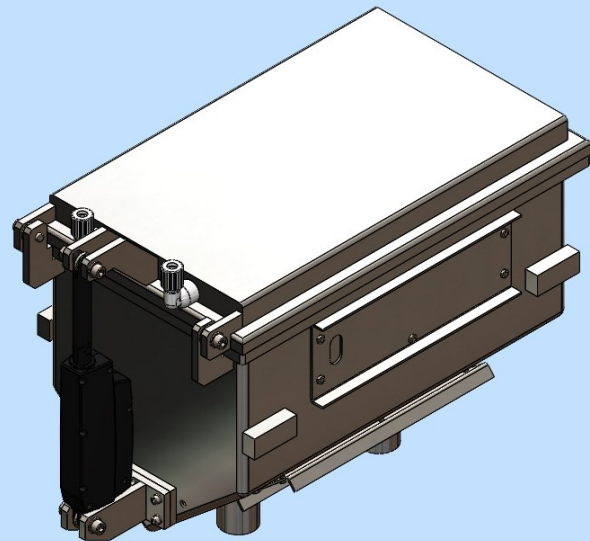
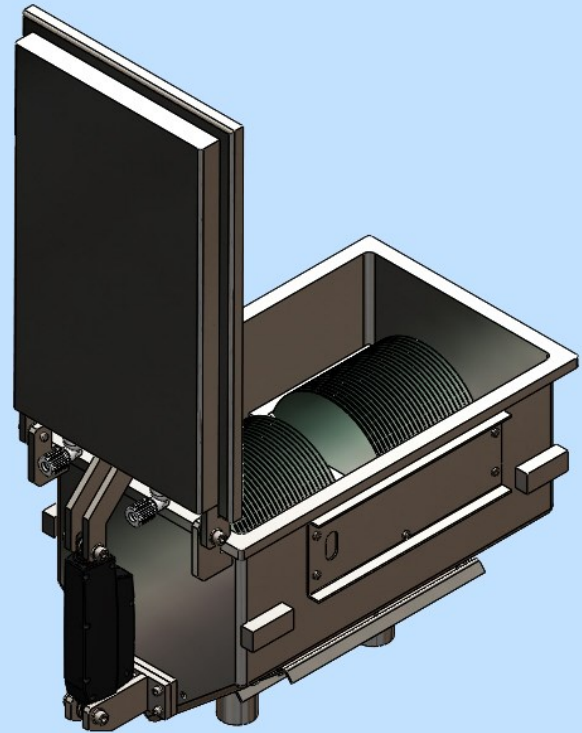
The N<sub>2</sub> pass trough a SS316L coil that is heated up by specific heater.

Before being injected into the tank, the nitrogen pass trough a 0.02 µm filter to remove any possible residual coming from the inline heater.

Finally the HOT N<sub>2</sub> arrive to the tank collector and is spread out thanks to PFA nozzles positioned in strategically position for festering the carrier drying.

All components used for N<sub>2</sub> treatment are fully made in SS316L or PFA material in order to warrant any contamination of the process in term of particles.

Tanks heater can be selected also in **ATEX version** when flammable solvent are present into the wet bench.



## AUTOMATIC COVER

The dryer is designed with an automatic cover that can be electrically or pneumatically controlled (for ATEX rules).



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***For further information don't hesitate to contact us!***



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