

# SLF/LL FLUID BED DRYER



# LABORATORY FLUID BED DRYER

## SLFL/LAB



The SLFL/LAB fluid bed dryer has been designed to be used in laboratories or pilot plants. It is versatile equipment that allows for drying, granulating, and even encapsulating particles of powdered products, whether they are pharmaceutical, chemical, or food products.

### PRINCIPLE OF OPERATION

The air is taken from the room or from an air handling unit, sucked in by a centrifugal fan, and passed through a pre-filter, that ensures its cleanliness. It is then heated by an electrical resistance heater that accelerates the drying process.

An air current is generated inside the dryer body, allowing the product fluidisation. The air passes through a mesh where the product is located, ascends along a hopper and the dryer body, and exits through the product retention filters installed in the dryer body. From there, it passes through an absolute filter and is extracted through the outlet channel.

If the process requires granulation and encapsulation, it is sprayed through diffuser nozzles, while the powder particles are in suspension, mixing and drying. The result is uniform product granules.



SLFL/LAB laboratory fluid bed dryer.



Detail of the Wurster tube installed in the product hopper, in unloading position.

### DESCRIPTION

» **Monobloc cabinet**, with a support base where all the drive and service elements of the equipment are housed, and the front is equipped with touch screen for operating the dryer. Among the services included in the equipment are: the centrifugal extraction fan (with an air flow rate regulated by a frequency converter); the air filter (acts as a pre-filter ensuring that the air enters clean of impurities inside the drying body); and the electrical resistance heater (heats the air before entering the mixing body, accelerating the drying process).

» **Product hopper** where the drying, granulating, and encapsulating takes place. This hopper has a cylindrical-conical design, an elongated inspection sight glass and a telescopic arm that facilitates extraction during loading and unloading processes. A perforated plate is installed at the bottom of the hopper, where the sieve of the material and mesh size required by the product is placed.



with you, step by step



## INDUSTRIAL EQUIPMENT

» **Cylindrical deceleration body**, where less fine particles lose kinetic energy and return to the drying hopper.

» **Cylindrical retention body**, located above the deceleration body. Here, the air is separated from any solid particles. It consists of a metal mesh with an appropriate mesh size for the particle size to be encapsulated or granulated; a concave retention plate that modifies the trajectory of the particles that achieve passing through the deceleration body, and a pneumatically operated mesh cleaning device.

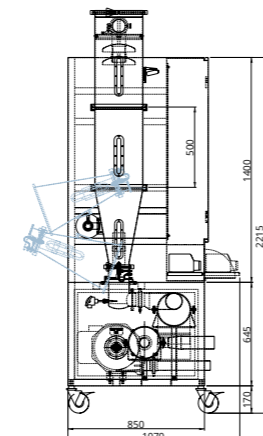
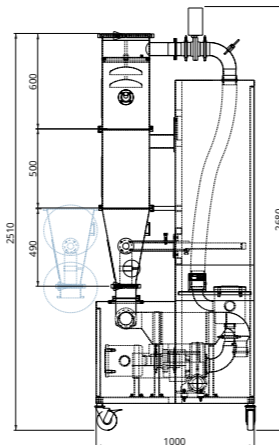
An inflatable seal system is installed in order to ensure the airtightness between the three bodies making up the fluid bed.

» For processes where, in addition to drying, granulation and encapsulation are required, the fluid bed can be supplied with a **spray unit** consisting of: a peristaltic pump, silicone piping, a binary spray gun (top spray), a Wurster tube, and a diffuser nozzle at the bottom (bottom spray).

» In order to avoid over-exposure of the product, the Lleal fluid bed includes **measurement probes** that control temperature, airflow, and humidity, allowing accurately determination of the process endpoint.



Detail of the product hopper. The fluidising product is visible through the sight glass



SLF/LL-100 fluid bed dryer, connected to sintered sheet safety filter.

The industrial fluid bed dryer is the only equipment capable of efficiently solving the drying, granulating, and encapsulating processes of chemical, pharmaceutical, and food products in a single unit.

As a dryer, Lleal's fluid bed dryer allows for obtaining a dry mixture without product aggression, uniform, and in a really short processing time: thanks to the high air flow (with controlled moisture) circulating inside, drying at low temperatures is achieved in times unattainable for traditional vacuum dryers.

### OPERATION

The equipment's mode of operation is simple: an adjustable flow of clean air (with controlled moisture) enters the body from the inlet channel, causing fluidisation. The granulation and encapsulation processes are carried out by feeding with liquid through a nebulizer gun (optional elements). In encapsulation, the coating is fed from the bottom of the body, requiring the installation of a Wurster tube, while for granulation, the binding liquid is introduced from the top. In both cases, when the liquid

addition is finished, the whole working process is completed, since the drying operation is simultaneous to the addition of the additives, hence the fluid bed dryer is able to reduce the processing time.

### INSTALLATION COMPONENTS

» **Air conditioning system**: in charge of air conditioning for filtering, heating, and losing moisture. It consists of two high-capacity filters, one of which acts as a pre-filter and is installed in the room air inlet, a heat exchanger (steam/air), and an optional dehumidifier, depending on the process.

» **Fluidisation column**: is the place where the product is deposited, either manually or through a vacuum feeding system. Here, the product is suspended in the flow of hot air provided by the heating system.

The fluidisation column consists of three modules:

- Air inlet module, connected to a suction fan (optional) and equipped with pneumatic valves for airflow regulation.



Fluidisation column, equipped with Wurster tube

### Technical data

Model	SLFL/LAB
Total vessel capacity (L)	17
Working volume range (L)*	1 - 5
Heating power (kW)	3
Fan power (kW)	1.1
Maximum air flow rate (m <sup>3</sup> /h)	500
Cylinder diameter (mm)	300

\*Production depending on product density, particle size, moisture, etc. These values represent the minimum and maximum.



## Optional accessories

- Drying module of cylindrical-conical design and removable by means of a hand-truck. It features an inspection sight glass and a sampling valve for process verification operations. At the bottom of the drying vessel, the sieve is installed, of material and mesh size to be determined.

- Filtration and fluidisation module, configurable depending on the type of product and whether the equipment operates only as a dryer or also it operates as a granulator or coater. It usually consists of a multi-bag filter with a pneumatic system to prevent clogging, either through a pneumatic cylinder that allows shaking of the bags or by means of a counter-current air injection system.

The fluidisation column has a safety sealing system with inflatable gaskets installed between each module, ensuring a complete hermetic sealing of the body during the working process.



High-flow fluid bed, in special execution, with internal rotating plate, installed in the customer's facility.

» **Extraction system:** in charge of air circulation, provided by a high-pressure centrifugal fan with a soundproof cabinet and regulated by a frequency converter that ensures maximum energy efficiency.

» In order to provide maximum versatility to the fluid bed dryer, it is equipped with a **PLC** with touchscreen that allows control and programming of all process parameters, audible and visual alarms for anomalies at critical points, and variables recording, as needed.



SLF/LL-420 fluid bed dryer with self-cleaning Jet filter to be installed in the technical area with the rest of the services: centrifugal fan and cooler.

**GRANULATION AND ENCAPSULATION SYSTEM:** The fluid bed dryer offers the possibility of granulating or coating solid particles through a spray system. Granulation improves the product's fluidity, distributes the components more homogeneously, controls bulk density, and optimizes solubility. Additionally, the coating process can be useful for masking flavours or protecting ingredients against moisture or oxidation.

For the granulation process, the binding liquid is fed through the top of the fluidisation chamber by means of a spray multi-nozzle spray gun, centred in the fluid bed expander (Top spray). The spray solution is controlled using a flow meter and a multi-head peristaltic pump.

For encapsulation, aqueous or organic polymer solutions are injected from the bottom by installing the *Wurster* tube and a diffuser nozzle (Bottom spray).



Wurster tube detail



Top / Bottom spray



## Technical data

**CONTROL ELEMENTS:** The fluid bed dryer is equipped as standard with temperature sensors and pressure gauges for pressure control. Additionally, humidity sensors (hygrometers) and speed sensors (anemometers) can be incorporated, controlled by the programmable PLC included in the equipment. Thanks to these sensors, it is possible to monitor the behaviour of the product in real-time or doing a or retrospective analysis, if a recorder is also included in the electrical panel.

**CIP (CLEAN IN PLACE):** CIP is an automatic cleaning process that is carried out with the equipment closed. In this case, the equipment is fitted with CIP balls for cleaning the chamber and the bottom. These balls are connected by means of automatically operated valves to an external CIP cleaning unit. The filters, whether bag or cartridge, are not suitable for CIP cleaning, so they must be removed beforehand.



Detail of a CIP ball

**AUTOMATIC LOADING AND UNLOADING SYSTEM:** Vacuum system connected to the drying module, minimizing downtime and contamination risks due to product exposure to the room environment.

**SAMPLING VALVE:** Additional register with product extraction for monitoring and verification.



View of the sampling valve



System for automatic loading and unloading

Model	SLF/LL-40	SLF/LL-100	SLF/LL-220	SLF/LL-420	SLF/LL-1100	SLF/LL-1560
Sealing or pressurisation system	Pneumatic	Pneumatic	Pneumatic	Pneumatic	Hydraulic	Hydraulic
Total vessel capacity (L)	40	100	220	420	1,100	1,560
Working volume range (L)*	10 - 30	25 - 75	55 - 165	105 - 315	275 - 825	390 - 1,170
Fan capacity (m <sup>3</sup> /h)	1,500	3,000	4,500	6,000	10,000	12,000
Fan pressure level (mmc/H <sub>2</sub> O)	1,000	1,000	1,000	1,000	1,100	1,100
Fan power (kW)	7.5	15	22	30	45	55
Fan speed (rpm)	3,550	3,550	3,550	3,550	3,550	3,550
Air treatment unit (UTA)**	To be determined according to product features: using steam or air, with heat or cold.					
Cooling/Heating Capacity (Kcal/h)	31,800	63,500	95,300	127,000	211,700	253,500
Electrical source	Specified by customer					
Heating medium	Saturated steam at 4 bar maximum					
Steam consumption** (kg/h)	58	115	172	230	382	458
Compressed air line	6 bar minimum (continuous)					
Compressed air line consumption (m <sup>3</sup> /h)	55	55	55	160	160	300

\* These values represent the minimum and maximum and are indicative and may vary depending on the product to be manufactured. **For other capacities, please consult with our technical team.**

\*\* These values are approximated and depend on the client's pipe connections and pressure losses.