# Filter sequence in Ecokitchen units


expansion® electronic

BETTER AIR FOR A BETTER QUALITY OF LIFE

# MAIN CERTIFICATIONS OF FEL SYSTEM ELECTROSTATIC FILTER

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# Filter sequence in Ecokitchen system

The filters installed in the Ecokitchen system guarantee a reduction of the particulate and of the odorous components that are emanated in the air during the cooking process.

The problems associated with the odors caused by the fumes of cooking equipment are very common, particularly in urban areas and represent a problem for residents close to such emissions.

In fact there are often commercial establishments such as pubs, restaurants, take aways and craft workshops such as delicatessens, bakeries etc. bordering the houses and often the emission of cooking fumes and odors starts from the early hours of the morning.

The responsible substances mainly include fatty acids, aliphatic and aromatic hydrocarbons, aromatic amines and aldehydes.

The type and amount of pollutants emitted mainly depends on the cooked products, the cooking modes and the fuel used for cooking.

The filtration system must be designed, built and maintained efficient to ensure good performance.

The system lay-out must comply with the system load conditions: for example, a high presence of fumes and odors caused by frying or cooking on the grill requires a higher filtering system compared to other cooking methods.

The factors influencing the control of odors coming from cooking activities include:

1. The size of the kitchen: this influences the intensity of the odor and the necessary ventilation;
2. The type of cooked food: this influences the chemical composition of the environment air;
3. The type of cooking and the equipment used: this influences the quantity of grease, of water drops and the temperature inside the environment;
4. The characteristics of the suction hood;
5. The presence of a fume purification system;
6. smoke evacuation duct;
7. height and structure of the chimney;
8. territorial context of the emission and specifically the proximity to settlements and the location in the old city centers.

# The cooling and treatment systems of fumes and cooking vapors

The technological evolution has allowed the realization of various systems of cooking fumes treatment, in some cases specifically directed to a specific product, in which the emissions are subjected to filtration and abatement of the smells, of the grease and of any unburnt powders.

Such systems are in particular proposed when it is not possible to move away the fumes from the roof due to problems related to the building conformation, to aspects of architectural protection of the building or due to the objective impossibility of obtaining any authorization from other condominiums.

The material is widely and exhaustively treated by the "Operational Guide for the prevention of combustion vapors and fumes in living environments" of the Tuscany Region, 2012 edition.

In the technical document the technical conditions for the realization of this type of system are represented and examined, with all the constraints related to this particular mode of intervention.

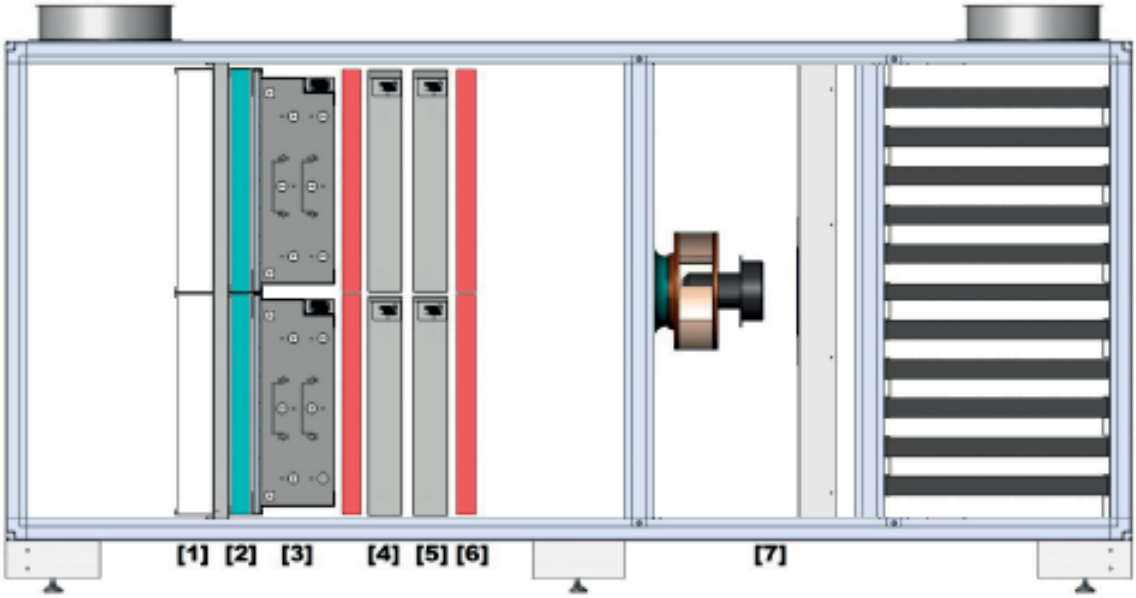
In general, the technical reference for this fume's treatment line is represented by the UNI EN 13779:2008 standard, now replaced by the EN16798-2018 Standard, which allows the direct discharge of fumes to the wall only if the emission deriving from cooking is declassified from EHA4 to EHA2, through filtration and abatement of pollutants.

The Paragraph III.2.2 of the guide contains all the technical information related to the main fume abatement systems.

The transition from EHA4 to EHA2 is possible using the most up-to-date filtration and deodorizing systems on the market today.

The filters installed in Ecokitchen systems produced by Expansion Electronic Srl guarantee a reduction of the particulate and the odorous components that develop in the air during the cooking process.

# Filters installed in Expansion Electronic srl Ecokitchen Units




A first stage, usually placed directly on the hood, is the classic labyrinth filter which, through an inertial action, allows to retain the fumes and the considerable quantities of water and oil vapor emitted during the initial cooking phases.

After this first filtration phase, the particulate and odorous pollutants are conveyed to the abatement system, where a series of filters with progressive efficiency have the purpose of retaining the particulate produced by cooking food [1], [2], [3].

The filters [1] and [2] are mechanical filters made essentially of metal or synthetic fiber matrices crossed by the fluid to be purified that retain the coarser particles by exploiting the interception and collision mechanisms.

The level of filtration of this stage is equal to G4 according to the old classification EN779 or ISO Coarse [90%] for particles larger than 10µm according to the new ISO EN 16890.

The filter [3] is an electrostatic finishing filter of the FEL series produced by Expansion Electronic Srl, which works at 70% of the maximum capacity on this type of systems.

On this filter the air for which the coarse particles have been pre-filtrated enters a set of wires and lamellae with different potential, that ionize the particles and capture them exploiting the attraction force generated by an electric field.

The filtration level certified according to the old EN779 classification is F9 or ePM1[80%] - ePM2,5[90%] according to the new ISO EN 16890.

If the system is equipped with a double electrostatic filtration battery, the filtration level is equal to an absolute filter with E11 classification according to EN1822 with a separation efficiency of 96%.

In this way the heavier pollutants which compromise the subsequent odor treatment steps are removed from the air. In addition, the Expansion Electronic electrostatic filters subjected to the tests of the UL867 standard have passed the tests and achieved the UL certification, a US standard that relates to the safety of equipment and specifically deals with the Safety of Electrostatic Air Filters.

The next stage of filtration of Ecokitchen systems is the treatment of odors [4], [5], [6], [7].

Here, the potential of chemical deodorizing by absorption is exploited by passing the air through an ionization battery [4], which charges the air with negative ions.

Subsequently, the pretreated air passes through an ozonation module [5], which enriches it with Ozone. Thanks to the super oxidants created by this treatment and to the turbulator system [6], the smells are oxidized obtaining a first and a high reduction of the same.

The oxidation process is followed by a battery of activated carbon [7], for the final deodorization and to remove any non-oxidized substances by adsorption.

The active carbons are arranged in a labyrinth to maximize the amount of activated carbon equal to 22g/m3 of treated air, to increase the passage surface area, to limit the speed of crossing in the carbons to obtain a longer stay of the air in the activated carbon and get a higher deodorizing than a normal cartridge system, where are usually employed from 6.5g/m3 to 13g/m3.

The result is that the air of the kitchens treated in this way passes from EHA4 to EHA2 or even EHA1 making it possible to expel it directly to the wall.

Any recirculation in the air environment so treated must consider the regulations in force in the country where the system is installed and the adoption of automatisms on the shutters that control the recirculation.

In this way, in the case of inefficiencies in the treatment system, there is the expulsion of the unfiltered air to the outside, safeguarding the health of the rooms for the operators.

# Exhaust filtration unit

The new filtration unit implemented by Expansion Electronic is designed specifically for the removal of smoke and grease particles from the air stream of commercial kitchen exhaust systems and for the elimination of odour.

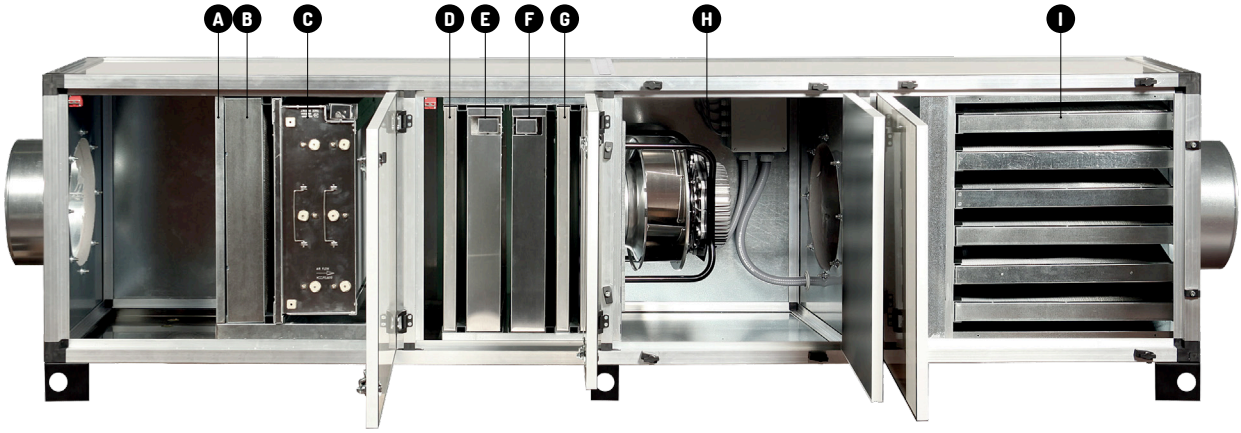
The filters inside the module guarantee a constant efficiency of filtration and, thanks to a high ability of separation and accumulation of oil, allow a remarkable energy saving and low drop pressure.

The module is produced in galvanized iron and painted with epoxy dusts colour RAL 7035.

| MODEL | DIMENSIONS (DxWxH) | N° OF ESP ELECTROSTATIC FILTER | AIRFLOW (speed passage 3 m/s) | EXTERNAL STATIC PRESSURE | FAN |
|---|---|---|---|---|---|
| ECO 0,5 | 545 x 1800 x 810 | 1 FEL 300 | 1300 $m^3/h$ | 500 Pa | DDMP7/7T |
| ECO 1 | 658 x 2550 x 715 | 1 FEL 600 | 2500 $m^3/h$ | 500 Pa | RAD 310 |
| ECO 2 | 1250 x 2550 x 715 | 2 FEL 600 | 5000 $m^3/h$ | 500 Pa | RAD 310 |
| ECO 2,5 | 1650 x 2550 x 715 | 2 FEL 600 + 1 FEL 300 | 6000 $m^3/h$ | 600 Pa | RAD 355 |
| ECO 3B | 1950 x 2550 x 715 | 3 FEL 600 | 7650 $m^3/h$ | 800 Pa | RAD 400 |
| ECO 3H | 658 x 2550 x 1850 | 3 FEL 600 | 7650 $m^3/h$ | 800 Pa | RAD 400 |
| ECO 4 | 1350 x 2650 x 1460 | 4 FEL 600 | 10500 $m^3/h$ | 1000 Pa | RAD 450 |
| ECO 5 | 1650 x 2650 x 1460 | 4 FEL 600 + 2 FEL 300 | 13000 $m^3/h$ | 800 Pa | 2 x RAD 355 |
| ECO 6 | 1950 x 2650 x 1460 | 6 FEL 600 | 15000 $m^3/h$ | 800 Pa | 2 x RAD 400 |
| ECO 9 | 1950 x 2650 x 2000 | 9 FEL 600 | 22500 $m^3/h$ | 1000 Pa | 4 x RAD 400 |

NB: THE DIMENSIONS ARE: **D = Depth • W = Width • H = Height**

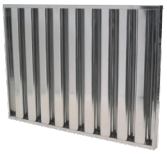
# Filtration Sections




**A** **Metal filter** made with galvanized wire mesh and galvanized frame, filter class EN 779 G2

**F** **Ozonisation filter FX**, with plates. **(optional)**

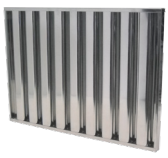
**B** **Sponge filter** of 30 PPI, able to filtrate large quantities of fat and oil. Fast and easy maintenance.



**G** Inox Steel **Turbulator** to increase air, ions and ozone combination. **(optional)**

**C** **Electrostatic precipitator** for oil and fat. FEL SYSTEM model, high efficiency performance with 230V electrical supply.

**H** Electric **fan** with power control.



**D** **Labyrinth filter** that guarantees the blockage of further possible drops of oil. It is placed before and after the ionizing filter FI. (optional)

**I** Granular **activated carbon filter** with galvanized metal frame sheet. Labyrinth disposition.

**E** **Ionization filter** ensures better sterilization and reduction of odours. **(optional)**

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