Standard NFX15-211

➲ WHAT THE STANDARD SAYS

This standard defines precisely the filtration system capacity of a fume hood to retain the harmful molecules evaporated in the enclosure and qualifies the air quality after the filter.

During the « normal operation» phase, standard AFNOR NF X 15 211 imposes a maximum concentration after the filtration system which must not exceed 1% of the TLV of the product handled.

Standard AFNOR NF X 15 211 deals with the performances of a fume hood as a whole: containment, speed, filtration system effectiveness. This standard does not define in any case the properties of a single and isolated filter of a filtration system. Therefore, a single filter cannot comply with standard AFNOR NFX 15 211.

Mandated by AFNOR, the Union de Normalisation Mécanique (UNM), made of a board of experts for ventilation, of government bodies, of professional trade union members, established standard AFNOR NFX 15-211:2009. This standard applies to fume hoods conceived for research and analysis works… for all laboratories handling chemical agents subject to a professional exposure limit value (TLV or OEL). This text imposes some performance criteria connected to:

1 - **The filtration effectiveness**
2 - **The containment effectiveness**
3 - **The air effectiveness on the front**
4 - **The documentation accompanying the fume hoodsn**

CLASS 1	CLASS 2
Fume hoods with safety reserve	Fume hoods without safety reserve
One main filtration level and one safety filtration level	Un niveau de filtration principal

The classes of standard AFNOR NFX 15-211: 2009

DENOMINATION ACCORDING TO NF X 15-211 :2009	
Particle filtration	Type P
Vapour filtration	Type V
Particle and vapour filtration	Type PV

1 - The filtration effectiveness

It indicates the filter capacity to retain the harmful molecules handled in the enclosure and qualifies the recirculated air quality after the filter.

2 - The containment effectiveness

It defines the fume hood capacity to retain the vapours or the particles in the enclosure without dispersing them into the laboratory atmosphere.

3 - The air effectiveness on the front

It indicates the fume hood capacity to create a dynamic barrier between the operator and what he handles.

For fume hoods with fixed front, the front air speed at any point along the opening must be between 0.4 and 0.6 m/s. Furthermore, they must be equipped with a continuous monitoring device of ventilation.

4 - The documentation accompanying the fume hoods

The fume hoods must be accompanied by a booklet including an exhaustive list of the chemical agents that according to the manufacturer's certification can be handled in the fume hood in compliance with the conditions described in standard NFX 15-211:2009

	CLASS 1	CLASS 2
Normal operating phase	Normal operating phase during which the concentration after the filter must be lower than 1% of TLV	
Detection phase	Detection phase during which the concentration after the filters must be lower than 1% of TLV and during which the automatic detector of saturation must warn the user	Detection phase during which the concentration after the filters must be lower than 50% of TLV
Safety phase	Safety phase during which the concentration after the filters must be lower than 50% of TLV and whose duration must not be lower than 1/12 of the duration of the normal operating phase	

Special prescriptions for enclosures of class 1

The enclosures of class 1 must be conceived for handling products whose OEL is higher or equal to 1 ppm.

The enclosures of class 1 must include a continuous measuring system of concentration, after the filter, associated to an alarm.

Special prescriptions for enclosures of class 2

The enclosures of class 2 must be conceived for handling products whose OEL is higher or equal to 10 ppm.

The enclosures of class 2 must include:

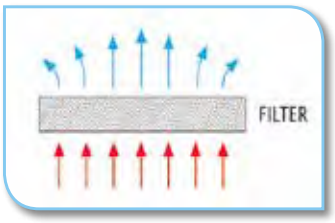
- Either an (audible or visual) alarm triggered by an hour meter every 60 working hours
- Or a continuous measuring system of the concentration after the filter connected to an alarm

The product mass that can be inserted into the enclosure must not exceed 1/8 of the retention capacity of the filter during normal operation.

➲ OPERATING PRINCIPLE OF A FUME HOOD

➔ OPERATION OF AN ACTIVATED CHARCOAL FUME HOOD

The harmful vapours are contained in the working volume, sucked by the ventilation unit and purified through their passage in the activated charcoal filter before being rejected into the atmosphere. You will find below the important parameters to consider for the good operation of the activated charcoal filter:



➔ CONCENTRATION

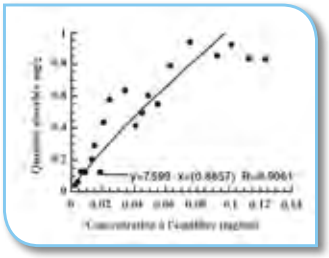
The higher the concentration of the handled products, the higher the quantity of coal that will be necessary.

➔ TEMPERATURE

The lower the temperature, the better the absorption capacity.

➔ PRESSURE

The higher the pressure, the better the absorption capacity.



➔ HUMIDITY

The lower the humidity, the better the absorption capacity.

➔ AIR FLOW SPEED

through the activated charcoal filter (0.2 m/s).

While the first 4 parameters are generally constant in a laboratory, the air speed is given by the suction system.

We conceived an electronic measuring system, allowing checking this fundamental parameter in order to optimize the absorption of chemical substances through the «coal bed». An anemometer sensor controls the speed of the air passage through the activated charcoal filter (about 0.2 m/s). It sends this information to the microprocessor validating the value if it is correct via a green light-emitting diode (LED) on the control panel. In case of a speed lower than 0.2 m/s, a red light-emitting diode LED flashes slowly.
If the speed is much higher than 0.2 m/s, the same red diode LED will flash more quickly. In these two cases, it will be possible to intervene manually to restore the good speed by means of the electronic regulator. In this way the inlet air flow speed on the front will be between 0.4 and 0.6 m/s.
These are the results obtained starting from the fume HOOD CHEMIHOOD PLUS:

➔ Results of the test with carbon tetrachloride (CCl_4)

OPERATION	NORMAL	DETECTION	SAFETY	OCCURRENCE
Average air temperature (°C)	21,0	20,3	20,5	19,8
Average relative humidity (%)	55	54	59	52
Sampling flow (L/min)	0,8	0,8	0,8	0,8
Sampling time (min)	480	480	480	480
Treated air volume (m^3)	0,382	0,381	0,383	0,384
Mass of CCL_4 absorbed (g)	2542	113	175	165
Concentration of CCl_4 rejected (ppm)	0	0	0	0
Volume discharged (ml)	/	/	/	180
% OEL	0	0	0	0
% TLV	0	0	0	0

➔ Results of the test with hydrochloric acid (HCl)

OPERATION	NORMAL	DETECTION	SAFETY	OCCURRENCE
Average air temperature (°C)	20,6	21,1	20,8	20,9
Average relative humidity (%)	54	53	54	52
Sampling flow (L/min)	0,8	0,8	0,8	0,8
Sampling time (min)	480	480	480	480
Treated air volume (m^3)	0,382	0,383	0,382	0,382
Mass of CCL_4 absorbed (g)	1588	776	134	287
Concentration of CCl_4 rejected (ppm)	0	0	0,04	3,93
Volume discharged (ml)	/	/	/	100
% OEL	/	/	/	/
% TLV	0	0	0,8	78,6

➲ OPERATING PRINCIPLE OF A FILTERING CABINET

The harmful vapours contained in the storage cabinet are sucked by the ventilation box and purified when they pass through the activated charcoal filter before being rejected into the atmosphere. The vapour filtration occurs in a specific manner by choosing a suitable activated charcoal filter.

All toxic vapours emitted by the storage of chemicals are eliminated by ensuring a purified air inside the laboratory.

This system, which is easier and cheaper to implement, allows the cabinet ventilation without any external connection and without air compensation problems in the room. The ventilated cabinet can be installed everywhere in your laboratory and near workstations.