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# Crystall Electrostatic Filters

## Installation and Maintenance Manual For Filter Use in Air Handling units

## Table of Contents:



## Intended use and overview

The electrostatic filters consist of 2 main elements:

- A filter module
- Power and control electronic equipment

**Filter module:** Consists of 2 sections; the first formed by insulating elements and electrodes that form a selfsupporting ionizing frame inside which there are the various Busbar sections (max 8), which are made of aluminium sheets that collect the captured particles and are therefore easily removed for routine cleaning.

**Electronic equipment:** Consists of a card that dispenses high voltage (Kvolt) with super low current (mA). The high voltage signal is supplied with a constant value to the ionizing frame. The electric safety of the entire electronic power board assembly is compliant with applicable regulations concerning LVD.

The electrostatic filter modules can be used to filter the air in order to reduce the concentration of particles (PM) contained in it.

They can be used:

- Inside air handling units in both flow and return with respect to the fan.
- Inserted in ducted air distribution systems.

## Regulations and certifications

Crystall electrostatic filters are compliant with the following regulations:

- UNI 11254:2007
- EN 60335-1 (2002) +A1+A1/ EC+A2+A11+A12+A13 – safety of household and similar electrical appliances- general rules
- EN 60335-2-40 (2005-6) +A1 – c.s – part 2 – particular requirements for electrical heat pumps, air conditioners and dehumidifiers
- EN 55014-1 (2006) limits and methods of measurement of radio disturbance characteristics
- EN 62233 (2008-04) +A1- measurement methods for electromagnetic fields with reference to human exposure
- EN 61000-3-2 (2006) electromagnetic compatibility (EMC)- part 3: limits- section 2: limits for harmonic current emissions
- EN 61000-3-3 (1995) +A1 + A2- electromagnetic compatibility (EMC)- part 3: limits - section 3: limitation of voltage fluctuations
- EN 55014-2 (1997) +A1- immunity requirements for household appliances, electric tools and similar apparatus

## Operating limits

Crystall electrostatic filters are to be used with air in the following conditions:

- Temperature below +70°C
- Relative humidity between 15% and 98% (refer to the note)
- Polluting particles with a grain size between 0.01 and 50 micron

**Note:**
The electrostatic filters must never be placed near humidifying and dehumidifying systems and the drawn air must never be saturated.

THEY CANNOT BE USED:

- In explosive atmospheres
- In atmospheres that are corrosive for aluminium

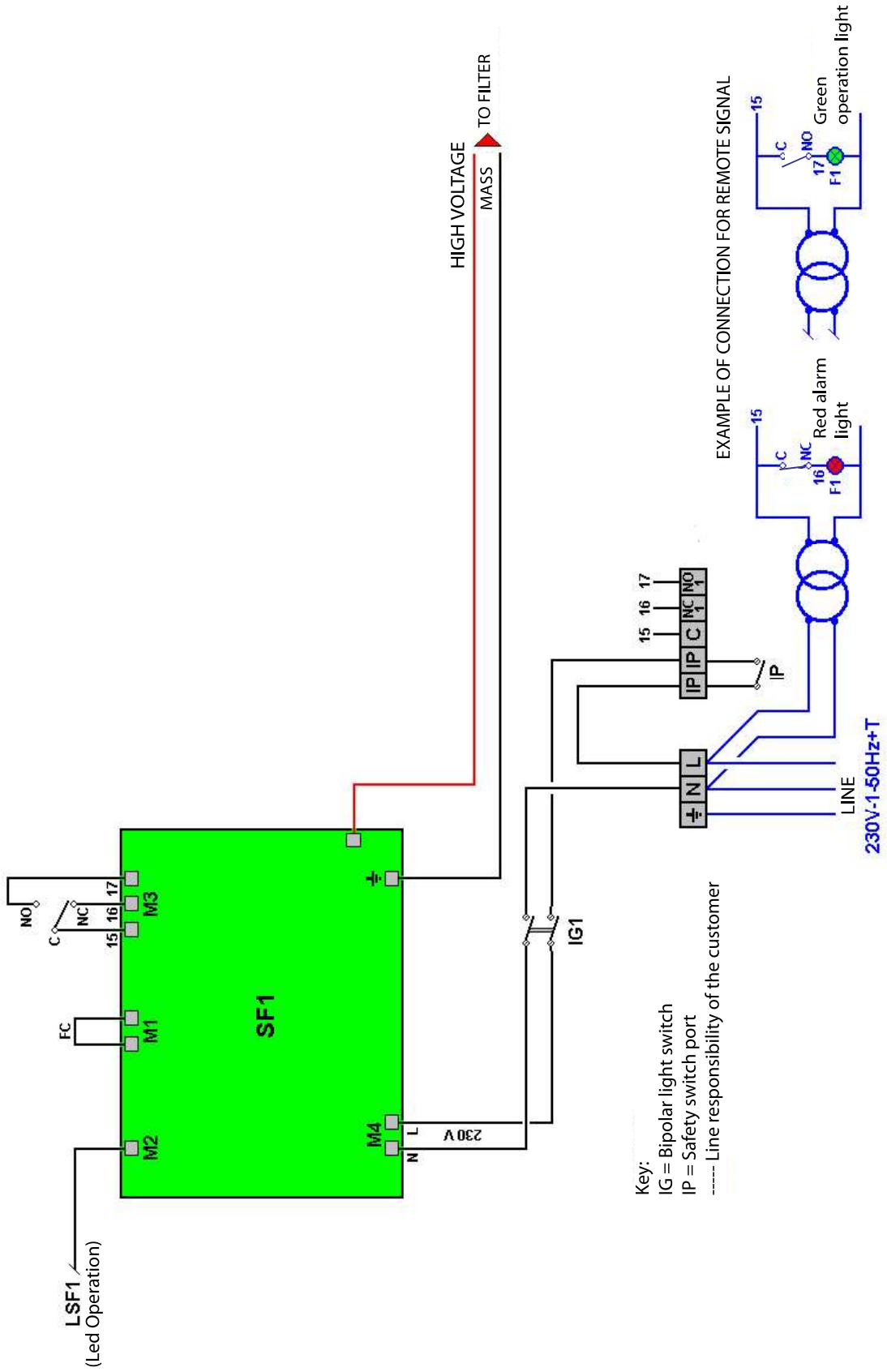
**IT IS FORBIDDEN**
To allow the electrostatic filters to be handled by the following persons:

- With reduced physical, sensory and mental abilities.
- No experience or specific knowledge in the field of electrical and electronic equipment.

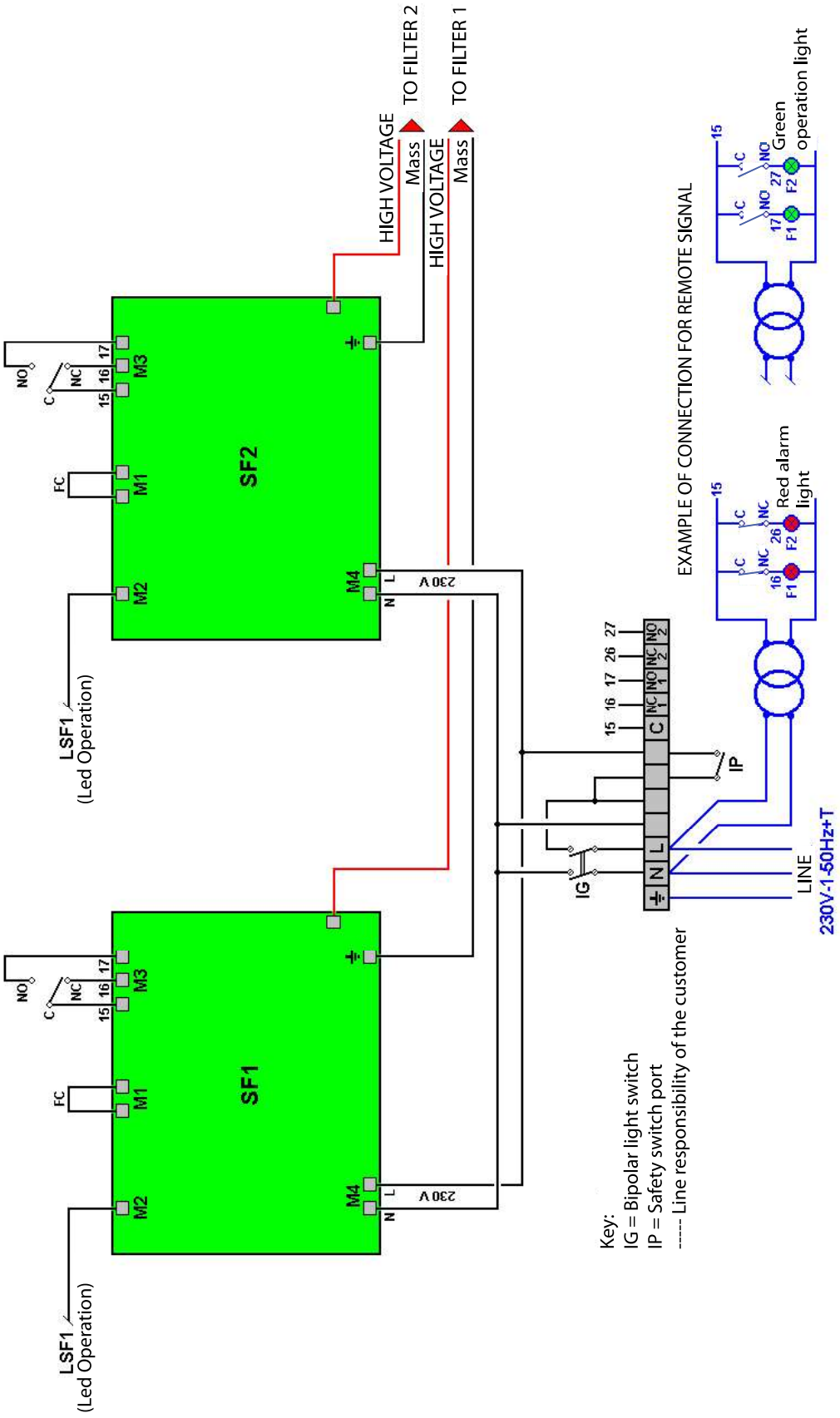
**IT IS MANDATORY**
For the persons in charge of handling the electrostatic filters to be:

- Of suitable age to be working.
- Guided by an expert manager unless they have specific experience.
- Informed and equipped with this manual that contains the assembly and maintenance instructions.

## Basic Wiring Diagram to Install a Single Filter Module



## Basic Wiring Diagram to Install Multiple Filter Modules



## Models and Dimensions

Crystall electrostatic filters designed for air handling units consist of a standard modular element with nominal dimensions of 150 x 600 x 100mm.

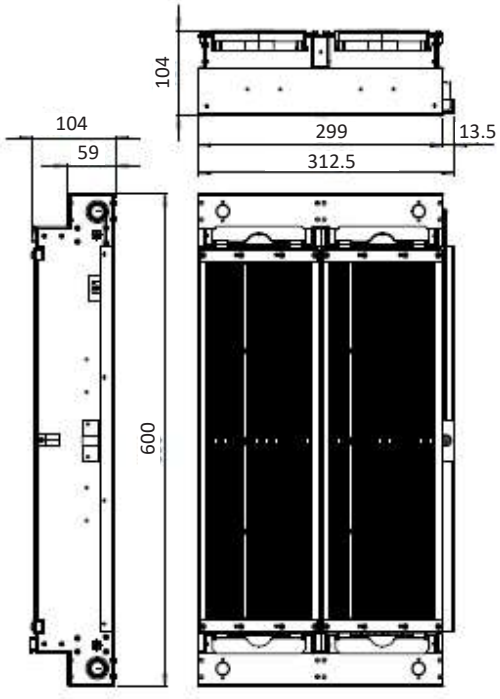
The ease with which the handles are removed and its small size enables easy maintenance operations, which involve simple washing.

## Standard Modular Element

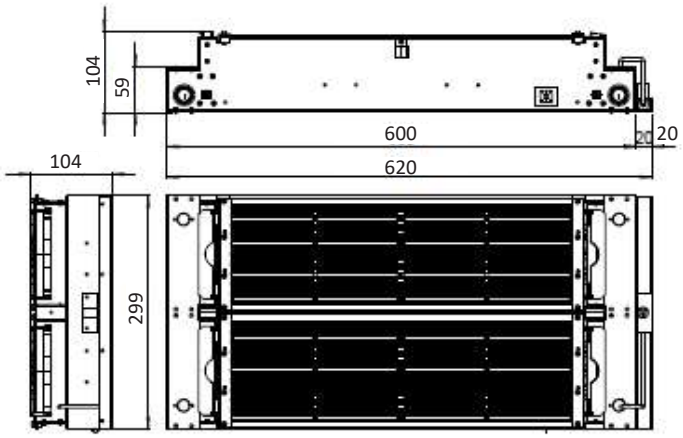
The modular element is to be assembled in 4 different frames for the filter modules to be formed with the following dimensions:

### Filter module model 300

- Nominal dimensions 300 x 600 x 104 mm
- Consisting of 2 standard modular elements
- Weight approx. 10 kg



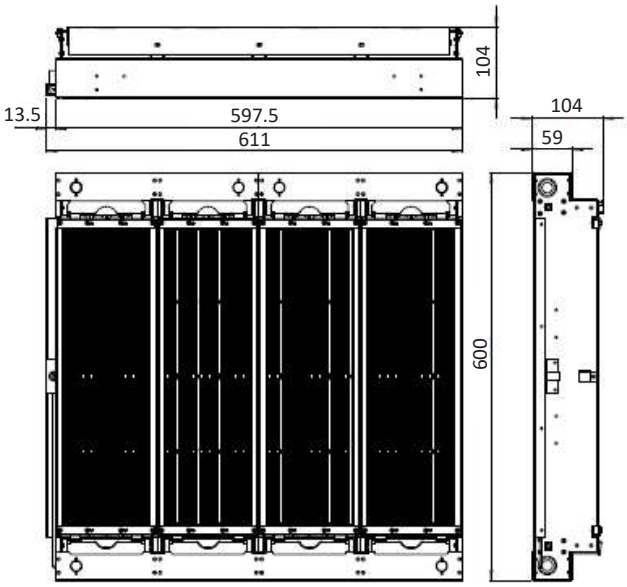

**Vertical model (standard)**




**Horizontal model**

### Filter module model 600

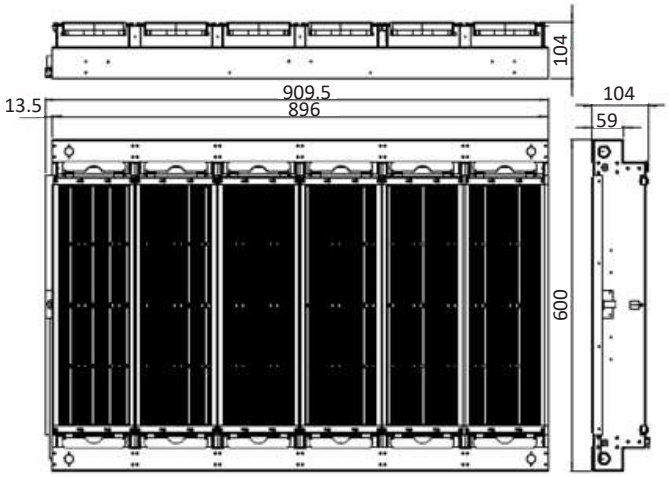
- Nominal dimensions 600 x 600 x 104 mm
- Consisting of 4 standard modular elements
- Weight approx. 20 kg




**Vertical model (standard)**

## Filter module model 900

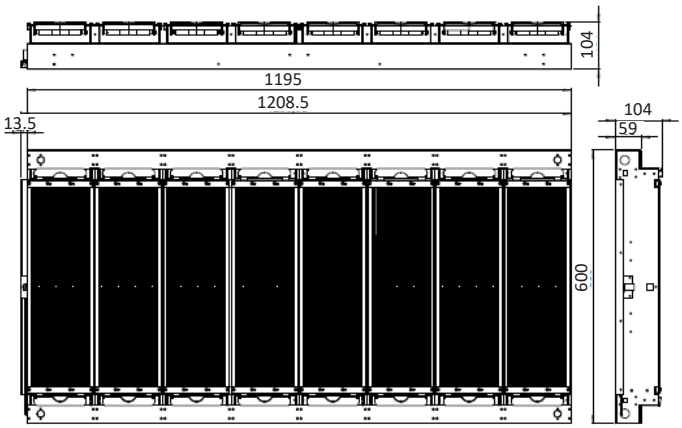
- Nominal dimensions 900 x 600 x 104 mm
- Consisting of 6 standard modular elements
- Weight approx. 30 kg



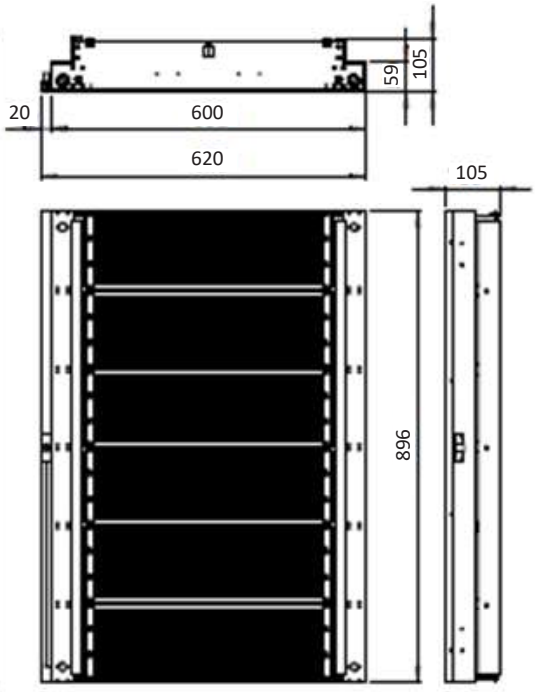

**Vertical model (standard)**

## Filter module model 1200

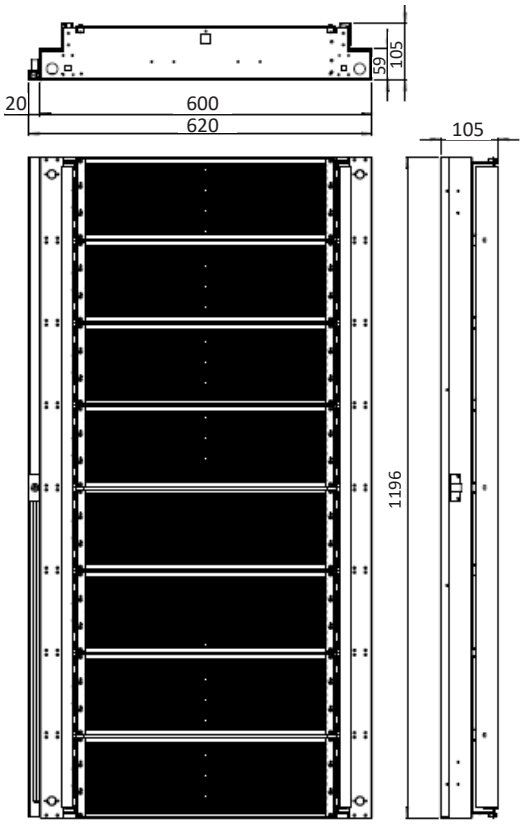
- Nominal dimensions 1200 x 600 x 104 mm
- Consisting of 8 standard modular elements
- Weight approx. 40 kg




**Vertical model (standard)**




**Horizontal model**

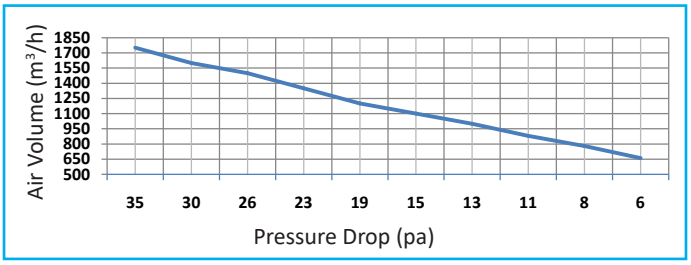


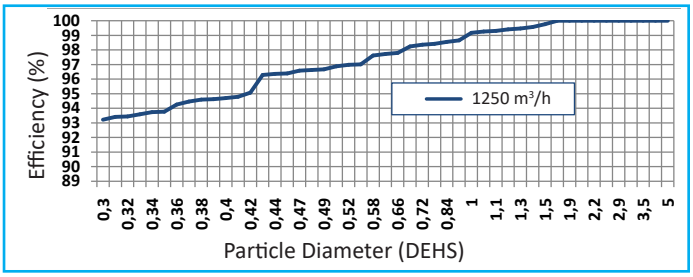

**Horizontal model**

## Nominal Performance

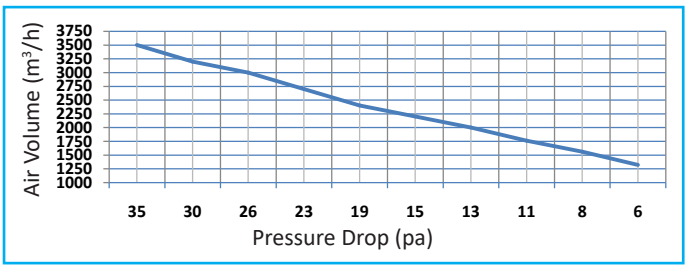
For each of the above 4 filter modules, hereunder is the graph concerning the pressure drop (clean filter) with the various air flow rates, and the graph concerning the efficiency detected with particles of different diameter at a reference nominal air flow rate corresponding to a crossing speed of 2m/s.

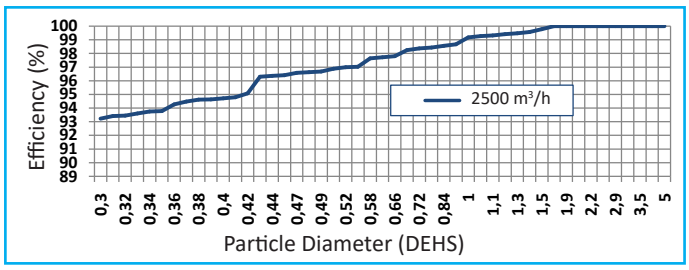
### Model 300



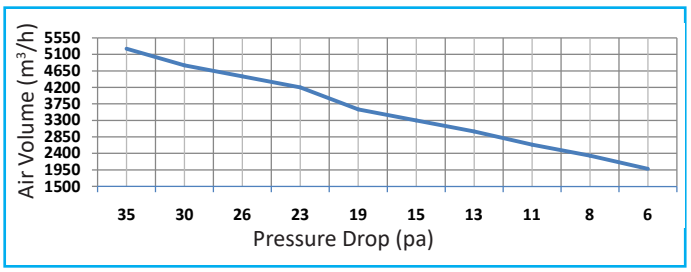



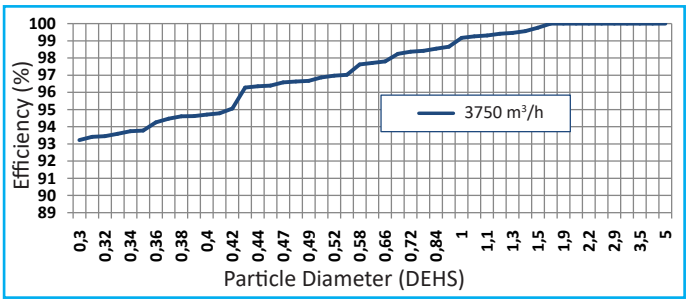

### Model 600



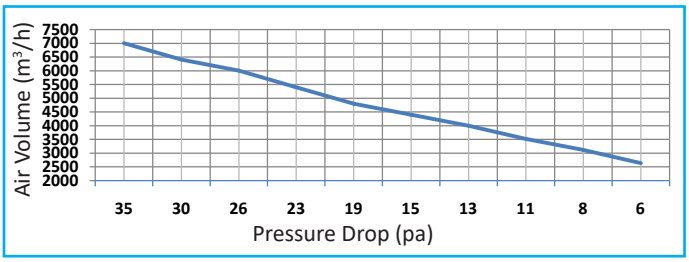



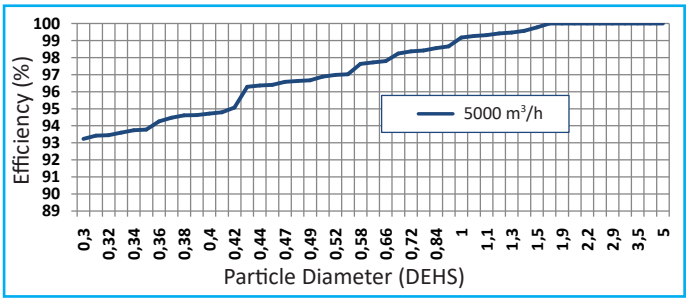

### Model 900




### Model 1200




## Filter Sections

The electrostatic filter sections in air handling units consist of the following:

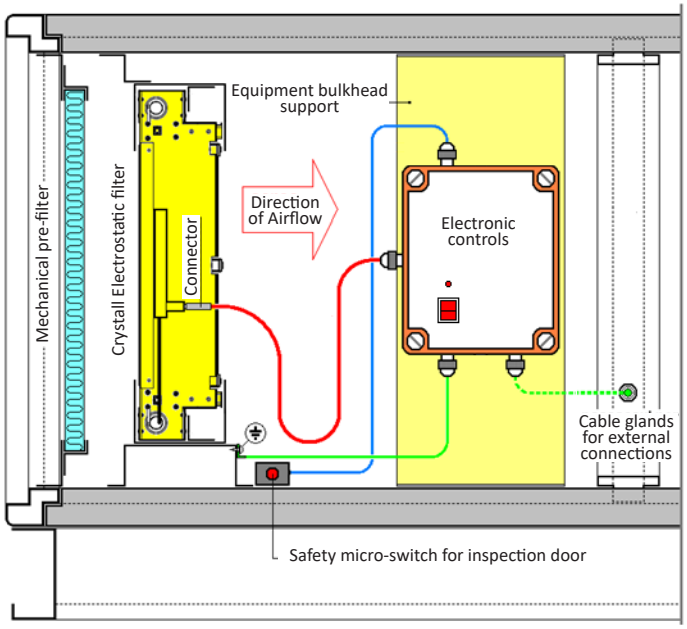



Fig.1 Filter section with single, side withdrawn filter module

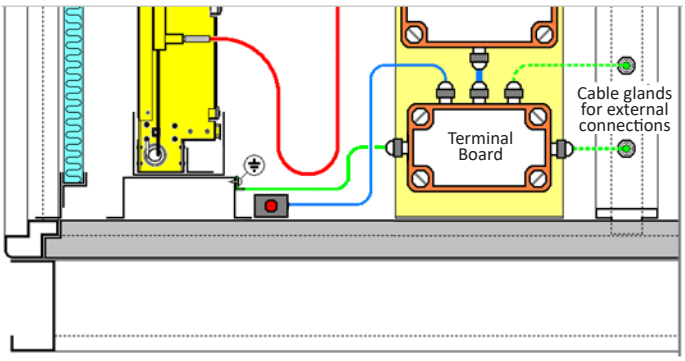



Fig.2 Filter section with two or more, side withdrawn filter modules

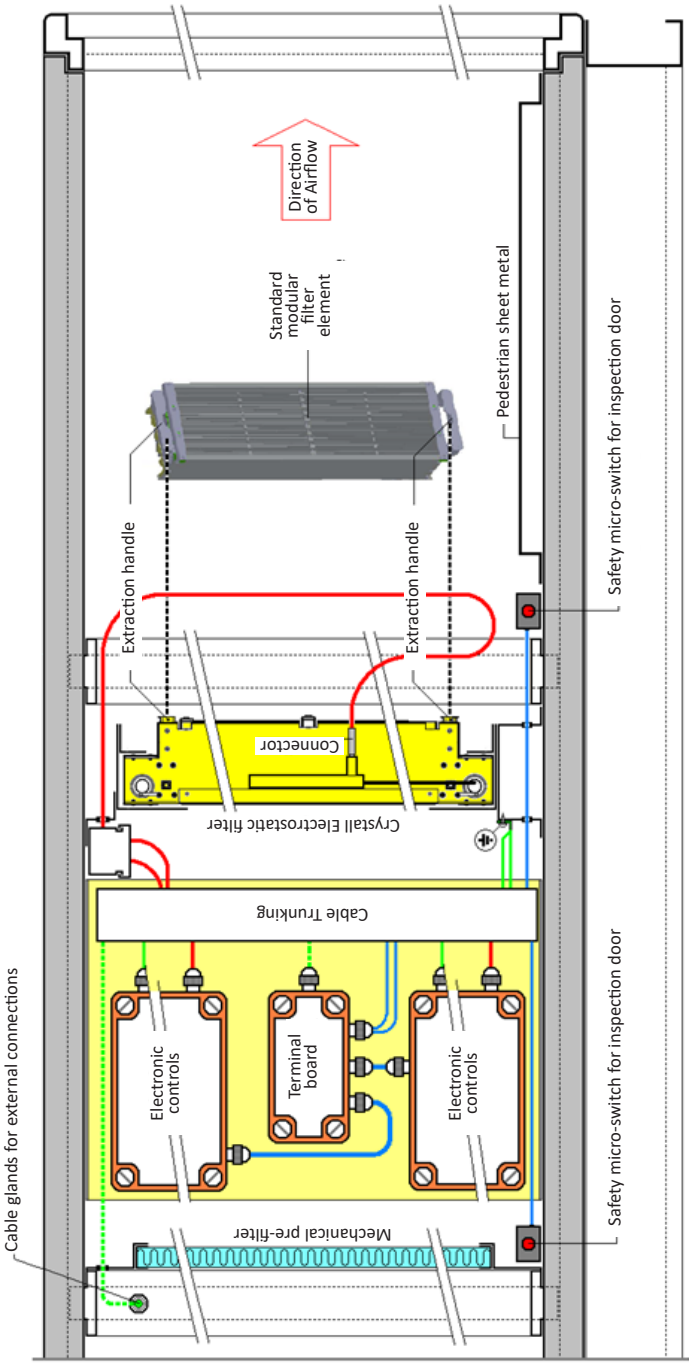



Fig.3 Filter section with internally withdrawn filter modules

## Filter location

Below are a few diagrams showing positions of the filter sections, compliant with the requirements stipulated in UNI EN 13779- Appendix A- section A3.

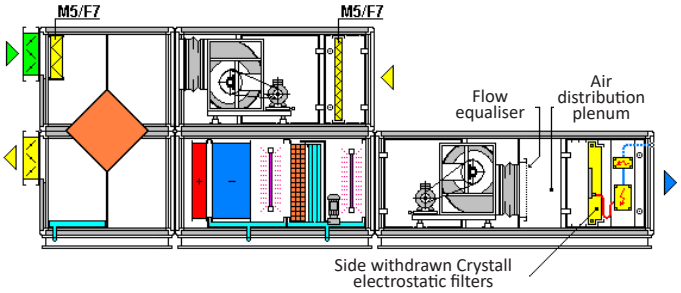



Fig.4 Unit fitted with heat recovery unit, UV-C lamps, centrifugal fans & electrostatic filtration as the last stage

Fig.4 Highlights the use of a flow equalizer at the fan opening as well as an air distribution plenum, which are required as a centrifugal fan is used. However this can be avoided if a plug-fan unit is used resulting in a reduction in length (fig.5).

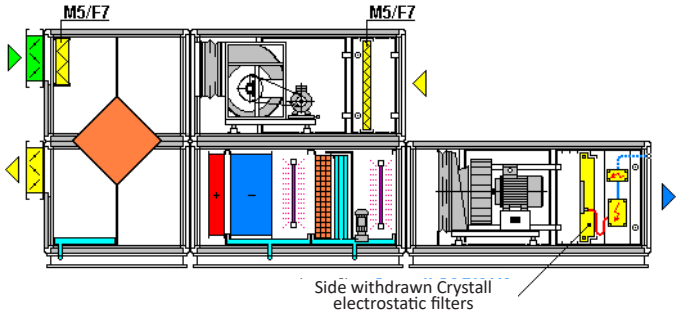



Fig.5 As Fig.4 but with plug fan

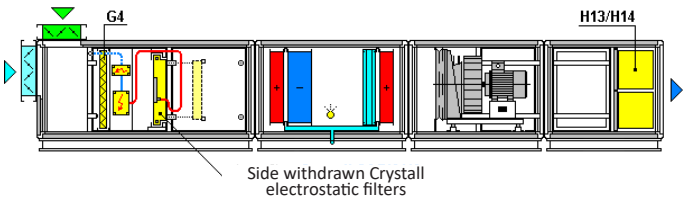



Fig.6 Inline unit with mixing chamber, pre-filters and electrostatic filters before the plug-fan and absolute filters prior to the outlet.

## Filter Maintenance
## Dis-assembly

Once acces to the filter compartment has been achieved:

Diconnect power supply by locating the power switch on the electronic control box to 'OFF'. Remember the number of control boxes is the same as the number of rows of electrostatic filter modules installed.

Electrostatic filter and pre-filter. Remove the pre-filters from their own mounting racks, then the electrostatic filter modules.

Side removal of the electrostatic filter module: Remove the safety screw to prevent the module from moving during transport (Fig.A), release the power connector (Fig.B) and remove the module (Fig.C).

Fig. A

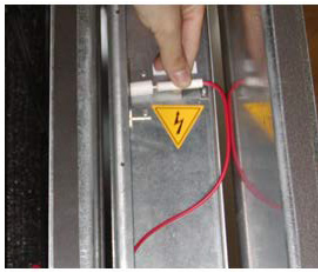


Fig. B

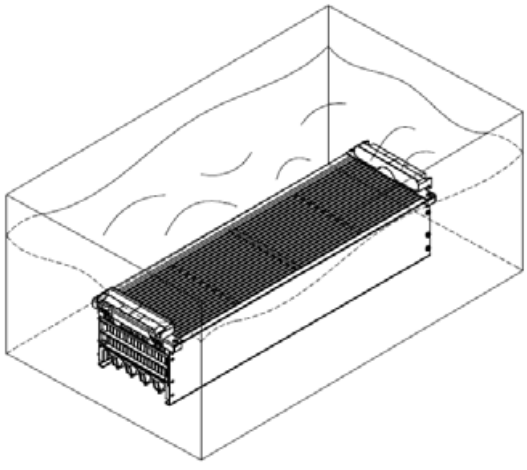
Fig.C

Removing the filter sections from the module: To remove the standard filter sections that form part of the filter module, use the relevant handles for front removal.

## Cleaning

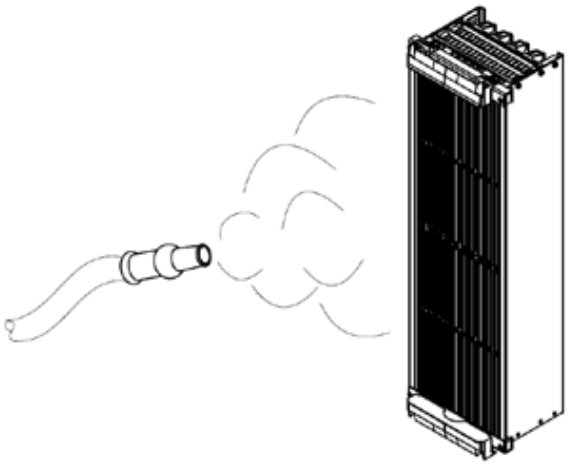
Immersion cleaning: Place the filter section in an adequately sized bowl with cold or warm water mixed with mild detergent (so as not to oxidise the aluminium). Allow the section to soak for the dirt to dissolve or detach and then rinse it.

The section can only be reinserted in the module is perfectly dry.



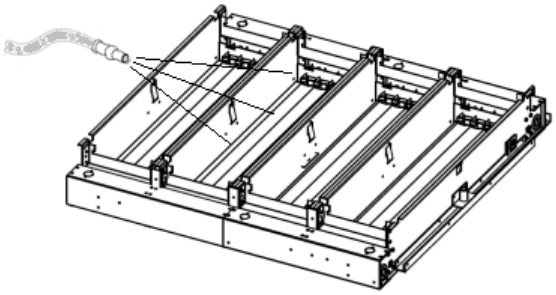
Steam cleaning (max 100 °C): Place the filter section upright and clean it with a steam jet.

After cleaning, let it drip and dry thoroughly before inserting it once again in the module.



Cleaning the section holder frame that forms the filter module: Clean the frame using a jet of compressed air at low pressure, being very careful not to damage the tungsten wire electrodes.

If dirt residue is noted on the wire electrodes, use a cloth dampened with alcohol-based detergent to gently wipe the wire without bending excessively.



## Re-assembly

Inserting the filter sections into the module. The task is made easier by inserting the frame of the module into the slide in which the initial filter section was previously inserted (fig.D). Then insert the other sections in sequence (fig.E), always verifying that the respective handles are closed correctly (fig.F).

This way, the entire module does not have to be moved, which would be too heavy.

Fig. D

Fig.E

Fig.F

Positioning the filter module: Push the module completely into its slide (fig.G) and then insert the power supply connector (fig.H).
The weight of the module itself facilitates inserting the safety screw on the slide (refer to point 4 of the disassembly chapter).

Fig.G

Fig.H

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Klingenburg UK Ltd,
Unit 8, The Glenmore Centre, Shearway Business Park,
Pent Road, Folkestone, CT19 4RJ
Tel: +44 (0)1303 275598
www.klingenburg.co.uk  info@klingenburg.co.uk