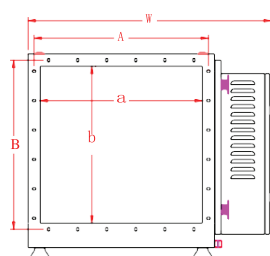


EvEsp



Commercial kitchen electrostatic precipitator. Working principle.

1. Electrostatic cells all made by stainless steel.
2. The bilateral fixed charging cathode rods can avoid electric discharge effectively.
3. Adjustable epoxy high voltage power regulates current intensity based on the fume concentration
4. Adopted freezer-type sealing technology which avoid fume and oil leakage
5. Safe control system prevent the circuit from electric discharge, short, arc extinction and high temperature.
6. Automatic startup by air pressure
7. Safety power cut off protection device
8. Simple installation and operation.
9. Low noise levels.
10. Customised to meet specific requirement
11. Durable construction for low maintenance and long service life.
12. Certificate: CE and ISO 9001



Technical characteristics

| Model | Airflow (m3/h) | Size (mm) (L*W*H) | Flange Hole Size (mm) (A*B) | Vent Size (mm) (a*b) | Weight (kg) | Rated Power (W) |
|---------------|-------------------|----------------------|--------------------------------|-------------------------|----------------|--------------------|
| EvEsp - 3000 | 3000 | 780*885*865 | 600*720 | 550*670 | 105 | 680 |
| EvEsp - 4000 | 4000 | 780*1005*865 | 720*720 | 670*670 | 115 | 770 |
| EvEsp - 6000 | 6000 | 780*1515*865 | 1230*695 | 1180*645 | 160 | 850 |
| EvEsp - 8000 | 8000 | 780*1515*985 | 1230*815 | 1180*765 | 180 | 940 |
| EvEsp - 10000 | 10000 | 780*1725*985 | 1440*815 | 1390*765 | 195 | 1000 |
| EvEsp- 12000 | 12000 | 780*1515*1550 | 1230*1380 | 1180*1330 | 300 | 1280 |
| EvEsp- 14000 | 14000 | 780*1635*1550 | 1350*1380 | 1300*1330 | 320 | 1420 |

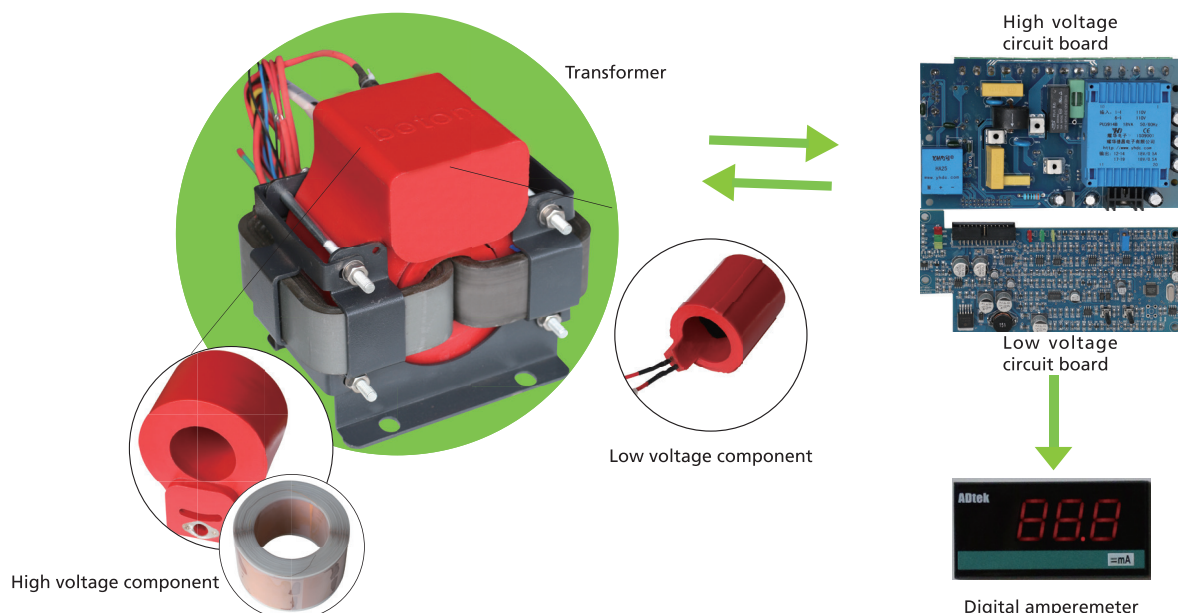
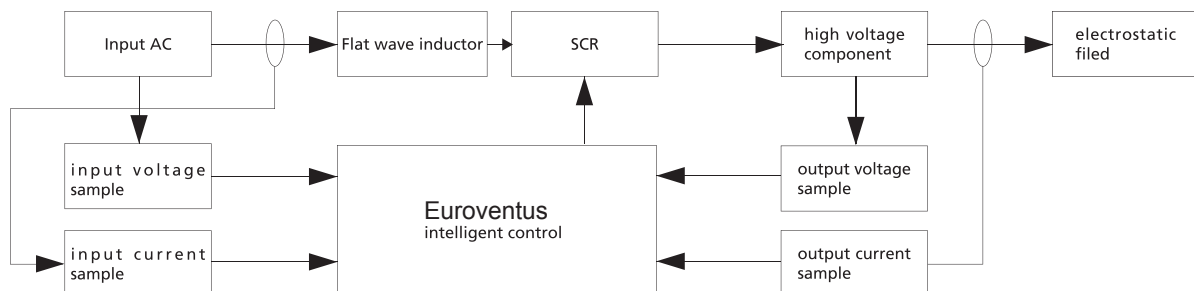
Intelligent High Voltage Power System

Background

Generally, hardware circuit is used for the normal power supply design, but its shortcoming is obvious. Firstly, it's weak at the flexibility. Secondly, it needs a potentiometer to adjust the deviation caused by temperature, component dispersion and inaccuracy. However, it enhances difficulty in production and after-sale service if the electrical protection relies on manual adjustment. What's worse, the selection of connection terminals causes inconvenience in protection and maintenance which reduce product's reliability and poses a burden on compatibility and follow-up research and upgrade. But intelligent high voltage power supply overcomes all the weaknesses mentioned above, so we research and apply it on our kitchen ESP.

Principles

Based on 32 bit AMR controller, we use accurate hall current sensor to take samples from output high voltage current. Adopting industrial electric control system algorithm to control input AC via flat wave inductor, SCR, high voltage component and then electrostatic filed will make output voltage current become constant set value.



Technical Advantages

7 Advantages

Check and trace the operation status

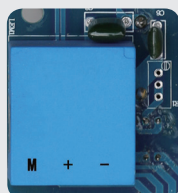
Normal power supply doesn't have record on the working status. Intelligent power source adopts EEPROM to record the operation status.



EEPROM

High voltage output open circuit control

Intelligent power supply takes sample from output high voltage current by accurate hall current sensor, and adopts industrial algorithm to trace the operation status. And it can set up the automatic protective point by itself. Then taking samples from cell short-circuit by using accurate voltage transformer. Thus it will take action for protection after calculating the cell short-circuit situation.



Hall Current Sensor

High voltage power supply digital amperemeter display

Intelligent power supply can accurately take sample from high voltage current and analyze the data and then directly display on the digital amperemeter.



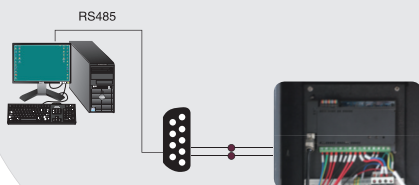
Digital Amperemeter

Cell short-circuit control

Power supply overload control

Power status control

Intelligent power supply utilize RS485 bus to transmit with computer backstage software. In this way, start and stop the power can be controlled by computer.



PCB anti-interference

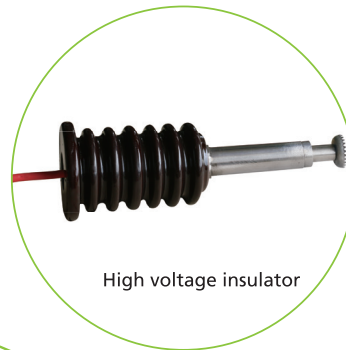
Normal power supply's high voltage line and low voltage line are put in an integrated circuit board. But we separate them into two circuit boards so that they can't interfere with each other.



High voltage circuit board

Low voltage circuit board

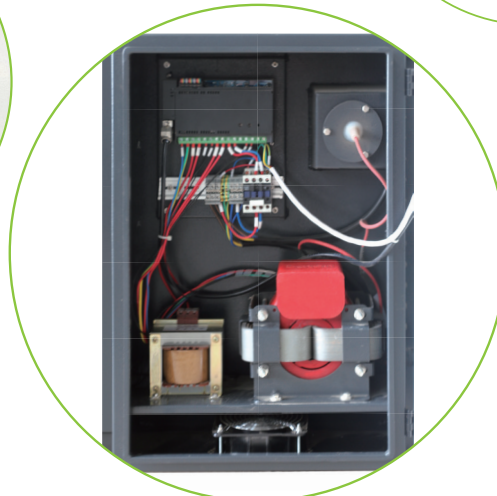
Wisdom Creaters Technology Just for Your Easy Using



High voltage insulator



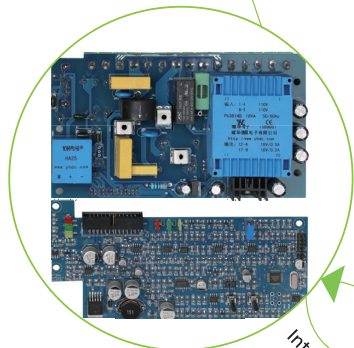
Digital display panel



Electrical panel

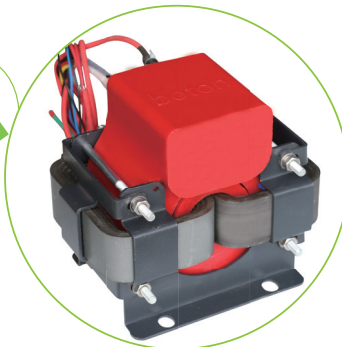


Input the high voltage to the electrostatic filtering cell by the high voltage insulator manufactured by Euroventus.

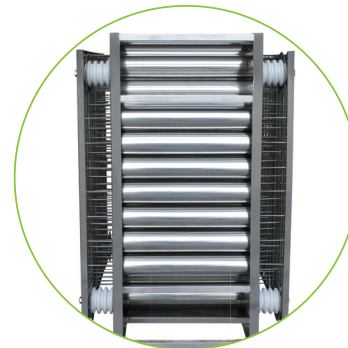


Circuit board

Intelligent control

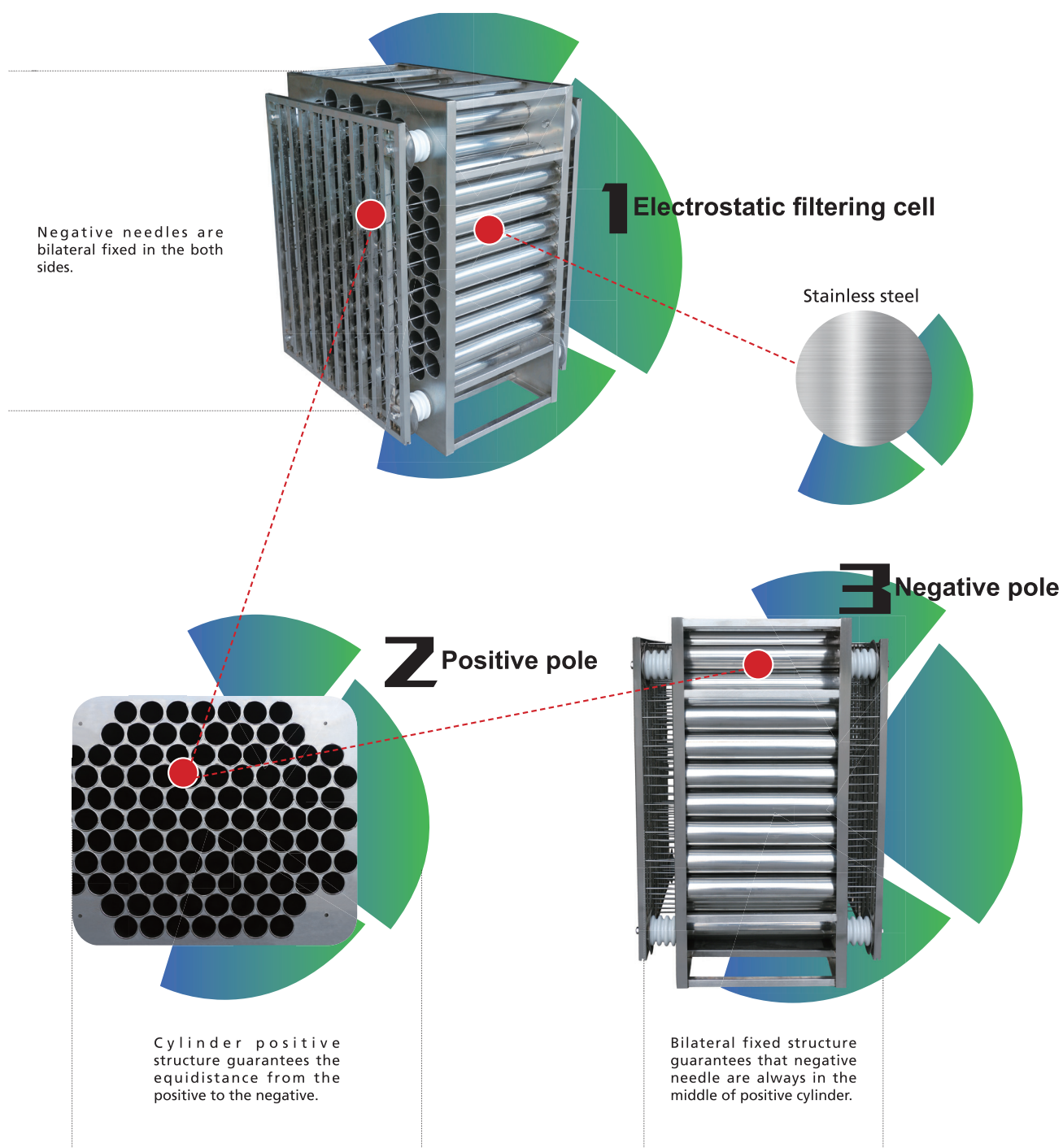


Transformer



Electrostatic filtering cell

Electrostatic filtering Cell



1. Take Care to Read the Following Text.

Purpose.

Commercial kitchen electrostatic precipitator is a type of professional environmental protection equipment used to remove smoke and grease generated by all kinds of cookers during the cooking, but not for flammable and explosive gas or corrosive gases. The processed exhaust must be outside. And we need to choose the open ventilation direction for emissions.

Features.

- Electrostatic precipitating technique ensures its high-performance flue gas filtration and some off-flavor elimination function;
- Easy operation intelligible indication, and auto fault diagnosis/monitoring function are available;
- Its electric field cells with double pin holder guarantees steady and constant operation;
- Modular structure is convenient for dismantling and maintenance.

Environmental Requirements.

- Ambient temperature: $+10 \sim +40^{\circ}\text{C}$.
- Ambient humidity: 20% ~ 90%.
- Sea-level elevation: $< 1,000\text{m}$.
- Exhaust (applicable) : $< 80^{\circ}\text{C}$, non-flammable, non-explosive, non-volatile and non-corrosive gases.

Technical Indices.

A. Purification efficiency : (rated volume and air flow at 60°C)

| Model | EvEsp (single pass) | EvEsp (double pass) |
|-------------------------|---------------------|---------------------|
| Purification efficiency | $\geq 90\%$ | $\geq 98.7\%$ |

2. Prior to Operation.

Working Principle and Structure Characteristics.

Working Principle

With the aid of fan, the exhaust is subjected to capture and separation achieved by electrostatic interaction of cascade electric field cells of the equipment, and the exhaust is cleaned before it is discharged. The liquid drops and soot separated from the electric field cells are settled on to the inner wall of anode tubes of the electric field cells, led to a grease trap for discharge, and then are discharged for uniform reclamation.

Structure Chart.

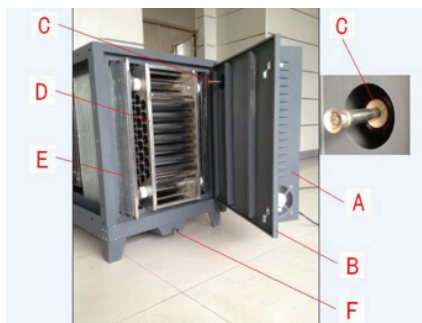


Figure 2-1

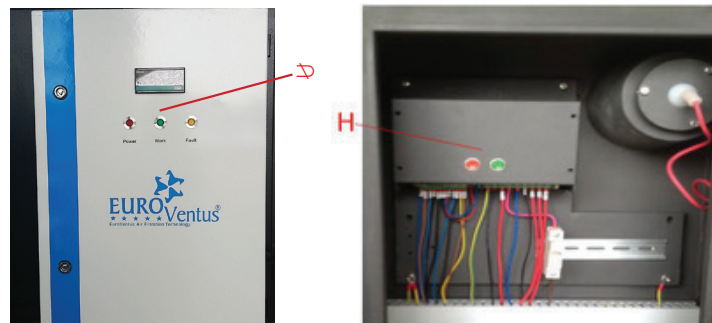


Figure 2-2

Structures and Functions.

| Marker | Name | Function |
|--------|---|---|
| A. | IC & Power System | Contain research and development of power supply on our own and electrical components. |
| | Overhaul door to high voltage insulator | Facilitate inspection and maintenance of the electric field cells. |
| C. | High voltage output ceramic insulator and | Output high-voltage static electricity to the electric field cells |
| D. | Honeycomb Cell | Filtering and absorb the exhaust, and discharge uncontaminated air. |
| E. | Perforated airflow divider | Isolate large-grained pollutants; Stabilise the flow velocity of flue gas, uniformly distribute the flue gas to all zones of the electric field cells, and keep high filtration efficiency. |
| F. | Drainage outlet | Discharge the grease residue collected by electric field cells and heat exchanger fins and the sewage water occurring during cleaning. |
| G. | Panel | Display the equipment operation states. |
| H. | Control box | Control the electrostatic operation. |

Installation.

Installation Methods of Precipitating System.

Ground Installation Diagram:

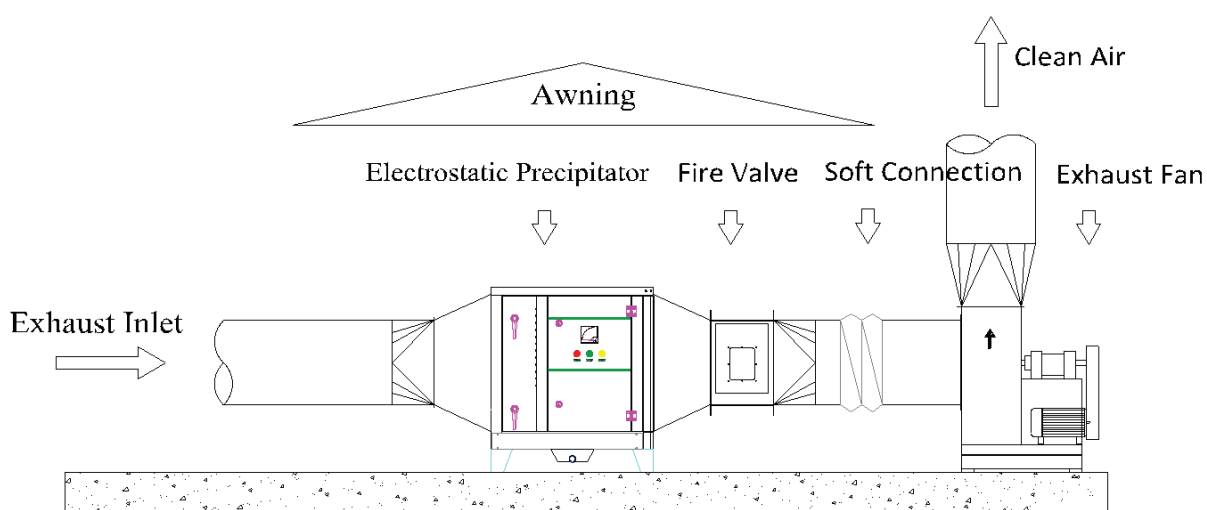


Figure 2-3

2. Ceiling Installation Diagram:

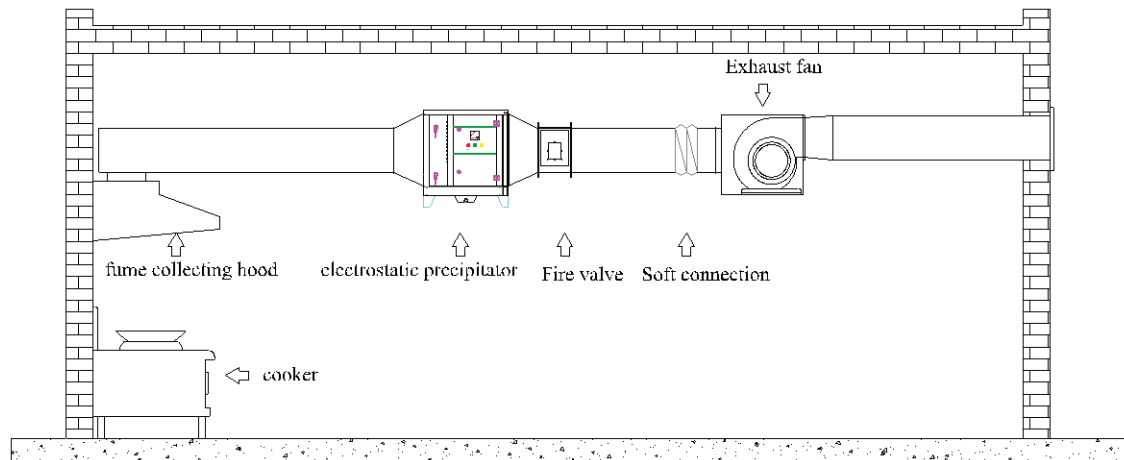


Figure 2-4



Notice

- ✓ In order to ensure the equipment safety, the user must install qualified fire damper in the outlet position of the equipment, maintain and test regularly.

Evaluation of Installation Location.

The installation site for main equipment must meet the following requirements:

- Level ground;
- The ground/building floor is strong enough to bear the weight of equipment;
- Enough maintenance space should be available before and after the equipment is installed (as shown in Figure 2-5);
- The flue gas temperature entering the equipment should be controlled well below 60°C.

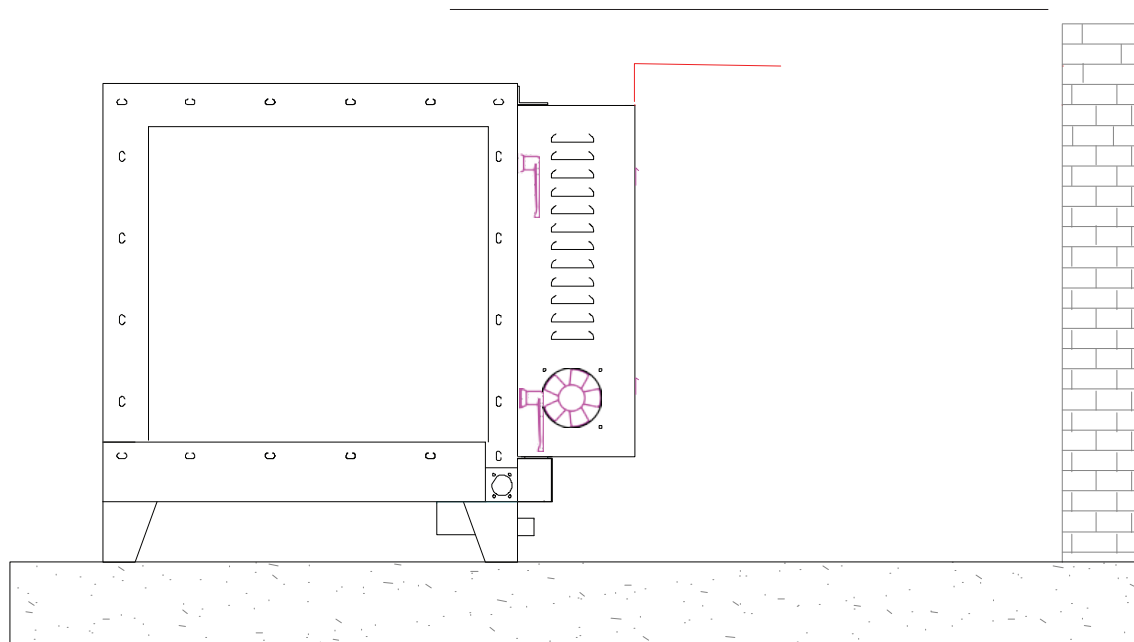


Figure 2-5

Generally in the kitchen, in addition to smoke generated frying stove and blast furnace, some don't smoke at stoves, such as steamer and soup furnace, etc. These stoves produce steam and heat that don't need to be purified by electrostatic precipitator in order to reduce cost as shown in figure 2-6.

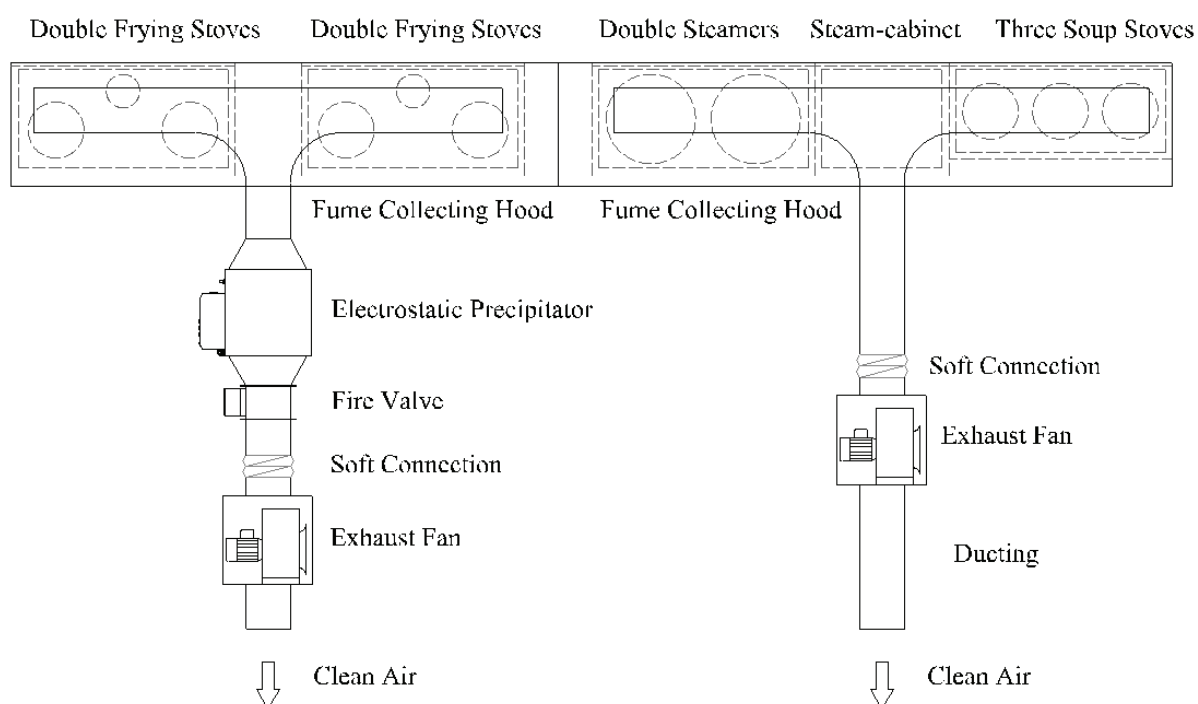


Figure 2-6

**Notice**

- ✓ Air leakage-proof measures should be taken for connection points of the air conduit to ensure better filtration efficiency.
- ✓ Use very smooth duct reducers at the inlet and outlet of the equipment, and connect them with very smooth ducts with a length that is at least 4 times longer than the diameter of the reducers to ensure a better purification efficiency of the equipment.
- ✓ The distance between the fire damper and the fan should be more than 1.5m to ensure a better airflow dividing effect.
- ✓ Hose connector should be applied in the section of ducting between the equipment and the fan, in case that the equipment would not work normally under the influence of the vibration of the fan.
- ✓ Users should choose a fan with an airflow rate capacity that is bigger than the rated exhaust capacity of the equipment to ensure the purification efficiency. Users can use transducer to control the fan or install adjustable air valve at the outlet of fan, to make sure that the equipment works at the rated exhaust airflow capacity.
- ✓ Users are suggested to keep a 1-2m long straight air duct behind the outlet of the fan to reduce the additional resistance.
- ✓ The equipment should work and operate in a negative air pressure status, which means that the fan should be installed behind equipment to ensure a better purification efficiency.
- ✓ When several equipment are put into use in a parallel connection pattern, and all of them share the same exhaust fan, make sure that the proportion of the actual airflow rate distributed to each equipment approximates the proportion of the rated exhaust capacity of each equipment.
- ✓ Weather protection measures, e.g. an awning, is required for the ESP if it is to be installed outdoors, to maximise the service life of the equipment and minimise the unnecessary maintenance fees.

Step 1: Install the electrostatic precipitator

Installation Steps

- Choose a installation method from the above mentioned options;
- The mainframe should be installed horizontally;
- To reduce the lifting weight, remove the honeycomb cells, install the electrostatic precipitator, and then fit on the electrostatic precipitator again.

**Notice**

- ✓ Put the removed precipitator and other assemblies in a safe place. Trample and impactation are strictly prohibited.
- ✓ No item is allowed to be at the outlet of heat dissipation so as not to result in bad cooling.

Step 2: Connect the ducts.

A. Install and assemble the equipment, air ducting, fire valve, hose connector, exhaust fan, etc. Please refer to the specific combination methods shown in figures 2-3 and 2-4;

- Flange connections should be sealed against air leakage by continuous perimeter gaskets of thermal-resistant oil-proof materials;
- Make sure that screw holes of the flanges match each other during the installation of the fire dampers, in case the fire dampers would not react and function normally due to deformation caused on the outer-frames;
- Make sure that the space for hose connector between air ducts is no shorter than 50mm;
- The ventilation ducting should be kept at a certain degrees of inclination to minimise the accumulation of residual grease inside the ducting;
- Install vibration damper at the support rack (namely shock proof rubber etc.) of the fan;

- No combustible item is allowed to be put at the outlet of the fan. When the fan outlet is located within a 5-meter radius from the electrostatic apparatus, the height of the outlet should be kept 1.5-meter higher than the electrostatic apparatus.

B. Install the drainage pipe.

- Open a drainage outlet at the lowest point of the fan volute and place an oil drum beneath it, just in case there is accumulation of residual grease inside the fan volute;
- Add a grease trap beneath the flange of the hose connector and place an oil drum beneath the drainage outlet of the grease trap.
- Add a grease trap beneath the flange of the fire damper and place an oil drum beneath the drainage outlet of the grease trap.

Open 1 drainage outlet at the lowest point of the ventilation ducting.



Requirement

- ✓ The number of bends of the sewage pipeline connected to the equipment should be minimised and the height of the sewage pipeline should not be higher than that of the drainage outlet of the equipment, so as to guarantee smooth drainage.
- ✓ A fire damper should be installed at the outlet of the equipment to protect the equipment, and each section of the air ducts should incorporate an access door permitting access for cleaning and servicing.
- ✓ The perforated air flow divider should be placed at the air inlet of the equipment.
- ✓ The effluent sewage treatment/discharge of the equipment should comply with the local environment regulations.

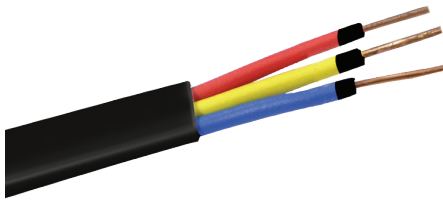


Danger

Cautious Notes

- ✓ The installation design of the equipment should be handled by qualified professionals.
- ✓ Do not power up the equipment before the completion of the installation of the system. There is extremely high voltage generated inside equipment when it is in full operation.
- ✓ Do not install the equipment near any facility that produces flammable or explosive gases.
- ✓ An electrical leakage protection device should be installed between the main power supply line and the power source to avoid the leakage risk.
- ✓ The ground lead should be reliable and the resistance should be less than 0.5
- ✓ The equipment installation need to maintain level and firm.
- ✓ In order to ensure the safety of maintainer, maintenance platform and fence should be installed in the right height building.
- ✓ In regions with low temperatures, heat insulation measures should be done on the exposed pipeline.

- Fire wire (red or brown)
- Zero line (yellow-green)
- Ground wire (blue)



Equipment Debugging.

Inspection before Powering up.

Check each instruction stated above to see if there is any discrepancy between the equipment installed and the guidelines. If so, improvement should be done to make sure that every requirement is met before the debugging. Make sure each part/ accessory has been installed correctly and firmly before powering up.

Power Inspection.

Before powering up, please use corresponding test meters to check if the power supply meets the requirements indicated on the nameplates of the equipment and the fan, and check whether the safety ground is reliable (earth resistance is smaller than 0.5Ω).

Airflow Rate Adjustment.

Power up, switch on the fan and make sure that its rotation direction is correct. With the help of airflow rate measuring device, adjust the airflow rate to the extent that the actual airflow rate handled by each equipment is equal to or less than the rated airflow capacity. Meanwhile, check if there is any air leakage, and take leak-mending measures when necessary.

Equipment Commissioning.

Refer to “3.2 Operation guide ” to check the electrostatic precipitation function of the equipment. Observe whether the corresponding indicator reacts normally while running each function. Refer to “5.1 Phenomenon and solutions” for problem shooting measures if something wrong happens. Meanwhile, check if there is any water leakage from connected points of the water pipes and take leak-mending measures when necessary.



Reminder

- ✓ Refer to “7.1 Problem processing and solutions” for problem shooting measures if the operation fails.

3. Equipment Operation

Panel Introduction.



“Power” indicator: when the indicator is on, that means normal power supply.

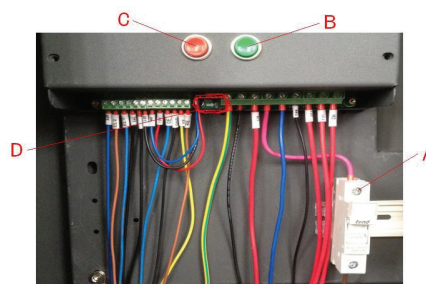
“Work” indicator: when the indicator is on, that means normal operation for the electrostatic precipitator.

“Fault” indicator: when the indicator is on, that means there is electrical discharge phenomenon.

Ammeter: display the high voltage electro static current.

Control System Introduction

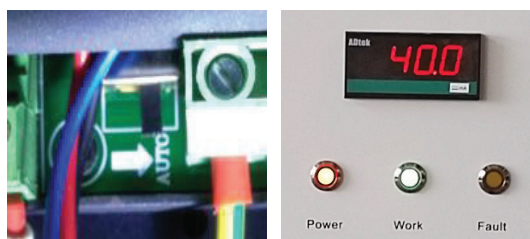
- A. Insurance tube: normal work plays a role of connection circuit when super load, it will cut safely and protect the circuit by using its fuse.
- B. “Start” button: Press this button, the work indicator will be on and that means the electro static precipitator starts working.
- C. “Stop” button: Press this button, the work indicator will be off and that means the electro static precipitator stops working.
- D. Selected switch: switch to the left, you need to manually press “start” button; switch to the right, the electrostatic precipitator starts automatically when the equipment is power on.



Operation Guide

Power On Start

1. Turn the selected switch to the left.
2. Power on (turn on the user main switch)
3. “Power” indicator and “Work” indicator on the panel of IC & Power System stay lit constantly, and the “ammeter” pointer points to corresponding current value.
4. Press “Stop” button, the equipment will stop running. “Power” indicator stays lit constantly and “Work” indicator goes out on the panel of IC & Power and the “ammeter” pointer points to “0” position.
5. Power off turn off the main switch 3 and “Power” indicator on the panel of IC & Power System stay lit constantly.





- ✓ The equipment works with high voltage inside, so it is not allowed to disassemble the parts and open the overhaul door before shutting down the main power.

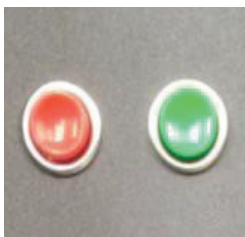
3. Equipment Maintenance

Users must carry out effective maintenance work on the equipment, in order that the equipment can run smoothly, steadily, securely and sustainably so as to maintain high performance filtration

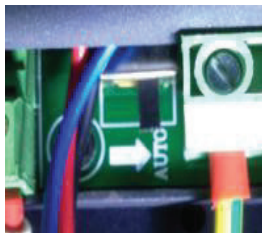
Maintenance Period Arrangement.

| Periodical arrangement | Maintenance itemst |
|------------------------|---|
| Daily | 1. Keep the surface of equipment clean; |
| | 2. Check whether the fan can work normally or not; |
| | 3. Check whether the drainage outlet is unobstructed or not; |
| | 4. Check whether the water pipe or ducting is leaking or not; |
| Every Month | 1. Clean the perforated air flow dividers; |
| | 2. Clean the high voltage output ceramic insulators; |
| | 3. Clean the grease residue inside the equipment; |
| | 4. Clean the electric field cells. |
| Every Two Month | 1. Check whether the fire damper can work normally or not |

Manual Start



1. Turn the selected switch to the left.
2. Power on (turn on the user main switch) & "Power" indicator on the panel of IC & Power System stay lit constantly.
3. Press the "Start" button, the "work" indicator on the panel of IC & Power System stays lit constantly and the "ammeter" pointer points to corresponding current value.



Stop Working

1. Turn the selected switch to the left.
2. Power on (turn on the user main switch) & "Power" indicator on the panel of IC & Power System stay lit constantly.
3. Press the "Start" button, the "work" indicator on the panel of IC & Power System stays lit constantly and the "ammeter" pointer points to corresponding current value.

Maintenance Guide.



Requirement

- ✓ The operators must wear eye-protection glasses, head-protection cap, gloves, and protective clothing so as to prevent alkaline liquid from damaging the skin of the operators.

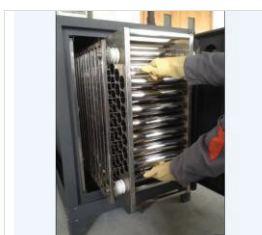


Figure 4-1
Draw out the honeycomb cells
and the perforated airflow divider

Clean the Perforated Airflow Dividers and the Honeycomb Cells.

Draw out the electric field cells and perforated airflow dividers as shown in Figure 4-1, use high pressure water spraying gun with home detergents to spray and clean it as shown in Figure 4-2 or dip them in a solution of home detergents and hot water as shown in Figure 4-3 if they are not very dirty. Or dip the perforated air flow dividers and electric fields in a solution of NAOH and hot water (1:25 in weight) as shown in Figure 4-4 if too thick residual grease deposits exist, so as to clean the items in a more quick, economical and thorough mode.



Figure 4-2
Spray washing of the honey
comb cells.



Figure 4-3
Dip bathing of the perforate
dair flow dividers



Figure 4-4
Dip bathing of honeycomb cells

Clean the Insulators

Use detergents, or NAOH to clean the ceramic post insulators supporting cathode needle frame and the high voltage output ceramic insulators. Then use clean water to rinse out residue solution and detergents on the surface of insulators, and then wipe it dry, as shown as Figure 4-5.



Figure 4-5 Clean insulators



Requirement

- ✓ Insulators must be rinsed with clean water and wiped dry, since the residual electrolyte solution of strong alkaline on the surface of the insulators would cause creepage, influencing the proper function of the equipment and posing safety challenges to the system.
- ✓ Insulators with crazings should be replaced immediately.



Figure 4-6



Figure 4-7

Honeycomb Cells Detection.

1. Problem-shooting:

Check whether there is any cylindrical anode tube has been dented, as shown in Figure 4-6. If so, carefully recover it with a round stick, as shown in Figure 4-7.



Figure 4-8

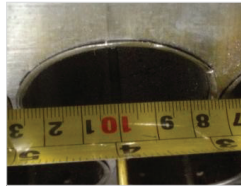


Figure 4-9

2. Calibration Steps :

Check whether there is any deviation between the cathode and anode of the electric field before installing the honeycomb cell back. Guarantee by eyeballing that the cathode needle is located inside the anode tube within a deviation of $\pm 1\text{mm}$ from the center; otherwise, screw off and readjust the union screw of insulator, and increase/reduce the flat washers when necessary. Guarantee that each cathode needle falls within the permissible deviation, and the fit the honeycomb cells into the electrostatic precipitator.



Figure 4-8



Figure 4-9

3. Installation Steps:

There are 2 kinds of honeycomb cell, one without the ejector pin, as shown in Figure 4-10, the other with the ejector pin, as shown in Figure 4-11. The honeycomb cells without an ejector pin should be installed first, then the ones with the thimble, with the ejector pin pointing inward.

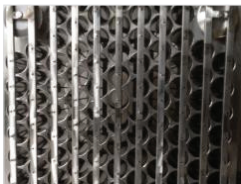


Figure 4-10

Connecting with
the ejector pin



Figure 4-11



Requirement

- ✓ Put the removed electric field cells other assemblies in a safe place. Trample and impaction are strictly prohibited.

Cautious Notes



Danger

- ✓ There will still be residual current running inside power box even if its main supply switch is power off. Users should switch off the general power supply before carrying out any maintenance or repair work on the equipment.
- ✓ Open the overhaul door of the equipment. Use screwdriver to release residual current inside the honeycomb cell, as shown on the right. To do that, users should hold the insulation section of the screwdriver, then use the metallic section of screwdriver to connect the cathode needle with anode tube. Take care to do close the vapour service valve before you access the equipment for overhaul, so as to prevent false triggering of high temperature stream that may injure human body.
- ✓ Users should clean the residual grease deposit inside the equipment regularly to prevent fire hazards



Reminder

- ✓ Users should keep record of the maintenance work carried out on the equipment.

5. Problem-shooting:

Phenomenon and solutions.

| Phenomenon | Possible causes | Solutions |
|--|--|---|
| Power supply is on, but it can't start working. | The fuse inside control box is burned down | Check and find out the causes and replace the broken fuse with a new one with identical parameters |
| Press the "Start" button, the equipment is running. "Work" indicator stays lit, but the equipment stops working after 2 seconds at last. | Honeycomb cell is connected with conductive stuff. (such as fine steel wire) | Refer to "4.2.1 Clean the perforated airflow dividers and the honeycomb cells" |
| | High voltage ejector pin doesn't connect with the honeycomb cell | Check whether the ejector pin is flexible or not and whether the ejector pin connect with the honeycomb cell or not when the door is closed. |
| Press the "Start" button, the "Work" indicator stays lit, but "Fault" indicator is on and the equipment stops working at last. | Some honeycomb cells inside the equipment has stopped working due to the changes of flue gas concentration | Press the start button again |
| | Residual water drops on the inner wall of the casing and inside the electric field after cleaning | Run the fan without running the equipment for some time to blow the water drop off entirely, then start the electrostatic precipitator again. |
| | Foreign matters or too much residual grease deposit inside the honeycomb cells | Refer to "4.2.1 Clean the perforated airflow dividers and the honeycomb cells" |
| | Residual detergent or alkaline solution on the insulators when maintenance is over | Rinse off the residual agents with clean water and wipe the insulators dry using dry cloth. |
| | Cathode needles deviate from the centre of anode cylinder | Insulators crack |
| | Refer to "4.2.3 Honeycomb Cells Detection". | Replace the insulators |
| | Flue gas temperature gets too high | Cool the flue gas temperature down. |
| | High voltage wire breakage enclosure discharge | Check high voltage wire after turning off the electrostatic precipitator. |
| "Power" indicator and "Work" indicator are on, but ammeter doesn't work. | Wire T31, T32, H1 and H2 fall off or poor contact, and reactor's two wires fall off | Check the wire mentioned in the possible causes. |
| Exhaust air can not be emitted or cannot be emitted smoothly | Too much grease deposited on the perforated air flow divider such that ventilation gets unsmooth | Refer to "4.2.1 Clean the perforated airflow dividers and the honeycomb cells. |

Cautious Notes**Danger**

- ✓ There will still be residual current running inside power box even if its main supply switch is power off. Users should switch off the general power supply before carrying out any maintenance or repair work on the equipment.
- ✓ Open the overhaul door of the equipment. Use screwdriver to release residual current inside the electric field, as shown on the right. To do that, users should hold the insulation section of the screwdriver, then use the metallic section of screwdriver to connect the cathode needle with anode tube.

**Reminder**

- ✓ Users should keep record of the maintenance work carried out on the equipment.

6. Others.**Unpacking.**

The unpacking should be done carefully. Users are also advised to check whether there is paint peeled off or there is any damage done to the equipment, whether the accessories are complete according to the packing list, and whether the user's manual is provided or not. fit the honeycomb cells into the electrostatic precipitator.

Delivery and Storage.

Please refer to relevant international rules on packing, delivery, storage. The equipment should be handled with much care. Users should try their best to avoid the collision and damage on the surface. The equipment should be stored in dry and ventilative environment, and kept away from high temperature, dampness, acid and alkali caustic fume.