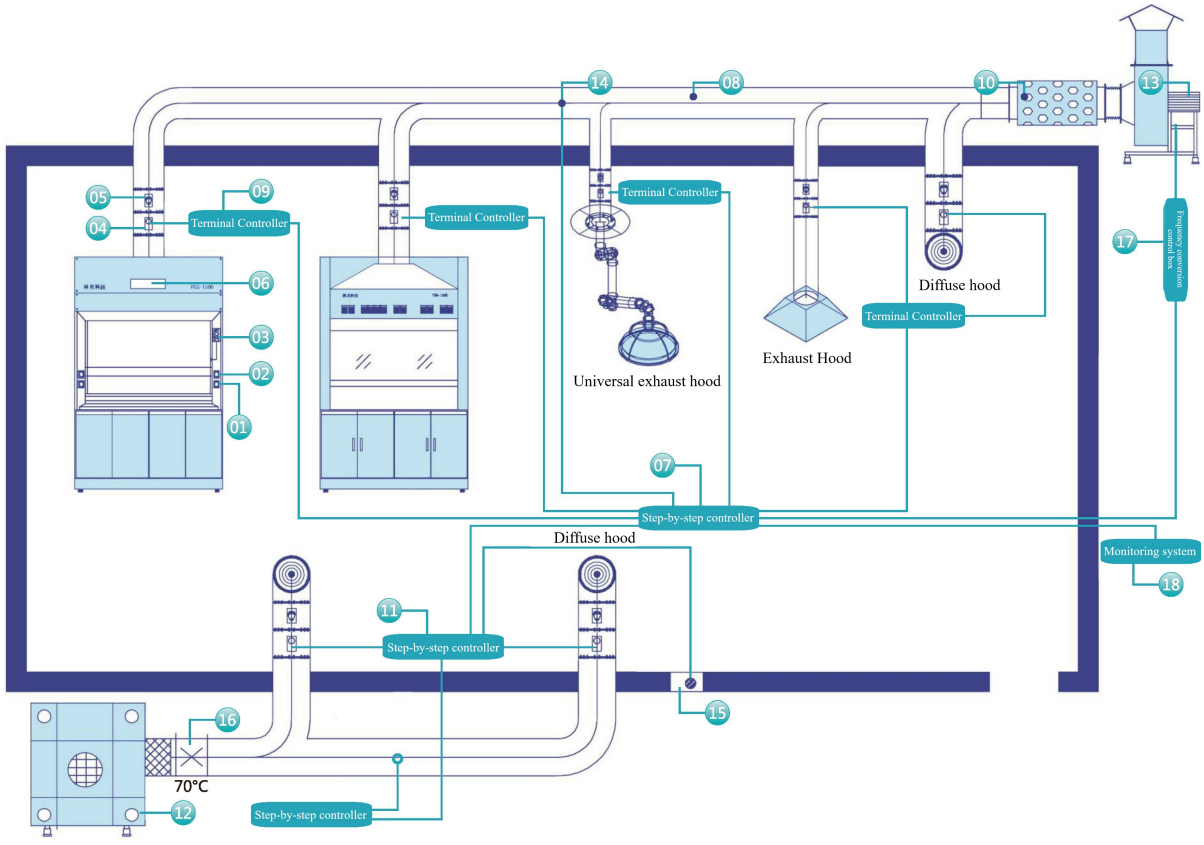
Variable air volume control system

Localized airflow external circulation energy-saving system

The local airflow external circulation energy-saving system is based on the VAV variable air volume standard control system and is designed with an auxiliary ventilation hood configuration. The system can operate in the local airflow external circulation mode by using outdoor fresh air to supplement the ventilation hood while maintaining the total exhaust flow rate. This avoids extracting gases with temperature differences at high temperatures in the laboratory when the temperature difference between the laboratory and the outside world is large, saving heating and cooling energy consumption, and reducing the overall energy consumption of the laboratory.

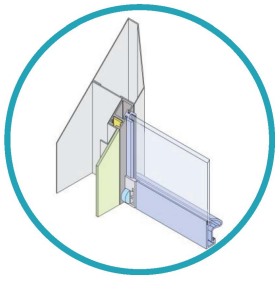
The local airflow external circulation energy-saving system adopts intelligent adjustment control technology, and every time the supply air control valve opens, it always lags behind the exhaust control valve. Every time the exhaust control valve is closed, it is always closed in advance to ensure that the auxiliary air ventilation hood is maintained at a relatively negative pressure and does not backflow into the laboratory.

Variable air volume control system configuration diagram



Window Sensor

Patent Number: CN201120179906.6



The window sensor is used to sense the opening position of the ventilation hood window and works with the ventilation hood controller to calculate the required exhaust volume of the ventilation hood. It can precisely change the exhaust volume of the ventilation hood according to the height of the window. The window sensor and the rapid damper actuator work together through the ventilation hood controller to quickly adjust the wind speed on the window surface to a safe range after the window height changes, preventing the escape of harmful gases.

Wind Speed Sensor

The draft surface air speed sensor is a device used to directly measure the window surface air speed in variable air volume ventilation systems. The fume hood controller uses the front air speed sensor to calculate the current exhaust air volume in real time and quickly maintains the fume hood window front air speed within a safe range by adjusting the air volume control valve.

Ventilation hood VAV control panel

The Draft Control Panel is a device within the Draft Control System that displays and configures the system's operating status in real time. The panel works with the Terminal Controller to display real-time information such as the ventilation hood air valve angle, window height, set air speed, etc. In addition, the system fans, ventilation hood dampers, lighting, etc. can be started and stopped with the touch of a button.

Quick Damper Actuator

Patent Number: CN201120194592.7

This terminal execution device has the characteristics of strong power, accurate and fast execution, and automatic diagnosis. Technically, it uses advanced technologies such as photoelectric motor, digital motor, high-power variable speed motor, etc. to adjust the air valve from 0° to 90° with a response of <1s.

Corrosion-resistant damper

Patent Number: CN201120204532.9

Corrosion-resistant dampers provide superior performance and safe airflow control in laboratories. The company can provide a series of control air valves to meet customer selections for different performance and application scenarios.

Human body infrared sensor

The optional area status sensor installed on the top of the exhaust hood can detect the presence or absence of people in the monitored area in front of the exhaust hood. When no people are around, the system sets the exhaust hood's surface air speed to a safe standby state (0.3 m/s) based on the window opening height. If a person appears in the monitored area, the system immediately (within 1 second) increases the front air speed to a safe value (0.5 m/s). A high exhaust flow rate is used only when people are present in the exhaust hood, and when they leave, the flow rate is reduced to reduce energy consumption.

Distributed Controller

Time function

The current time, including year, month, day, hour and minute, is displayed at the top of the home page. In the upper right corner is a dial that indicates whether the current system is working properly. Under normal working conditions, the needle on the dial rotates at a constant speed. The current time can be changed on the program control setting page.

Monitoring function

The bottom line of the homepage displays the latest fault system information showing the operation status of the ventilation hood in this room, such as communication faults (including frequency converter and digital regulator) and air valve fault indication.

Inverter control function

1. The start and stop buttons on the operation panel control the start and stop of the inverter.
2. If the height of the ventilation hood window of the system is lower than 2cm, the system will enter the sleep state and the frequency of the frequency converter will automatically change to the sleep state frequency conversion frequency. When the remote high-speed switch or emergency exhaust switch is pressed, the frequency of the frequency converter will automatically change to the corresponding state set value, which has the highest priority among the various control modes of the frequency converter.
3. When the program control button is pressed, the inverter frequency will be controlled by the work schedule based on the comparison of the current time with the five time points of the work schedule, and the frequency of the corresponding time period will be entered. There are four set values: stop, sleep, normal speed, and high speed.

Air duct

PP material air duct
The material is hard, has a high melting point, good fire resistance, good steel surface, good scratch resistance, very high shrinkage rate, moisture absorption resistance, acid resistance, alkali corrosion resistance, and excellent melting resistance. Recommended for use in highly corrosive laboratories.

PVC material air duct
It is rainproof, fireproof, antistatic, easy to mold during processing, has a beautiful appearance, is non-toxic and non-polluting, and is a mainly recommended product.

Ventilation terminal control device

The fume hood is equipped with a built-in fume hood variable air volume controller, which consists of an embedded chip with a window sensor and an electric damper, and can complete all the control functions described in the man-machine dialogue interface above. It also has a strong network communication function, which can exchange data with the monitoring computer and distributed controller of the DCS system.

Muffler

Mufflers are effective devices for controlling the outward propagation of aerodynamic noise, and after internal acoustic treatment, they can significantly reduce the generation and propagation of noise without affecting the airflow. After installing the muffler, the acoustic attenuation of the equipment should reach 0-40 dB(A), and the subjective noise reduction effect will be reduced by 50-90% accordingly.

Outdoor Air Unit

The air supply unit is water-cooled or air-cooled, and a primary filter can be installed at the unit's air inlet, allowing for concealed installation.

Air Supply Controller

The indoor LCD operation panel is linked to the electric damper and displays the indoor temperature. If the indoor temperature deviates from the set value, the valve opening is automatically adjusted to keep the indoor temperature constant.

Centrifugal separation unit

Commonly used materials: fiberglass or PP material. The casing and impeller are made of fiberglass or PP material with excellent corrosion resistance, which is widely used in various laboratories. The selection of the fan should be calculated based on the design air volume of the laboratory surge system and allow for a margin.

Duct static pressure Sensor

Duct static pressure sensor, which can accurately detect the gas pressure inside the ventilation duct.

Fire damper

Fire dampers are installed in the supply and return air ducts of ventilation and air conditioning systems and are normally open. When the gas temperature in the pipeline reaches 70℃ during a fire, the fusible part will melt and the valve will automatically close under the force of the torsion spring. It meets the requirements of fire resistance stability and fire resistance completeness within a certain period of time and acts as a smoke and fire barrier. When the valve is closed, it will output an "off signal".

Monitoring system

The variable air volume control system is equipped with a remote monitoring function, enabling remote control and adjustment of laboratory ventilation.

Pressure Sensor

Differential pressure sensor, which can accurately detect the difference in indoor and outdoor gas pressure.

Frequency conversion control box

Its main features are modular structure, networked connection, manual and automatic compatibility, and complete protection function, making it an important control device for DCS system. It can realize the frequency conversion control of the fan speed of the ventilation system, and has an independent PID controller built-in, and does not rely on external control instructions to perform the frequency conversion. It can cooperate with the DCS monitoring system and realize the remote diagnosis function by sending parameters of the frequency converter to the PC.