

Fume Hood Diagnostic Testing



KANOMAX
The Ultimate Measurements

Application Note

A fume hood is a local ventilation device designed to eliminate or minimize exposure to hazardous fumes, dust or other airborne particulates. Basically, the fume hood provides an area where a technician can safely work with certain hazardous materials. The fume hood is designed to contain and vent all dangerous vapors and particulates away from the worker. A typical fume hood will undergo quality testing by the manufacturer, but it is also necessary to test the fume hood in its installed state and to periodically make sure the hood is performing correctly to limit human exposure to airborne hazards. ASHRAE 110-1995 is the current industry accepted standard for this testing procedure.



Fume Hoods are common in many types of labs and industries

The test is further broken down into different segments some or all of which may be used to test a fume hood depending on the setup and user requirements:

The first, most basic, part of the test is a face velocity test performed with the fume hood sash open at various heights. This test involves using an anemometer to measure the rate of airflow in front of the fume hood where a worker would be standing. The test involves dividing the front of the hood into an imaginary grid and then measuring at various equidistant points along this grid to determine average velocity and identify any points where excess air is escaping from the fume hood.

then automatically averaged using the calculation feature. Both units use a small hot-wire sensor so they are easy to position precisely at each point along the grid.

Next is a smoke visualization test that is done in conjunction with the face velocity test. This involves introducing a visible smoke to the fume hood so that the vapor can be observed. The fume hood fails the test if visible vapor escapes the hood, but it also allows a trained technician to identify if there are any eddies or reversals in the air flow within the hood. An eddy is an area where the air currents swirl around in one place instead of flowing properly and a reversal is a localized area where the flow is going in the wrong direction. An eddy or reversal is an indication that the fume hood is not performing optimally as the flow is being interrupted within the hood. Smoke sticks may be used for test or a commercial fog machine such as the one provided by Kanomax may be used to generate large quantities of visible vapor.

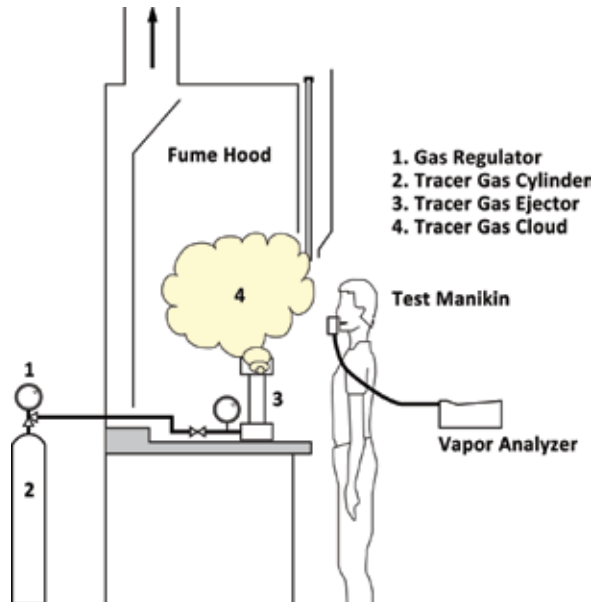


Kanomax Climomaster

Kanomax suggests using our Climomaster 6541, with its $\pm 2\%$ of reading accuracy for this part of the test as it can be programmed to take 1 second readings, for 20 readings per point. This technique is taught by NEBB fume hood certification training. The values from the 8 points of (20) twenty, (1) one second readings are then averaged automatically.

This is not only a time-saver, but eliminates the possibility of an error occurring from manual calculations. The lower cost Anemomaster Professional is also well suited for this low velocity testing with an accuracy of $\pm 3\%$ of reading, however the values must be stored by pressing the data store button for each value saved,

Lastly we'll talk about is the Tracer Gas Test. This involves using a diffuser made to the specifications laid out in ASHRAE drawing 110-83M. The diffuser is placed inside the fume hood and a tracer gas such as sulphur hexafluoride (SF₆) is released at a controlled rate of 4 liters per minute. SF₆ is used because it has a molar mass of 146.06 g mol⁻¹ making it heavier than ambient air. If the hood is operating correctly the tracer gas will be removed by the ventilation system of the hood. The test will be executed with the sash of the hood in various positions to see if any gas escapes.



Setup Diagram for the Tracer Gas Test

During this test a manikin designed to simulate an average person is placed in front of the fume hood during testing and a vapor analyzer is used to check for the tracer gas near the manikin's face. The purpose of the manikin is two-fold. First, if any significant amounts of tracer gas are detected near the manikin's face it means the hood is not working properly as a person working at the hood would be inhaling the fumes. Second, the manikin simulates the space and disruption to the room's airflow that a worker would cause if they were present at the hood.

Kanomax provides all the components for tracer gas testing except the actual tracer gas itself. Our dif-kit is made of durable and reliable stainless steel components to the specifications of drawing 110-83M. Our test-manikin includes an adjustable stand so you can easily position it at the correct height for the ASHRAE 110 test. We also offer a vapor analyzer calibrated to detect SF6.

Note: There has been some concern about using SF6 for the test as it is a known greenhouse gas and there is considerable concern about its effects on the environment. For now it is still the accepted standard, but there has been some discussion about using nitrous oxide N2O or heptafluoropropane C3HF7 (more commonly known by its trade names FE-227 FM-200). The dif-kit and vapor analyzer provided by Kanomax are both able to be adapted to use and detect these alternative gases respectively.

Kanomax offers fume hood testing equipment to cover all parts of ASHRAE 110. The entire kit may be purchased together or just the parts you require for your specific testing may be bought separately. Our experienced team is active in the industry and we'll be ready with whatever future requirements or changes are announced. Wherever possible we try and design our products so they can be upgraded to meet future requirements rather than needing to be replaced. We don't think you should have to buy another meter or test-kit if your existing one can be modified to meet changing requirements for a fraction of the cost.

About Kanomax USA, Inc.

Kanomax has delivered the best measurement solutions in its products and services that adapt precision measurement technology for fluids and particles. Kanomax product lines include anemometers, particle counters, dust monitors, and IAQ monitors. Kanomax is contributing to technological innovation and quality improvement for the processes of quality management, environment management, and technology development in the areas of environment, health, and energy, which are essential to sustain human well-being, as well as in other industrial areas including automobile, aerospace, semiconductor, electronics manufacture, heavy industry, steel, shipbuilding, pharmaceutical, biotechnology, food-processing, medical, construction, and civil engineering.



Kanomax Dif-Kit for Fume Hood Testing



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