Waters™

Andrew+ Pod

Recirculatory Filtration Fume Cabinet (with ABEK filter) - Performance Document

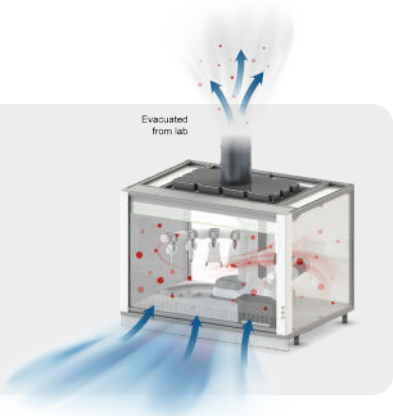
INTRODUCTION

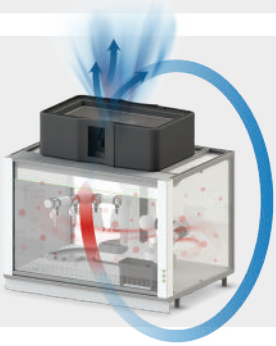
This report is based on a study done by SKAN AG[1] called: "SKAN Containment Testing (Conttest) on a newly developed Bidirectional Filtration Cabinet in 13 situations". It outlines the performance of the Andrew+™ Pod configured as a Recirculatory Filtration Fume Cabinet (RFFC) using an ABEK (carbon filter) following the European ISO norm standard EN 14175-3:2019. This ISO standard specifies the requirements and testing methods for fume cupboards like RFFCs, focusing on their containment efficiency and safety performance. The norm specifically addresses critical parameters such as airflow, tracer gas containment, and sash opening effects to ensure that hazardous substances are effectively captured and do not escape into the workspace.
This norm is widely used in laboratories to validate fume cupboard performance under both static and dynamic conditions, providing a benchmark for safety and operational effectiveness.

CHEMICAL FUME HOODS EXPLAINED

Traditional Chemical Fume Hoods

Airflow Type	Sample Protection	User Protection	Filter(s)	Key Advantages	ISO Norms	
					Europe	USA
Ducted: - Constant Air Volume (CAV) - Variable Air Volume (VAV)	**NO**	**YES**	**NONE**	**High Contaminant**	EN 14175-3:2019	ANSI/ASHRAE 110-2016





Ductless Chemical Fume Hoods

Airflow Type	Sample Protection	User Protection	Filter(s)	Key Advantages	ISO Norms	
					Europe	USA
Reciculatory	**NO**	**YES**	**ABEK**	**Flexible installation with no dcuting required**	EN 14175-3:2019	NONE

Biological Safety Cabinets

Airflow Type	Sample Protection	User Protection	Filter(s)	Key Advantages	ISO Norms	
					Europe	USA
Ducted OR **Reciculatory**	**YES (Class II only)**	**YES (Class I and II)**	**HEPA**	**Protects users, samples and the environment from aerosols and biological particulates**	EN 14644-1:2015 + Country specific	NSF/ANSI 49-2024

Low-flow Fume Hoods

Low-flow fume hoods aim to be energy efficient while offering performance on-par with traditional fume hoods. This requires specific ductwork as well as regular and precise calibrations.

Portable Fume Hoods

Portable fume hoods function the same way as ductless chemical fume hoods. They are ideal for small-scale, manual work but have limited airflow capacity due to their compact nature.

[1] SKAN AG is a third-party company based in Switzerland. SKAN is a global market and technological leader for isolators, cleanroom devices, and decontamination processes for the aseptic production of biopharmaceutical substances.

The Andrew+ Pod qualifies as a ductless chemical fume hood because it recirculates filtered air back into the lab environment instead of exhausting it outdoors, making it suitable for controlled indoor use. It employs an ABEK carbon filter, specifically designed to neutralize mixed chemical vapors (Acidic, Basic, Organic compounds, and specific hazardous chemicals like Ketones). In its ducted configuration, the Andrew+ Pod can also be considered a traditional chemical fume hood. However, this configuration has not been tested in the context of this study. Importantly, the Andrew+ Pod cannot be considered a Biological Safety Cabinet due to the nature of its non-airtight design.

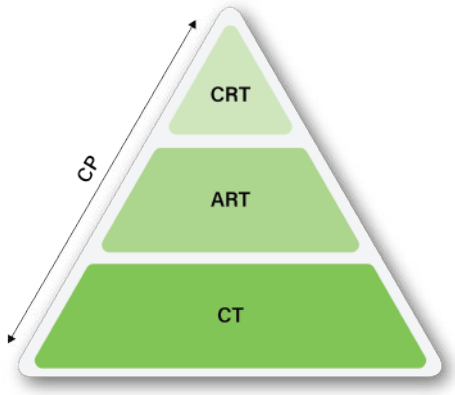
PERFORMANCE TESTS

TESTING CONTEXT

SKAN AG carried out their state of the art "SKAN-Conttest[2]" assessment on the Andrew+ Pod. This test goes beyond those required by ISO norm 14175-3 because it also incorporates the real working conditions of the product during testing, like the arm movements of a simulated operator and of the Andrew+ Robot during operation.

Twelve sensors positioned on a moving robotic station simulate the various positions of potentially exposed body parts. These sensors measure the presence in parts per million (PPM) of an IPA tracer gas, thus providing the core data necessary to assess containment performance (CP) levels. The tests performed on the Andrew+ Pod assessed CP levels of the enclosure under various operating conditions[3] to ensure safety during the use of volatile compounds.

CONTAINMENT PERFORMANCE (CP) LEVELS



CP levels are established by performing three, 10-minute tests on the Andrew+ Pod : The Containment Test (CT), Acute Risk Test (ART) and Chronic Risk Test (CRT). The product receives a grade between 0-3 (with 3 being the best) for each test.

These grades are then considered together to determine the overall CP level of the product.

- The **Containment Test** measures the immediate environment around the enclosure. The minimum requirement to pass this test is an unaffected environment.
- The **Acute Risk Test** measures the protection level for short activities during the day.
- The **Chronic Risk Test** measures the protection level for intensive activity during 8 hours in front of the enclosure.

There are three possible CP levels:

CP0: Indicates poor containment performance, with significant leakage or escape of substances. This occurs when airflow is insufficient or improperly managed, often under large sash openings or low fan speeds.

CP2: Reflects moderate containment, where the cabinet can manage some hazardous substances but may not fully contain higher concentrations or under dynamic conditions. This level is typically seen when airflow is slightly restricted or when background interference affects performance.

CP3: Represents the highest containment level, indicating excellent capture of hazardous substances with minimal or no leakage. Achieving CP3 requires optimal airflow (*e.g.*, higher fan speeds), controlled sash openings, and well-functioning filters, ensuring safe operation even under demanding conditions.

[2] https://skan.com/en/services/products-and-services-for-the-laboratory/service-containment-test-for-fume-cupboards/

[3] *The Andrew+ Pod is intended for use with the Andrew+ robot. While at times operators need to interact with the Pod and the Andrew+ robot (ie. when setting up automated runs or during manual interventions), its primary operating conditions are when the system is completely closed with the Andrew+ robot operating inside it. This means that containment performance (CP) is most relevant (and shows better results) in these conditions.*

TEST RESULTS

The test results done on the Andrew+ Pod as a RFFC in accordance with ISO norm EN 14175-3:2019 have enabled Waters™ Lab Automation to:

1. Establish the optimal working conditions of the product in this configuration, thus ensuring utmost user safety

When in the RFFC configuration, the Andrew+ Pod and OneLab™ automatically set the fan speed of the onboard ventilation module to 2000 rpm and prevent opening of the sash more than 25 cm while in use. With both conditions met, the Andrew+ Pod meets the Containment Performance level of CP2[4].

Conclusive Test
Onboard ventilation module speed: 2000 rpm
Sash opening: 25 cm

CRT	1	**2**	3
ART	1	2	**3**
CT	**Passed**		
Overall CP:	1	**2**	3

At 2000 rpm and with a sash opening of 25 cm, the airflow speed of the Andrew+ Pod is of 0.25m/s. This corresponds to an air volume flow of 222m^3/h.

While opening the sash of the Andrew+ Pod completely (54cm) is possible, it requires an intentional user interaction (additional push of the sash button). Colored LED notifications reflect the potential danger this poses as air inflow velocities are reduced, thus diminishing the performance of the enclosure to CP0-CP2.

2. Guarantee Filter Efficiency

The ABEK filters used by the Andrew+ Pod effectively retained IPA tracer gas, reducing external lab exposure to minimal levels (1–2 ppm).

[4]The sequential nature of the multiple tests performed within a few hours (including tests intentionally done with non-optimal conditions) has increased the background noise of the IPA tracer gas within the testing space. With this background noise calculated out, this test would have resulted in the best possible CP (CP 3).

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