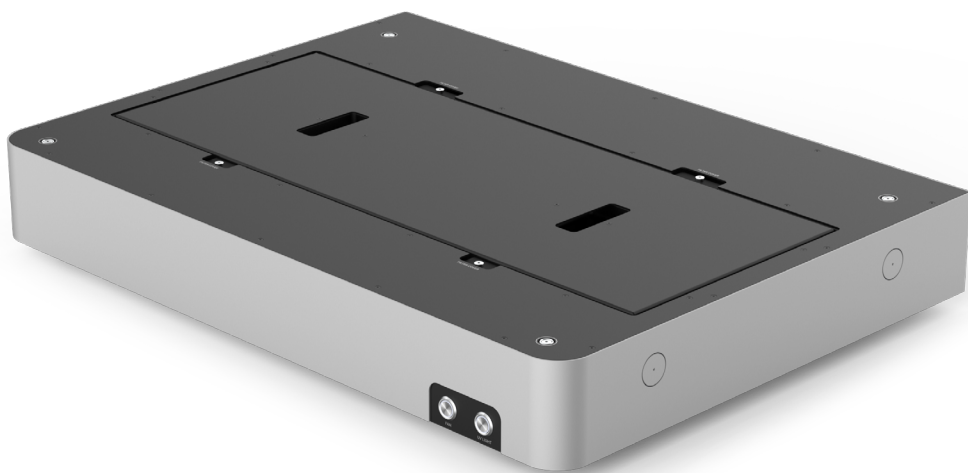# HEPA/UV Module

Instruction Manual

Opentrons Labworks Inc.

July 2024

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Product and Manufacturer Description

PRODUCT DESCRIPTION

The Opentrons Flex HEPA/UV Module is a positive-pressure clean air and ultraviolet (UV) disinfectant accessory for the Flex liquid handling robot. It contains a mesh pre-filter, a HEPA filter, and two UV lights. Running the module's filtration and lighting for 15 minutes creates an ISO-5 clean bench environment within the Flex enclosure.

Review this guide for information about the features of the HEPA/UV Module, including installation, maintenance, and warranty information.

MANUFACTURER DESCRIPTION

Opentrons Labworks Inc
45-18 Ct Square W
Long Island City, NY 11101

Safety Information and Regulatory Compliance

Opentrons recommends that you follow the safe use specifications listed in this section and throughout this manual.

ENVIRONMENTAL CONDITIONS

The HEPA/UV Module should only be used indoors in an environment with stable ambient conditions. This module is designed for use with the Flex robot only. It cannot be used with the OT-2 robot or as standalone equipment. Follow the installation instructions to ensure proper and safe operation.

> **Note:** The HEPA/UV Module should not be powered on or used in conditions outside of the acceptable operating conditions.

The following table lists and defines the environmental operating conditions for recommended use, acceptable use, and storage of your HEPA/UV Module.

Environmental Conditions	Recommended	Acceptable	Storage and Transportation
Ambient Temperatures	+20 to +25 °C	+2 to +40 °C	+2 to +40 °C
Relative Humidity	40–60%, non-condensing	30–80%, non-condensing (below 30 °C)	10–85%, non-condensing (below 30 °C)
Altitude	Approximately 500 m above sea level	Up to 2000 m above sea level	Up to 2000 m above sea level
Pollution Degree	2	2	2

The following table lists and defines standards for recommended use, acceptable use, and storage.

Operating Conditions	Description
Recommended	Opentrons has validated the performance of the HEPA/UV Module in the conditions recommended for system operation. Operating the module in these conditions provides optimal results.
Acceptable	The HEPA/UV Module is safe to use in conditions acceptable for system operation, but results may vary.
Storage	Storage and transportation conditions only apply when the device is completely disconnected from power and other equipment.

INSTRUMENT SAFETY WARNINGS

Warning symbols posted on the HEPA/UV Module and in this manual refer directly to the safe use of the unit. The following table lists and defines each safety warning symbol.

Symbol	Description
	Caution: Mercury (Hg) exposure hazard! The fluorescent UV bulbs contain mercury (Hg). In the event of a broken bulb, there may be a risk of exposure to mercury. Follow lab procedures and local regulations for bulb cleanup and disposal. Intact bulbs do not present a health hazard.
	Caution: Ultraviolet radiation (UV-C)! The HEPA/UV Module produces high-intensity ultraviolet light (UV-C). The Flex and the HEPA/UV Module come with safety features that protect you from UV-C. Even with these safety features in place, always take care to protect your eyes and skin from exposure while the UV lights are on. Do not attempt to remove or adjust the HEPA/UV Module while powered on. If using the waste chute accessory, ensure that the chute door is unobstructed and in its closed position before enabling the UV lights.
	Caution: High Voltage! The rear enclosure of the HEPA/UV Module contains high voltage electricity which can cause electric shock. This area should only be opened and serviced by qualified personnel.
	Caution: Heavy object! The HEPA/UV Module requires two people to lift it properly. Also, lifting and carrying the HEPA/UV Module by its handles is the best way to move it on and off the robot.
	Warning: Biohazard! The HEPA/UV Module is not a biosafety cabinet. ■ Do not use it with pathogens. ■ Do not use it in situations where volatiles or hazardous aerosolized materials are present. ■ Do not use to filter particles smaller than 0.3 micrometers (µm).

STANDARDS COMPLIANCE

The HEPA/UV Module has been tested and found to be in compliance with all applicable requirements of the following safety and electromagnetic standards.

Safety

Rule ID	Title
IEC/UL/CSA 61010-1	Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use – Part 1: General Requirements
IEC/EN 62471	Photobiological safety of lamps and lamp systems

Electromagnetic Compatibility

Rule ID	Title
EN/BSI 61326-1	Electrical Equipment for Measurement, Control, and Laboratory Use – EMC Requirements – Part 1: General Requirements
FCC 47 CFR Part 15 Subpart B	Equipment Authorization of Unintentional Radiators
IC ICES-003	Spectrum Management and Telecommunications – Interference-Causing Equipment Standard – Information Technology Equipment (Including Digital Apparatus)

Hazardous Substances
RoHS 3 compliant.

FCC Warnings and Notes

Warning:
Changes or modifications to this module not expressly approved by Opentrons could void the user's authority to operate the equipment. This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:
- This device may not cause harmful interference.
- This device must accept any interference received, including interference that may cause undesired operation.

Note:

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC rules. These limits are designed to provide a reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at their own expense.

Canada ISED

Canada ICES–003(A) / NMB–003(A)
This product meets the applicable Innovation, Science and Economic Development Canada technical specifications.
Le présent produit est conforme aux spécifications techniques applicables d'Innovation, Sciences et Développement économique Canada.

CISPR 11 Class A
Caution:

This equipment is not intended for use in residential environments and may not provide adequate protection to radio reception in such environments.

Environmental Warning
Warning:

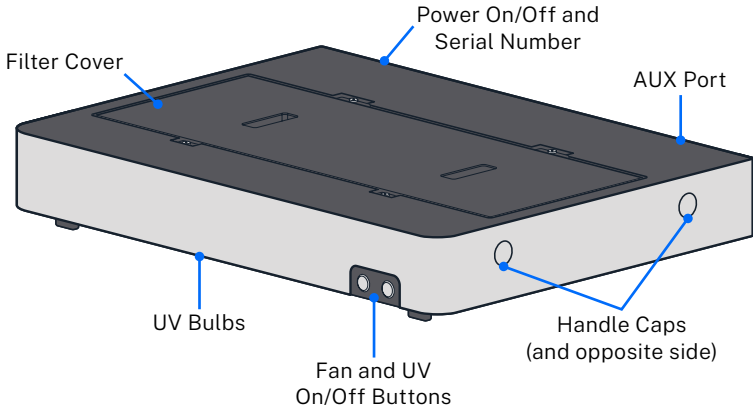Cancer and Reproductive harm – www.P65Warnings.ca.gov

WEEE Policy

Opentrons is dedicated to adhering to the EU Directive on Waste Electrical and Electronic Equipment (WEEE – 2012/19/EU). Our goal is to ensure that our products are properly disposed of or recycled once they reach the end of their useful life.

Opentrons products that fall under the WEEE directive are labeled with the symbol, signifying that they should not be thrown away with regular household waste but must be collected and handled separately.

If you or your business have Opentrons products that are at end of life or need to be discarded for a separate purpose, contact Opentrons for proper disposal and recycling.
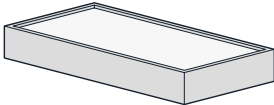
Product Specifications

Power On/Off and
Serial Number

Filter Cover

AUX Port

UV Bulbs

Fan and UV
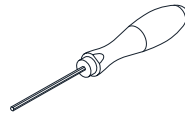On/Off Buttons

Handle Caps
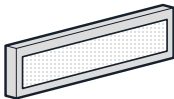(and opposite side)

INCLUDED PARTS

(1) HEPA/UV Module

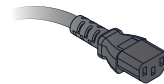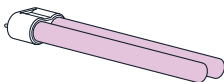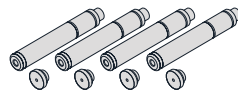(1) M12 AUX Cable

(1) HEPA Filter

(1) 2.5 mm Hex Screwdriver

(1) Pre-Filter

(1) Power Cable

(2) UV Bulbs

(4 each) Carrying Handles
and Caps

PHYSICAL SPECIFICATIONS

Box dimensions	102 cm L x 79 cm W x 25 cm H
Module dimensions	87 cm L x 64 cm W x 14 cm H
Module weight	~20 kg (42 lbs)
Operating space	20 cm / 8" (minimum) of side and top clearance

INPUT AND OUTPUT CONNECTIONS

The HEPA/UV Module has the following power input requirements, which are met by the included power supply.

> ⚠ **Warning:** Observe the following when handling the module power cable:
> - Always plug the power cable into a grounded outlet.
> - Make sure that the power cable is not obstructed, in case it needs to be disconnected.
> - Do not replace the power supply cable unless at the direction of Opentrons Support. This ensures that the power cable has adequate ratings for the equipment.

Power Specifications

|	
Input	- 100–240 VAC, 50/60 Hz - 2.2 A at 115 VAC - 1.1 A at 230 VAC
Output	24 VDC, 8.4 A, 201 W max
Mains supply voltage fluctuation	100–240 VAC ±10%
Fuse type	T3.15 A, 250 V, 5×20 mm

Power Consumption

The power consumption specifications are measured with the UV lights and fan on.

- Typical power consumption: 75.5 W
- Peak power consumption: 160 W

HEPA Specifications

The Flex HEPA/UV Module uses a two-stage filtration system to purify air pulled into the enclosure. This system includes a reusable pre-filter and a disposable H14 HEPA main filter. The pre-filter traps large particles while the HEPA filter captures up to 99.99% of airborne particulate matter at ≥ 0.3 microns (μm). Vertical air flow from the HEPA filter creates a positive-pressure environment within the enclosure. This air boundary helps protect samples inside the Flex from external contamination. The air cleaning system of the Flex HEPA/UV Module meets ISO-5 clean bench standards.
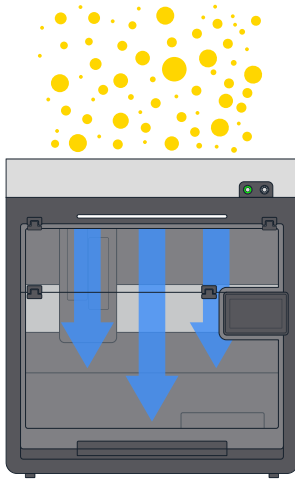
FILTER DATA

Specification	Description
ISO clean bench standards	ISO-5
Pre-filter	■ Metal mesh ■ Reusable
HEPA filter	■ Grade H14 ■ 99.99% efficiency for particles ≥ 0.3 μm ■ Disposable
HEPA filter lifetime	3 years of use (~6,000 hours)
Ambient fan noise	≤ 70 dB at 1 meter during fan operation

UV Specifications

The HEPA/UV Module holds two compact fluorescent UV bulbs. When on, the bulbs emit UV-C at the 254 nm wavelength. At this wavelength, UV-C disinfects by killing or damaging the genetic material found in various microorganisms. After a 15-minute exposure cycle, the ultraviolet light produced is sufficient to achieve log-4 (99.99%) inactivation of commonly targeted microorganisms within the enclosure.

SAFETY FEATURES

The HEPA/UV Module produces high-intensity ultraviolet light (UV-C). The Flex and the HEPA/UV Module come with features that protect you from UV-C exposure and prevent it from operating in an unsafe manner.

Safety feature	Description
Panels	The robot's polycarbonate door and side panels block UV-spectrum light to below a level which represents an exposure risk. Never operate the UV lights with the robot's door or side panels removed.
Door switch	Flex uses a mechanical switch to tell if the front door is open or closed. The UV lights only work when the front door is closed. Opening the door deactivates/disables the UV lights. This safety interlock works even when Flex is turned off.
Attachment sensor	The Flex and HEPA/UV Module each have a built-in sensor to detect if the module is attached properly. The sensors deactivate/disable the UV lights if the module is not mounted on the robot, removed while in operation, or misaligned.

> **Warning:**
> - Direct exposure to UV-C light can damage your eyes and exposed skin. Always take care to protect your eyes and skin from exposure while the UV lights are on.
> - Properly attach a fixture or deck plate cover in every deck slot before turning the UV lights on. Never operate the UV lights with empty deck cutouts.

BULB DATA

| Specification	Description
Bulb type	Actinic fluorescent light bulb
Bulb base	2G11 (4 pin, single cap)
Useful life	9,000 hours
UV risk classification	- UV-C risk group 3 - Brief or temporary exposure may pose a hazard
UV end-of-life deprecation	20%
Mercury (Hg) content	4.4 mg
Power consumption	18 W
Current (nominal)	0.375 A
Voltage (nominal)	58 V

Unboxing and Installation

Ask a lab partner for help with unboxing, lifting, and attaching the module. For tools, you will need scissors and the 2.5 mm hex screwdriver that comes in the Module User Kit.
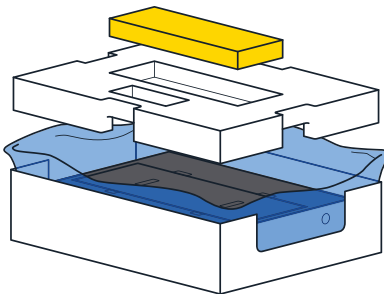
> **Note:** When attached, the HEPA/UV Module requires 20 cm (8") of top and side clearance to operate properly.

UNBOXING

1 Open the box and remove the power cable.
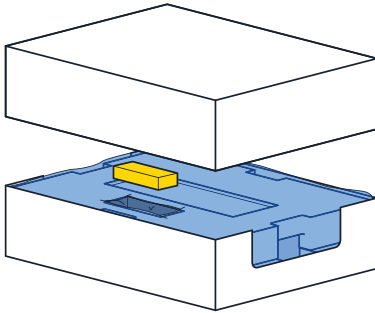
2 Cut open the blue shipping bag. Remove the foam padding and the Module User Kit.

**3** Remove the four aluminum handles from the Module User Kit. Screw the handles into the sides of the module. The bottom half of the box has side cutouts so you can attach the handles while the module is still in the box.
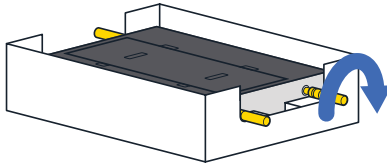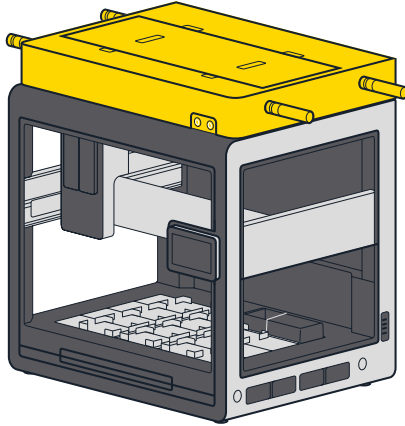

INSTALLATION

4 Using the 2.5 mm hex screwdriver, remove the top window panel from your Flex. Store the window panel and screws in a safe place for future reassembly.
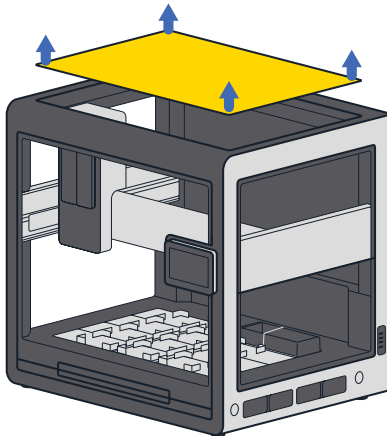
5 Working with a lab partner, lift the module from its box by the handles. Lower the module onto the top of the robot. Chamfered corner pins on the module help guide it into place.

6 Use the 2.5 mm hex screwdriver to tighten the module's captive screws and fasten it to the robot.
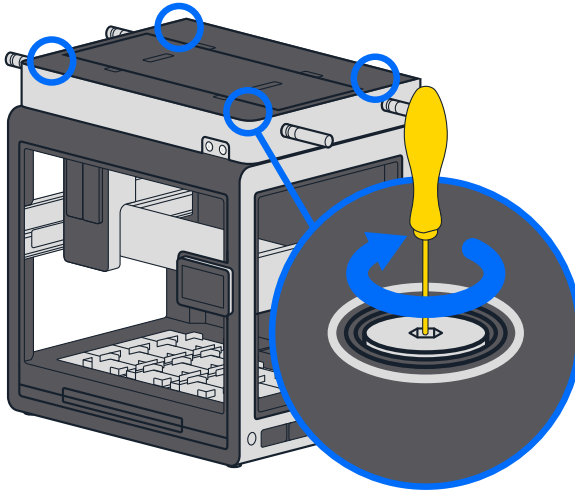
The HEPA/UV Module is attached properly when it sits flush with the top of the robot. There should be no gaps between the foam seal on the HEPA/UV Module and the robot.

7 Remove the UV bulbs from the Module User Kit. Unwrap and install them in recessed receptacles on the underside of the module.
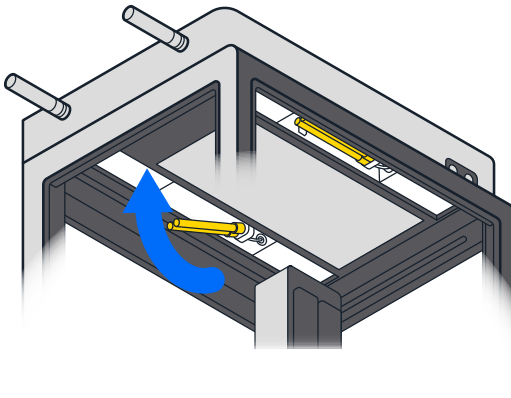
- If necessary, move the gantry to its home position at the back right. When Flex is powered off, the gantry should move easily by hand.
- Each bulb has 4 prongs that fit into the power receptacle. Push the prongs into the receptacle.
- Retaining clips hold the free ends of the bulbs in place. Press the bulbs gently until they snap into the clips.

8 Remove the carrying handles and replace them with the finishing caps. Fasten the caps using the 2.5 mm hex screwdriver. The caps close the handle openings and give the HEPA/UV Module a clean, finished appearance. Store the handles in the Module User Kit for future use.
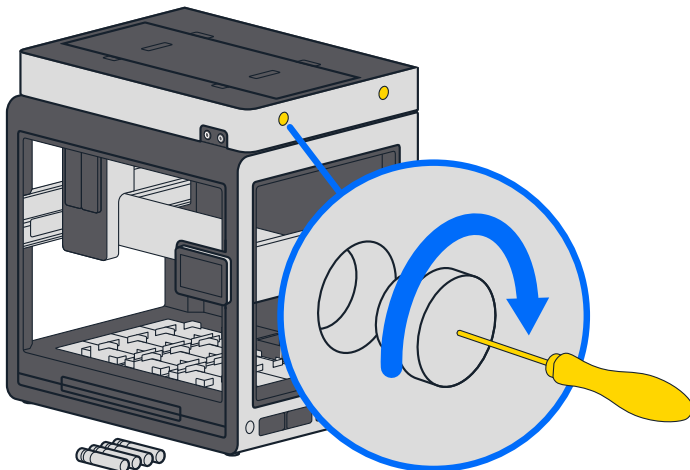
9   Remove the M12 AUX cable from the Module User Kit. Attach the cord's right-angle connector to the AUX port on the back of the HEPA/UV Module. Attach the other end to an AUX port on the back of the Flex.
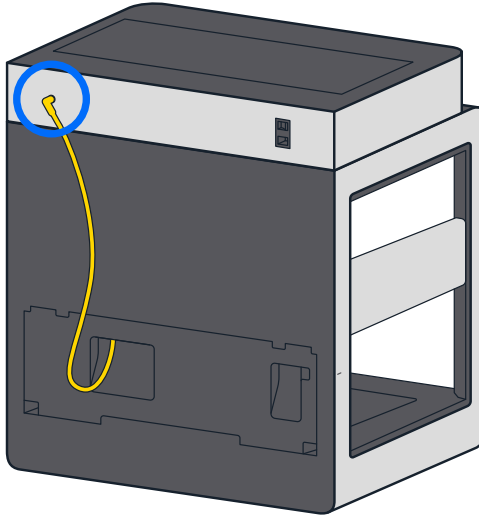
10   Connect the power cord to the module and to a wall outlet.

11   Press the rear power switch to turn on the HEPA/UV Module. The ring lights around the on/off buttons should glow white.

With everything secure, connected, and powered on, your HEPA/UV Module is ready for use. This module does not require calibration.

Hardware Controls

Separate on/off buttons on the front of the HEPA/UV Module control the fan and UV lights. You can operate these systems simultaneously or independently of each other.

See the following table for the information on how to operate the HEPA and UV systems.

Function	Operation
HEPA filtration on	Press **Fan** once.
HEPA filtration off	Press **Fan** again.
UV lights on	Press **UV Light** once. Do not turn on the lights during a protocol run.
UV lights off	Lights turn off automatically after 15 minutes. Or press **UV Light** again.

Ring lights around the on/off buttons change colors to indicate the operational status of the HEPA fan and UV lights.

| LED color	LED pattern	HEPA/UV status
⚪ White	Solid	Idle
🟢 Green	Solid	Normal operation
	Pulse	An operation cycle has been completed or canceled. Returns to white/idle state after pulse.
🔵 Blue	Solid	Indicates user intervention required or an unsafe condition (e.g., the door opens while the UV lights are on).

Maintenance

Aside from replacing the UV bulbs and filters, users should not attempt to service or repair the HEPA/UV Module themselves. If you have concerns about the module's performance or require maintenance, please contact Opentrons Support (support@opentrons.com).

BULB REPLACEMENT

The UV bulbs are user-replaceable items. To purchase a new bulb, contact Opentrons Support (support@opentrons.com).

FILTER MAINTENANCE

You can clean and reuse the pre-filter but not the HEPA filter. Always replace your dirty HEPA filter with a fresh filter. To purchase a new set of filters, contact Opentrons Support (support@opentrons.com).

Filter Cover

Pre-Filter

HEPA Filter
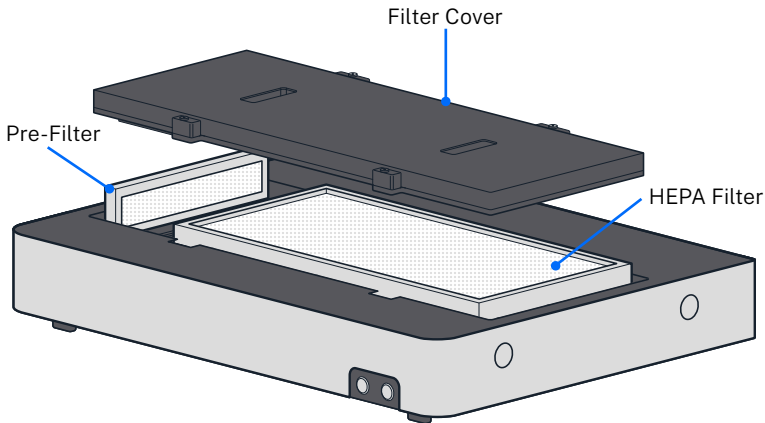
To access, replace, and clean the filters:

1 Turn off power to the HEPA/UV Module.

2 Using the 2.5 mm hex screwdriver, loosen the captive screws that secure the filter panel to the top of the module. Lift the panel off the module and set it aside.

3   Remove the old HEPA filter and throw it away.

4   Install the new HEPA filter with the airflow direction arrow pointing down, towards the Flex enclosure, and write the replacement date on the filter label.
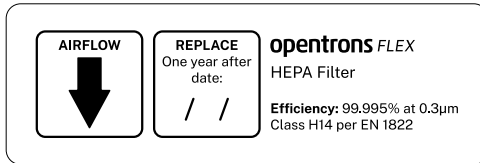
5   Remove the pre-filter and replace it with a fresh one. You can also clean the pre-filter with warm water or a mild detergent. Rinse and let it air dry before reinstalling.

6   Install the pre-filter with the airflow direction arrow pointing towards the HEPA filter.

7   Set the filter cover on top of the module and fasten the screws.

8   Turn the power on. Press the Fan button for 3 seconds to reset the filter status.

Cleaning

The following table lists the chemicals you can use to clean the exterior of your HEPA/UV Module. Diluted alcohol and distilled water are our recommended cleaning products, but you can refer to this list for other cleaning options.

> ⚠️ **Warning:**
> - **Do not** use acetone to clean the HEPA/UV Module.
> - **Do not** disassemble the HEPA/UV Module and attempt to clean its internal electronic components.

Solution	Description
Alcohol	Includes ethyl/ethanol, isopropyl, and methanol. Dilute to 70% for cleaning. Do not use 100% alcohol.
Bleach	Dilute to 10% (1:10 bleach/water ratio) for cleaning. Do not use 100% bleach.
Distilled water	You can use distilled water to clean or rinse your HEPA/UV Module.

CLEANING THE HEPA/UV MODULE

Be sure to turn the power off before cleaning the module. You can clean the exposed surfaces of the module while it's installed on the Flex. However, for better access, you may want to:

- Disconnect the AUX and power cables before you begin.
- Remove the HEPA/UV Module from the Flex.

Once you've prepared the module for cleaning:

1. Dampen a soft, clean cloth or paper towel with a cleaning solution.
2. Gently wipe off the surface of the module.
3. Use a cloth dampened with distilled water as a rinse wipedown.
4. Let the module air dry.

BROKEN BULB CLEANUP

The fluorescent UV bulbs used by the HEPA/UV Module contain small amounts of mercury. Intact bulbs do not present a health hazard, but a broken bulb can release mercury vapor. If a bulb breaks, follow your institution's protocols for cleaning broken compact fluorescent bulbs.

Additional Product Information

WARRANTY

All hardware purchased from Opentrons is covered under a 1-year standard warranty. Opentrons warrants to the end-user of the products that they will be free of manufacturing defects due to part quality issues or poor workmanship and also warrants that the products will materially conform to Opentrons' published specifications.

SUPPORT

Opentrons Support can help you with questions about our products and services. If you discover a defect, or believe your product is not functioning to published specifications, contact us at support@opentrons.com.

Please have the serial number available when contacting support. You can find the serial number on the back of the module near the power cable.

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Post-sales service & contacting Opentrons

If you have any questions about the use of the system,
abnormal phenomena, or special needs, please contact:
support@opentrons.com. Also visit www.opentrons.com.